The Effect of Legislation Concerning Environmental Tobacco Smoke (ETS) on the Short-term Health of Hospitality Workers: A Canada – Italy Comparison

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Abstract

Background: Environmental tobacco smoke (ETS) is a combination of the smoke exhaled by smokers and the smoke burning from a cigarette, cigar or pipe that is not being inhaled. It contains over 4000 chemicals many of them being known carcinogens and toxins. The recently-identified hazards of ETS have resulted in the implementation of new legislation to protect non-smokers' health in jurisdictions worldwide.

Purpose: This study tests the hypothesis that legislation eliminating ETS from all enclosed public places improves the health of hospitality workers.

Methods: This is a descriptive, case-series study, which investigates tobacco smoke exposure in non-smoking hospitality workers in Canada and Italy. Data was obtained by testing workers for levels of carbon monoxide before and immediately after working in venues where smoking was permitted and was not permitted. Workers also provided information on respiratory and sensory irritation symptoms.

Conclusion: Legislation eliminating ETS improves the health of hospitality industry workers.

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Chapter 1 – Introduction

A. Smoking and Environmental Tobacco Smoke

Globally, approximately 5.5 trillion cigarettes are smoked annually which relates to a consumption rate of 900 cigarettes per smoker per year (Proctor, 2004). However, there has been a rise and fall to consumption patterns of smoking within the world population since cigarettes were first commercialized. Various developments throughout the 19th and much of the 20th centuries made it easier for people to smoke. From the creation of flue curing and safety matches, to the promotion of cigarettes as a war-time stress reliever and the massive marketing force behind the product for nearly a century, the rise of cigarette use was engineered by a powerful industrial force (see Table 1.1).

Table 1.1 Six Principle Stages in the Rise of Cigarette Smoking Prevalence

Year	Event
1830s	Flue curing, a fermentation process allowing the production of a tobacco leaf that could be inhaled deep into the lungs without causing the smoker to cough was invented.
1855	Invention of safety matches to make cigarettes easier to light.
1880s	Development of the *Bonsack* rolling machine to produce cigarettes faster.
1880s	Recognition of cigarettes by the government as a reliable source of tax revenue.
1914-1918 WWI	Cigarettes handed out to soldiers as part of their rations to relax and calm the soldiers during a time of war. Much advertising back home in North America during this time of the benefits of cigarettes as a stress reliever.
1920s-present	Growth of mass consumer marketing of tobacco products: radio, television and print.

Source: Proctor, 2004

The Surgeon General of the United States in 1964 wrote a report on tobacco and health that helped to change the view of smoking in society from a glamorous past-time to a major health hazard, initiating the decline in tobacco consumption (Sundaram et al., 2004). In fact, evidence about smoking's role in cancer and respiratory problems began accumulating in the 1960s (Trotter and Chapman, 2003). Chronic health conditions with which smoking has been linked include: heart attacks, chronic obstructive lung disease, emphysema, cancers of the lung, lip, tongue, larynx, pharynx, and bladder as well as other complications such as blindness (Proctor, 2004). In 2000, at least 4.83 million deaths worldwide were attributable to smoking-related causes (Sundaram et al., 2004).

By 1971 a ban was placed on smoking advertisements on television in the United States (Sundaram et al., 2004). However, that ban did not stop the tobacco industry from promoting their product. Instead, tobacco companies began using logo placement at sporting events and sponsoring as many different events and organizations as possible to obtain exposure for their products (Sundaram et al., 2004) using various media including print, billboards, and movies.

While the evidence regarding the negative health effects of smoking has been increasing over the past half-century, only since the 1980s, has it been understood that exposure to Environmental Tobacco Smoke (ETS) is also detrimental to health (Trotter and Chapman, 2003). The first report on negative effects of lung function in workers exposed to ETS was written in 1980 by White and Froeb (White and Froeb, 1980). Two reports released in 1986 (one by the National Research Council and the other by the U.S. Surgeon General's Office stemming from the original 1964 report) concluded independently that ETS increases the risk of lung cancer in non-smokers. Since then,

there have been many other studies concluding that ETS causes lung cancer as well as many other cancers, lower respiratory tract illnesses such as acute bronchitis, bronchiolitis and pneumonia, asthma, coronary diseases, stroke, SIDS (Sudden Infant Death Syndrome) and other long term health effects (Lukachko, 1999; Chan-Yeung et al., 2003; Wilson and Thomson, 2002; Brownson et. al., 1997).

ETS includes the smoke exhaled by smokers and the sidestream smoke from a burning cigarette, cigar or pipe. ETS contains over 4,000 chemicals with at least 60 of them being known carcinogens (Dhala et al., 2004; Yeung and Dimich-Ward, 2003) and another 400 of them being classified as toxins (EPA, 2003). Some of the major toxins emitted when a cigarette is burned are carbon monoxide, formaldehyde, hydrogen cyanide, benzene, and polycyclic aromatic hydrocarbons and carcinogens such as arsenic, cadmium, nitrosamines, and vinyl chloride (Brownson et al., 2002). These chemicals are inhaled by both the smoker and others in close proximity to the smoker.

Any or all of the chemicals found in ETS can cause health effects for those who are exposed to them. Carbon monoxide (CO) is a by-product of the burning of tobacco. It reduces the ability of red blood cells to deliver oxygen to tissues by binding with haemoglobin (Jo et al., 2004). Some of the symptoms of CO exposure include headaches, nausea, and incorrect judgement of time intervals. It also increases the risk of coronary heart disease (Jo et al., 2004). Benzene is considered toxic under CEPA (Canadian Environmental Protection Act) and a Class 1 carcinogen by the International Agency for Research on Cancer. Benzene, as with urethane, vinyl chloride and some aromatic amines and nitrosamines also found in ETS have been linked to cancers other than lung cancer (Dhala et al., 2004). Lung cancer has been associated with ETS

constituents in other (non-smoking) environments where polycyclic aromatic hydrocarbons (PAHs), nickel, chromium, cadmium and arsenic are prevalent (Dhala et al., 2004). Formaldehyde has been shown to cause airway diseases, eye, nose and throat irritations as well as breathing problems (Dhala et al., 2004; Health Canada, 2004). Hydrogen cyanide is one of the most toxic chemicals found in cigarette smoke. Some of the most common symptoms experienced because of exposure to hydrogen cyanide are weakness, headache, nausea, vomiting, rapid breathing, eye and skin irritation and enlarged thyroid glands along with more severe health effects such as heart irregularities and death caused by metabolic asphyxiation (Health Canada, 2004; Dhala et al., 2004). Chronic low exposure to this chemical is reported to cause neurological, respiratory, cardiovascular, and thyroid effects within material safety data sheets and chronic toxicity summaries where tobacco smoke is listed as a main source of exposure. Hydrogen cyanide, aldehydes, ammonia, nitrogen dioxide, sulphur dioxide all found in ETS, have been associated with diseases of the airways (Dhala et al., 2004).

B. Exposure and Susceptible Populations

People are exposed to ETS in their homes when they live with indoor smokers, at workplaces that permit smoking on their premises and in public places where smoking restrictions do not exist. The amount of ETS to which a person is exposed depends on such factors as: the number of smokers and the rate at which they smoke, the size of the enclosure or room, the proximity to the source of ETS, ventilation characteristics and the duration of the exposure.

Blue-collar workers (e.g. the bartenders and waiters/waitresses in the hospitality industry) are more likely than white-collar workers (e.g. doctors, lawyers, accountants) to smoke cigarettes and be exposed to ETS. In fact, data from 1997 have shown that blue-collar workers are 75% more likely to smoke than white-collar workers (Howard, 2004). Further, blue-collar workplaces may be more tolerant of smoking on their premises (Giovino et al., 2002).

Children are more vulnerable to ETS exposure because they are usually unable to escape or change the environment (compared to adults). In fact, the main cause of ETS exposure for children is parental smoking (Dhala et al., 2004). As well, young children have less developed organ systems, causing chemicals to which they are exposed to have an even greater effect on their organs such as the lungs. The measures of ventilatory function and of lung size increase as the lungs grow, which is greatest during the adolescent stage (Wu-Williams and Samet, 1990). Non-smoking adults are more susceptible to adverse respiratory effects from ETS if they are asthmatic or have hyper-responsive airways (Chan-Yeung and Dimich-Ward, 2003).

C. Health Effects of ETS Constituents

It is believed by scientists that the same diseases that are associated with smoking can also be associated with ETS (inhaling indirect, sidestream smoke). The composition of ETS and mainstream smoke is qualitatively similar (Bartal, 2005). However, mainstream smoke inhaled by smokers directly burns off contaminants due to the higher temperature produced by puffing as opposed to sidestream smoke inhaled indirectly which produces contaminants at a lower temperature causing them to remain intact

(Dewey, 1985). Sidestream smoke may actually be considered more dangerous to health since it contains twice the amount of nicotine and tar and three times the amount of pyrene, phenols and benzopyrene (Tinker, 1978). Smokers inhale both mainstream and sidestream smoke, and are thus at a greater health risk than non-smokers who only intake sidestream smoke.

There are various acute and chronic symptoms seen as a result of exposure to ETS constituents (see Table 2.1). Those who are exposed to ETS are prone to such immediate symptoms as a runny nose, watery eyes, chronic coughing, wheezing and frequent colds (Yeung and Dimich-Ward, 2003; Akbar-Khanzadeh and Greco, 1996). The chronic illnesses experienced due to long term exposure to ETS are ischemic heart disease, chronic obstructive pulmonary disease, asthma, and lung cancer as well as cancers of the head, neck, bladder and cervix (Dhala et al., 2004).

The main cardiovascular diseases related to cigarette smoking include ischemic heart disease, hypertension, stroke, aortic aneurysm, thromboangitis obliterans (Buerger's Disease), systemic atherosclerosis, cardiac arrhythmias, and heart failure (Leone, 2005). Ischemic heart disease is a term used to refer to problems with the heart due to a narrowing of the arteries causing less blood and oxygen to flow to the heart which over time may lead to a heart attack (American Heart Association, 2005). Smoking is an important preventable cause of cardiovascular mortality. One in ten cardiovascular deaths worldwide in 2000 were attributable to smoking (Ezzati et al., 2005). There are several mechanisms by which smoking tobacco increases the risk of ischemic heart disease, including increasing plasma fibrinogen, reducing high-density lipoprotein cholesterol, increasing carboxyhemoglobin, and increasing platelet stickiness and aggregation, which

is also affected by ETS exposure (Law and Wald, 2003). Acute exposure to ETS (20 minutes to 8 hours) has caused an 80% reduction in platelet sensitivity to prostacyclin (PGI_2) in non-smokers (Burghuber et al., 1986) leading to increased thrombosis, acute effects of carboxyhemoglobinemia on blood oxygen transport and myocardial respiration, and endothelial damage (Leone et al., 2004). An excess of heart disease mortality in non-smokers with ETS exposure has been found in some studies (Garland et al., 1985; Svendsen et al., 1987, Blackburn, 1998, Groh and Morrison, 2002). Law and Wald (2003) found that ETS exposure caused an increase in risk for ischemic heart disease events of 30% in non-smokers.

Chronic obstructive pulmonary disease (COPD) can be defined generally as a progressive, irreversible decline in lung function (Bartal, 2005) or more detailed under the two forms in which it is seen; chronic bronchitis and emphysema. It is one of the leading causes of mortality and morbidity in the world (Viegi et al., 2001). In general it can be considered as a progressive, irreversible decline in lung function (Sunyer, 2001). Chronic bronchitis is the production of excess mucus in our lungs, which impairs breathing and is usually associated with constant coughing (Health Canada, 2005). Coughing is a natural mechanism that removes foreign particles and irritants from our airway and bronchial tree. Symptoms of chronic bronchitis include a constant cough, excess phlegm, and a higher incidence of throat and lung infections. Emphysema is a degenerative, debilitating disease. It begins as a shortness of breath with any movement or exertion and eventually the person becomes progressively weaker to the point that breathing becomes a difficult task (Health Canada, 2005). The most important risk factor for COPD is cigarette smoking (Ramirez-Venegas et al., 2006; Bartal, 2005), although

the exact mechanism by which smoking causes the disease is not known (American Thoracic Society, 1996). Even though there are only a few studies on ETS and COPD, existing evidence shows an increased risk of COPD with increased ETS exposure (Jaakola and Jaakola, 2002). Estimates of COPD linked with ETS may be low due to a tendency of physicians to report chronic bronchitis and emphysema as separate entities rather than COPD (Jindal et al., 2006).

Asthma is a chronic inflammatory disease of the airways caused by genetic factors and environmental factors such as ETS (Dhala et al., 2004). It is estimated that 2.7 million Canadian adults and children (over age 4) have asthma (Health Canada, 2006) and 287 Canadians died of asthma in 2003. ETS contains respiratory irritants such as sulphur dioxide, ammonia, and formaldehyde and is linked with elevated levels of serum IgE levels, an allergic phenomenon (Eisner, 2005). This has the potential to induce new cases of asthma in adults and adversely affect asthma control for those adults who already have the disease. Exposure to ETS in childhood can contribute to asthma in adulthood (Dhala et.al., 2006; Jinot and Bayard, 1996).

Cancer is a term for more than 200 diseases, but it is generally defined by the Canadian Cancer Society (2004) as the uncontrolled, abnormal growth of cells that can invade and destroy healthy tissue. Tobacco smoking has been linked with cancers of the lung, larynx, oral cavity, oesophagus, pancreas, bladder, kidney, stomach and the uterine cervix (Tredaniel et al., 1993; U.S. Department of Health and Human Services, 1989). Lung cancer is associated with ETS exposure because of the causal association between active smoking and lung cancer and the qualitative similarities between ETS and mainstream smoke (Dewey, 1985). There is a vast amount of evidence to support the

association between smoking and lung cancer (Kuper et al., 2002). The link between ETS and lung cancer is supported in animal bioassays and genotoxicity studies, ETS exposure and uptake of its constituents, and the results of close to 40 studies performed on the link between ETS and lung cancer in humans (Jinot et al., 1996). The ETS and lung cancer studies have mainly assessed lung cancer cases in non-smoking women with spouses who smoke. The first of these studies to show the association was in 1928 (Schnonherr). Lung cancer is the leading cause of cancer death in the world (Dhala et al., 2004, Parkin et al., 1988). Other cancers (such as sinonasal) were linked to ETS because of similar types of findings occurring in other studies (Jinot et al., 1996). Breast cancer, which may not be linked with direct cigarette smoking (Kuper et al., 2002), has shown an increased incidence associated with exposure to ETS (Delfino et al., 2000; Johnson et al., 2000; Lash and Aschengrau, 1999).

In summary, smoking and ETS exposure are both related to many terminal diseases and therefore contribute to many deaths all over the world. Forty-five thousand Canadians will die this year from tobacco use and at least one thousand of those will be non-smokers (Health Canada, 2004).

D. Public Smoking Legislation

The increasing awareness of the hazards associated with ETS are now resulting in the implementation of legislation to protect non-smokers' health in many jurisdictions worldwide. Countries that have national laws banning smoking in public places include Italy, Ireland, Norway, Montenegro, Uganda, South Africa, Tanzania, and South Korea (Yach and Hirschhorn, 2005), although some of these countries may not have as

complete of a ban as others. Despite movement towards smoke-free places, restaurants and bars have frequently been exempt from smoke-free policies until recently (Akbar-Khanzadeh and Greco, 1996). Most Canadian provinces (such as Manitoba) now have in place comprehensive bans on smoking in all public places. On the other hand, other areas of the developed world including those in southern Europe appear to continue to find smoking more socially acceptable and anti-smoking legislation is perceived to be a lower priority for the public (Israely, 2000).

E. Goal of the Study

Studies investigating employees' health in restaurants and bars are scarce (Akbar-Khanzadeh and Greco, 1996). There was an opportunity to examine ETS exposure and legislation in one of these countries (Italy) and compare it to the Canadian situation. This study tested the hypothesis that legislation eliminating exposure to ETS in public places improves the health of workers in the hospitality industry, using information collected from a sample of hospitality workers employed in two countries (Canada and Italy). Participants of the study comprised non-smoking employees of establishments whose management was willing to allow the study to occur on the premises. Various restaurants, bars, lounges, casinos, and bingo halls were selected by identifying establishments known to have a large number of customers. Participating employees were asked to complete a questionnaire before their shift to collect data on age and gender of the individual, duration of employment in the hospitality industry, number of hours they are exposed to smoke every day from work, home, and other locations, and if they experienced particular symptoms associated with ETS. As well, participants were asked

to breathe into a personal carbon monoxide (CO) meter to test the level of CO in their lungs before and after their shift to identify changes occurring during their time at work.

Chapter 2 – Literature Review

A. Environmental Tobacco Smoke (ETS) and Health

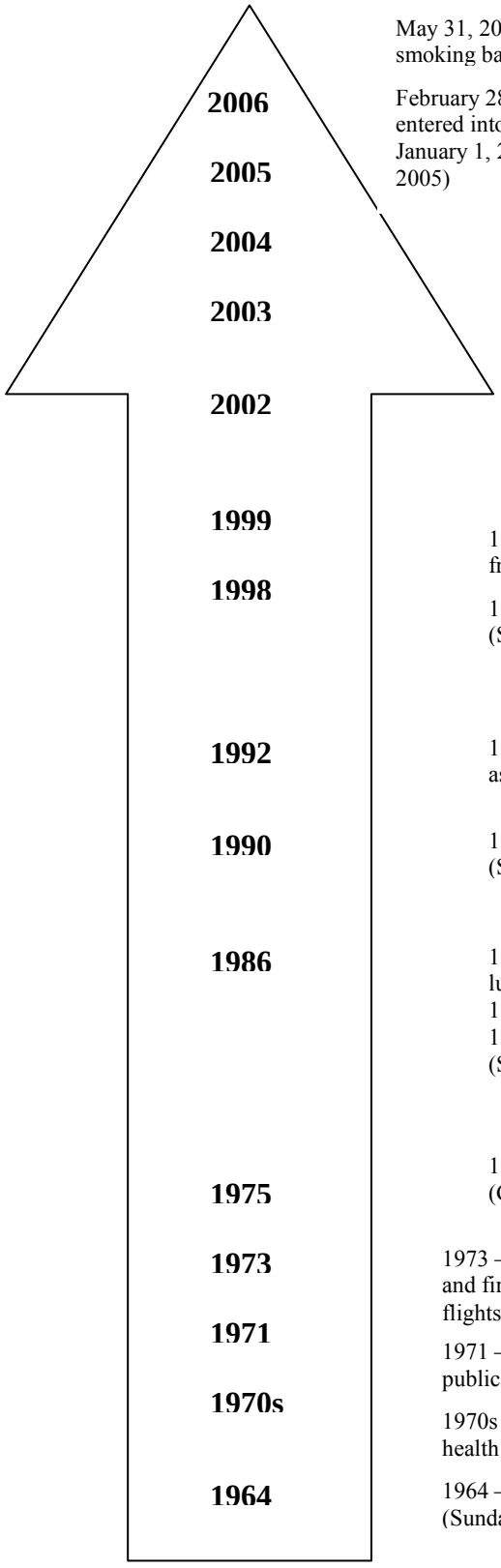
Environmental Tobacco Smoke (ETS) is a combination of the smoke exhaled by smokers and the smoke burning from a cigarette, cigar or pipe when it is not being inhaled. It contains over 4000 chemicals with at least 60 of them being known or suspected carcinogens (Dhala et. al., 2004) or other toxins. Examples of some of the carcinogens found in ETS are arsenic, chromium, cadmium, nickel, urethane, vinyl chloride, formaldehyde, and benzene (Dhala et. al., 2004).

Exposure to environmental tobacco smoke is a critical public health issue. ETS exposure is associated with a variety of adverse health impacts, including cancer as well as cardiovascular, developmental, reproductive, and respiratory effects (Brownson et al., 2002) (Table 2.1). In adults, the weight of scientific evidence supports the view that ETS causes lung cancer, asthma and heart disease (Collier and Pritsos, 2003). The United States Environmental Protection Agency (EPA) classifies ETS as a Group "A" carcinogen for which there is no known safe level of exposure (Sockrider, 2004). A study by Groh and Morrison (2002) estimated that there are over 800 deaths from coronary heart disease caused by ETS annually in Canada; a similar study in Italy by Forastiere et al. (2002), estimated 235 deaths per year. Recent evidence also indicates ETS may increase the risk of acute stroke and that it also poses a danger to persons with asthma and other respiratory conditions (Lukachko, 1999). In children, ETS causes bronchitis, pneumonia, ear infections and asthmatic attacks (Wu-Williams and Samet, 1990; Jinot and Bayard, 1996).

Table 2.1 Acute and Chronic Health Effects from ETS Exposure in Adults in Selected Studies

Study (year)	Summary of acute effects	Summary of chronic effects
Dhala et al. (2004)		Cardiovascular morbidity, ulcerative colitis, ischemic heart disease, respiratory tract illnesses (croup, bronchiolitis, bronchitis, pneumonia, asthma, allergies), malignancies (lung, head & neck, bladder, cervix)
Howard (2004)	Compromised endothelial function of coronary arteries causing myocardial ischemia	Asthma, lung cancer, cardiovascular disease, stroke, chronic obstructive lung disease
Nazaroff and Singer (2004)	Acute respiratory illness	Asthma, lung cancer
Chan-Yeung and Dimich-Ward (2003)	Eye, nose and throat irritation, wheezing, decreased lung function	Asthma, lung cancer
Collier and Pritsos (2003)		Asthma, coronary heart disease, cancers of the mouth, esophagus, larynx, pharynx, lung, bladder, cervix
Bates et al. (2002)		Lung cancer, heart disease, stroke
Brownson et al. (1997)	Cough, phlegm production, reduced lung function, irritation of eyes, nose and throat	Lung cancer, heart disease
Akbar-Khanzadeh and Greco (1996)	Eye irritation, stuffy nose, sore throat, headache	
Jinot and Bayard (1996)	Irritation of eyes, nose, throat, wheezing, shortness of breath, symptoms of bronchitis, decreased lung function	Lung cancer
Leaderer (1990)	Irritation of the eyes, nose an throat, unacceptable odour	Lung cancer

Figure 2.1 Partial History of Cigarette Smoking and Health Legislation



2006 May 31, 2006 Quebec and Ontario enact a public smoking ban.

2005 February 28, 2005 – WHO Framework Convention on Tobacco Control entered into force (WHO, 2005)
January 1, 2005 – Complete Public Smoking ban in Italy (Gallus et al., 2005)

2004 October 1, 2004 – Complete Public Smoking ban in Manitoba, Canada (Province of Manitoba, 2004)

2003 September 1, 2003 – Complete Public Smoking ban in Winnipeg, Manitoba (City of Winnipeg, 2003)

2002 September 1, 2002 – Complete Public Smoking ban in Brandon, Manitoba (City of Brandon, 2002)
January 1, 2002 – Partial Public Smoking ban in Winnipeg, Manitoba (City of Winnipeg, 2002)

1999 1999 – 70% of USA workforce is employed under a smoke-free policy (Sundaram et al., 2004)

1998 1998 – California first U.S. state to ban smoking in bars (Sundaram et al., 2004)

1992 1992 – USA Environmental Protection Agency classified ETS as a carcinogen (EPA, 1992)

1990 1990 – Smoking banned on all domestic flights < 6 hours (Sundaram et al., 2004)

1986 1986 – A number of epidemiological studies linked ETS to lung cancer and coronary heart disease (Thompson et al., 1995)
1986 – Smoking banned on all domestic flights < 2 hours (Sundaram et al., 2004)

1975 1975 – Italy passes first law banning smoking in public places (Gazzetta Ufficiale della Repubblica Italiana, 2005)

1973 1973 – Arizona first state to ban smoking in many public places and first no-smoking sections required on all commercial airline flights (Sundaram et al., 2004; Brownson et al., 1997)

1971 1971 – USA Surgeon General proposed first ban on smoking in public places (Sundaram et al., 2004)

1970s 1970s – Studies performed on deleterious effects of ETS on the health of non-smokers (Thompson et al., 1995)

1964 1964 – USA Surgeon General creates report on tobacco and health (Sundaram et al., 2004)

Note: Partial Public Smoking Ban refers to prohibiting smoking by law in indoor public areas where children under 18 years of age can enter. Complete Public Smoking Ban refers to prohibiting smoking by law in all indoor public places.

In general, ETS is related to three main categories of health effects; cardiovascular and cerebrovascular disease, cancer, and respiratory diseases and related disorders. The risk of experiencing these diseases increases with increased exposure to ETS (Dhala et al., 2006; Ong et al., 2004).

The cardiovascular diseases are those associated with the circulatory system. These diseases include acute myocardial infarction, ischemic heart disease, valvular heart disease, peripheral vascular disease, arrhythmias, high blood pressure and smoke (Public Health Agency of Canada, 2003). Cerebrovascular diseases concerns one or more blood vessels of the brain (Public Health Agency of Canada, 2003).

Many types of cancer have been associated with ETS in the last decade. These include lung cancer, cancer of the bladder, pancreatic cancer, cervical cancer and breast cancer, to name a few (Collier and Pritsos, 2003; Tredaniel et al., 1993). In fact, ETS has been ranked as the second most important cause of lung cancer in Canada right after smoking as the primary cause (Canadian Lung Association, 2006).

Respiratory diseases and related disorders include coughing, wheezing, excessive sputum, an increase in asthma, colds, sore throat, middle ear infection, reduced lung function, pneumonia, emphysema, and bronchitis (Brownson et. al, 1997; Eisner, 2005; Lam et al., 2005; Dhala et al., 2006).

Certain populations are particularly prone to health effects from tobacco smoke; such vulnerable populations include children, the elderly, those who already suffer from asthma and other respiratory and cardiovascular ailments, those with existing cancers,

and those with immunodeficiencies (Dhala et al, 2004; Chan-Yeung and Dimich-Ward, 2003; Wu-Williams and Samet, 1990). Infants and young children who are exposed to ETS can develop an increased rate of lower respiratory tract and ear infections, an increase in asthma, a decrease in the rate of lung growth, and an increased risk of SIDS (sudden infant death syndrome) (Jinot and Bayard, 1996).

Many people are exposed to ETS in their daily lives, whether it is at home, work, or in a public setting such as a restaurant or a bar. The effect of exposure to ETS has been roughly equated to primary tobacco smoke exposure. A non-smoker spending two hours in a smoke-filled bar has the same health effect as if they smoked four cigarettes (CCTC, 2002). Tobacco smoke consists of a gaseous phase and a particulate phase. The particulate phase is composed of particles of varying sizes. PM_{10} is particulate matter that is less than or equal to 10 microns in diameter. Particulate matter of this size is respirable and can be retained in the lungs (Yassi, 1997), therefore causing many respiratory health problems such as those presented in Table 2.1.

ETS is both an environmental and health matter and therefore its impact should be considered under both health and environmental policies. The Canadian Ministers of both Health and of the Environment declared PM_{10} toxic under the Canadian Environmental Protection Act (Environment Canada, 2002).

B. Hospitality Workers as a Susceptible Population

Hospitality workers are at a greater risk of exposure to high amounts of ETS than many other types of workers (Albers et al., 2004). For example, Tang et al. (2003) estimated occupational exposure to ETS to be 3.9 to 6.1 times higher among bar workers

than among office workers. A study of San Francisco bartenders by Eisner et al. (1998), found that 74% of employees of taverns and bars reported having respiratory symptoms and 77% reported experiencing mucosa irritation symptoms from ETS exposure. This study was conducted on 53 bartenders working in bars and taverns in San Fransisco, California. It can be considered similar to the present study, as the California researchers used a questionnaire for respiratory and sensory irritation symptoms based on the same questionnaire as the current study utilized. The difference in the Eisner et al. study was the use of forced expiratory volume in one second (FEV_1) and forced vital capacity (FVC) to perform a spirometric assessment on the physical changes to participants instead of personal carbon monoxide monitoring. Eisner et al. found an improvement in FEV_1 and FVC levels in participants whose work environments changed the act of smoking from being permitted to prohibited with the enactment of smoking legislation.

ETS exposure in restaurants and bars is of concern for its impact both on customers and on those who work in these establishments. A non-smoker working in a bar can have the same nicotine exposure as a regular smoker as evidenced by levels of nicotine in the hair of non-smoking bar employees to be similar to that of a daily smoker, presumably from work exposure (Tang et. al., 2003, Al-Delaimy et. al, 2001).

Another study similar to the current study was carried out in 17 municipalities in the Vancouver area, recruiting 88 non-smoker food and beverage server participants from lists of local restaurant, bar and hotel unions. This study by Dimich-Ward et al. (2005) utilized the same questionnaire as in the current study, but obtained the answers via a postal survey method. These researchers found that more anti-ETS legislation was associated with fewer respiratory and sensory irritation symptoms. They also tested hair

samples for levels of nicotine and concluded that workers in places covered by smoking bans had lower levels of nicotine in their hair. FEV_1 and FVC levels in participants were measured and were markedly better where more anti-smoking legislation was in effect.

C. ETS Legislation: The Canadian Experience

As the knowledge of the health effects of ETS has increased, there has been a parallel increase in legal action to protect those exposed (Byrd, 1992). Historically, the protection of Canadian citizens from ETS has been primarily the responsibility of municipalities, although in most of Canada all three levels of government have the authority (Physicians for a Smoke-Free Canada, 2005). Municipalities across Canada have adopted bylaws restricting smoking in public places. In general, most public places such as hospitals, schools and malls are completely smoke-free. The greatest discrepancy in legislation across Canadian municipalities is for restaurants and bars. Some of the bylaws that regulate smoking in restaurants and bars are partial and require that smoking and non-smoking sections are separate and designated, or that persons under the age of 18 or 19 (legal drinking age) are not allowed entrance. Other bylaws mandate a complete ban on smoking in all restaurants and bars. The latter is more effective in that it affects all businesses equally.

The City of Winnipeg (January 1, 2002) had a partial ban in that smoking was banned in any public establishment where minors (those under 18) were allowed. Partial bans such as this one have been criticized because all businesses are not affected equally. For example, smoking would be allowed in bars and lounges where minors are not permitted to enter, while smoking would be prohibited in restaurants where minors are allowed to enter. Therefore, restaurants fear they could lose more business from smokers than would bars and lounges. A complete ban such as that adopted by the city of Brandon, Manitoba in September 1, 2002 does a much more thorough job of showing the importance of the issue to the general public (Bylaw no.6696). Ultimately, Winnipeg

followed Brandon's lead and passed a similar bylaw in September 1, 2003 (Bylaw no. 88/2003). Manitoba enacted a province-wide ban in October of 2004, as did New Brunswick (Physicians for a Smoke-Free Canada, 2005). Saskatchewan enacted its ban in January of 2005 (Physicians for a Smoke-Free Canada, 2005). The provinces of Quebec and Ontario enacted province-wide smoking bans on May 31, 2006. Still, the movement is not nation-wide. In the province of Alberta and in the Yukon Territory, for example, there are no provincial bans on smoking in restaurants and bars.

When all public establishments have to abide by the same laws and ban smoking, there is reduced claim of bias (Janzen, 2003). The restaurant and bar owners will be more likely to abide by smoking laws if they are enforced by the city or the province so their customers can direct the blame toward the government instead of the business (Janzen and Fallding, 2003).

In addition to the protection of the general public from the harms of ETS, there is also a need for protection of workers in their place of employment. The Canada Labour Code – Part II states that the general duty of the employer is to "ensure that the health and safety at work of every person employed by the employer is protected" (Human Resources Development Canada, 2003). This means that any federally regulated business needs to provide a workplace free of ETS because it is considered a health hazard as a carcinogen by the U.S. Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC) and a respiratory irritant.

One group of particularly at-risk employees are those in the service-industry (Albers et al., 2004). Failing to protect the employees from ETS can result in Workplace

Safety and Health issues and workers are now taking their employers to court for compensation (Dimond, 2003).

Ms. Heather Crowe, a waitress from Ontario, submitted a worker's compensation claim for a ETS-induced workplace illness and won. Ms. Crowe worked as a waitress in the hospitality industry for over 40 years. The venues she worked in were filled with smoke from cigarettes, but Heather herself never was a smoker. She developed lung cancer caused by exposure to ETS in her workplace. Ms. Crowe filed a claim with the Workers Compensation Board in Ontario where she resided and the claim was accepted within 8 weeks, the first ever accepted for illness caused by ETS in restaurant workers (Crowe, 2005). Ms. Crowe died of lung cancer on May 22, 2006.

Prohibiting smoking in public places not only reduces everyone's exposure to ETS, but also increases public awareness on the issue as well as reducing the social acceptability of smoking. If the legislation put forth does nothing more than to convey smoking as socially unacceptable and act as a support for those who already want to quit it will directly affect the people exposed to ETS. As smoking becomes less acceptable in social settings, fewer people will believe it is their right to smoke in settings where the ETS is inhaled by others.

D. ETS Exposure Differences in Canada and Italy

In some countries, notably in Europe, smoking is still considered fashionable and smoking rates are higher than in Canada (Crumley, 2003). In Italy, 27.6% of the population aged 15 and over smoke (Instituto per le ricerche statistiche e l'analisi dell'opinione pubblica, 2003) compared to 21% in Canada for the same age group studied

in 2002 (CTUMS, 2003). In European countries, it may be more difficult to change lifestyles because of a smoking-supportive culture, which influences an individual's morals, values and lifestyle choices (Israely, 2000).

In Italy, the smoking prevalence was 27.6% at the time of this study (DOXA, 2003) and was 26.2% in 2004, one year later (DOXA, 2004). Therefore, a reduction in smoking prevalence can be seen even in parts of the world with larger smoking populations. However, this reduction still leaves the country with a high smoking prevalence and ETS is still be an issue within the workplace. A study by Mirabelli and Kauppinen (2005) was done in Italy to determine the carcinogens with the largest prevalence of exposure within a workplace environment. This study found ETS to be more prevalent than any other carcinogen.

At the time of the data collection there was no complete ban anywhere in Italy, but partial bans were increasing rapidly (Mazza, 2003). Many restaurants had areas set aside for non-smokers, although they were usually not separated by any barrier. They may also have had designated times when smoking was allowed. At the time of the study it was found that some Italian establishments would allow smoking in their venues during certain periods of the day to lessen the amount of tobacco smoke that was produced. In addition, compliance was an issue because there was no monitoring or enforcement in place (Mazza, 2003). For example, although smoking has been banned in airports in Italy for 25 years, many people still smoke in airports as soon as they are off the plane (Israely, 2000). The culture perceives a smoking violation as minor as a parking violation, neither of which is taken seriously (Israely, 2000).

The legal smoking age in Italy is 14 years as written under the Penal Code (La Repubblica, 2004). As well, people of any age, even younger than 14 years, can buy cigarettes from vending machines found on the streets of Italy accessible to everyone. Purchasing cigarettes is as easy as purchasing candy for a young person.

Since the time that data were collected for the Italian portion of this study, changes have been made concerning ETS legislation. A new law came into effect for the entire country of Italy regarding smoking in public places on January 1, 2005. This law named "Legge Sirchia" was named for the Italian Minister of Health (Ministro deel Sanita), Girolima Sirchia, who created it. This law was introduced in January of 2003 as Act No.3 Article 51 (Calati, 2004). The interval between the law being passed and enforced was given to allow owners and managers time to adjust to the new legislation. This law states that there is no smoking allowed in bars, restaurants, pizzerias, discos, pubs or any other type of premises open to the public (Calati, 2004).

The only significant difference between the Italian law and the law in effect in Manitoba is that in Italy, owners can create a separate room within their premises that is constantly closed off to the rest of their customers with four walls and a door that remains closed. As well, the separate smoking room must have a proper ventilation system as per the law and the room for smokers must be less than half of the area of the entire premises (Calati, 2004). While this law protects the general public, it may not protect the health of those working in the hospitality industry, since they would still be exposed to ETS inside the smoking rooms.

E. The Study: Learning from an International Comparison

A "natural experiment" is afforded by studying the effect of ETS legislation in Canada and Italy as each has been observed to have different cultural norms in terms of smoking. This is important because "countries with higher smoking prevalence and fewer smoking restrictions are more likely to have a greater proportion of the population exposed and higher levels of ETS exposure" (Jinot and Bayard, 1996). Non-smoking, hospitality industry workers were used as a sentinel population. The conclusion of such an assessment was expected to yield useful information to support the implementation of ETS legislation in national and provincial smoking jurisdictions. The results of this study contribute to the body of knowledge about the impact of restrictive smoking legislation on ETS exposure and associated health effects, which ideally increases the implementation and enforcement of complete bans on smoking in public areas.

Chapter 3 – Methodology

A. Summary

Hospitality industry venues were contacted in Winnipeg (Canada), Brandon (Canada) and Milan (Italy). Managers of the participating venues signed a waiver form allowing their establishment to participate in the study. When data were collected, from employees, participants read and signed a consent form agreeing to participate in the study. Exhaled carbon monoxide (CO) levels were measured at the beginning and the end of the participant's shifts to find the difference in CO during that time period using a *Vitalograph* BreathCO monitor in Canada and a *Bedfont Micro Smokerlyzer*® in Italy. The participants were also asked to complete a questionnaire to capture data on the personal characteristics and respiratory health effects experienced due to ETS exposure at work. The differences in CO measurements and symptoms experienced were assessed using appropriate statistical tests. Within Canada the respiratory health effects and CO levels seen in smoking and non-smoking permitted venues were compared. When assessing data from Canada and Italy areas with similar smoking laws (prior to either country having legislation regarding the ban of smoking in the hospitality industry) were compared to see whether external factors such as a different smoking rate can affect the exposure of non-smokers to ETS.

B. Legislation: Smoking in Public Venues

The legislative backdrop was important to provide context for the results. In Canada, the legislation concerning smoking in public places was found on government

websites. In Italy, the legislation concerning smoking in public places was found with the aid of local researchers studying environmental tobacco smoke; the legislation was translated into English upon return to Canada. The legislation of each country was compared to learn if there were differences likely to produce different health effects for those who work in the hospitality industry. Criteria used in the analysis of the legislation included restrictions on smoking in public places, penalties given for not following the legislation and enforcement of the legislation.

C. Participants

Bars, lounges and restaurants were contacted by the study coordinator who sought approval of the venues' management before asking their employees to participate. A waiver form was signed by management to allow the testing to occur. Out of 64 bars, restaurants and lounges asked to participate in the study 22 agreed.

On the date agreed upon by management and the tester, employees were approached before their shift and asked if they were willing to participate. A shift had to be a minimum of three hours and no more than 8 hours. The intent of the study and its requirements to participate were explained and consent was obtained. Each participant was assigned a non-identifying study number. The test was administered and any questions asked by the participants were answered immediately.

A total of 112 subjects (61 females, 51 males) were recruited for the study. These participants were 18 years or older working in the hospitality industry in establishments where smoking was allowed, but the employees themselves were non-smokers (meaning

that they had not been a smoker for the previous six months) as defined in a study by Bates et al. (2002).

D. Research Tools

There were two types of data collected for this study. CO levels were taken using a *Vitalograph* BreathCO monitor in Canada and a *Bedfont* Micro Smokerlyzer® in Italy. Other data were captured using a questionnaire to determine if participants had experienced respiratory symptoms commonly reported by individuals exposed to ETS.

The *Vitalograph* BreathCO carbon monoxide monitor (Figure 3.1) was obtained from the Department of Respiratory Medicine at St. Boniface General Hospital in Winnipeg, Manitoba, Canada. The monitor was designed by *Vitalograph* to be used in smoking cessation programmes, and measures the level of CO in exhaled breath. To use this device the participant stands erect, inhales deeply, holds his/her breath for 10 seconds and then expires his/her entire breath slowly and evenly into the machine. During expiration, the participant's mouth is closed around a disposable mouthpiece attached to the handheld instrument which is replaced for each participant. The detection principle behind the instrument is a electrochemical sensor. It can measure CO in a range of 0-199 parts per million (ppm) with a measuring accuracy of +/- 3 ppm.

Used with permission from Barbara Copas, Vitalograph, March 28th 2007.

Source: Vitalograph, 2004.

Figure 3.1: Photo of *Vitalograph* BreathCO Carbon Monoxide Monitor

The *Bedfont* Micro Smokerlyzer® Breath CO Monitor (Figure 3.2) used in the data collection in Milan, Italy was supplied by Ario Ruprecht, an air quality analyst, who works with the National Cancer Institute in Milan. Similar to the *Vitalograph* BreathCO Carbon Monoxide Monitor, this instrument was designed to be used in smoking cessation programmes to show smokers proof of the damaging CO levels to which they were exposed. As with the *Vitalograph* BreathCO Carbon Monoxide Monitor, an electrochemical sensor within the instrument detects exhaled levels of CO. The electrochemical sensor reacts with case carbon monoxide to give a current output from the sensing electrode (Bromley, 2006). This current is defined for each sensor and gives an approximate response of 0.075 μA/ppm, which is converted using low noise electronics into a voltage output. This voltage goes into the analogue-to-digital converter in a microprocessor, which controls the display, the zeroing of the sensing and other functions required in the device. The units are dependent on sensor accuracy, which has found to be consistent. Both instruments were calibrated in the same manner.

Used with permission from Jennifer Cole, Bedfont Scientific Ltd, March 29th, 2007.

Source: Bedfont Scientific Ltd., 2005

Figure 3.2 Photo of *Bedfont* Micro Smokerlyzer® Breath Carbon Monoxide Monitor

The questionnaire used (Appendix A) was used in a previous study (H2202:102) measuring many of the same factors (Taylor et. al., 2002) and was derived from a questionnaire for asthma-like symptoms of the International Union Against Tuberculosis and Lung Disease (Burney et al.,1989). The questionnaire included the identification number for the participant, their personal characteristics, and questions regarding symptoms experienced due to exposure to ETS. The questions asked in regard to symptoms included:

1. Are you short of breath with the activities of daily living?
2. Do you wheeze?
3. Do you cough in the morning?
4. Do you cough during the day?
5. Do you cough at night?
6. Do you cough up phlegm?
7. Are your eyes irritated?

8. Are your eyes teary?
9. Does your nose run every day?
10. Do you frequently have a scratchy throat?
11. Do you frequently have a cold?

When conducting the investigation in Italy the same questionnaire was used, but it was translated into Italian (Appendix B). For Manitoba participants recruited after the smoking ban was enacted, the questionnaire needed a slight modification to include whether the symptoms listed were worse, the same or better, after the implementation of a smoking bylaw (Appendix C).

The data for CO and respiratory symptom exposure from each participant were placed under an identification number (rather than their name) assigned according to venue and the order in which they were tested. This identification number could be used to identify any outliers that may have existed in the data and therefore address any discrepancies caused by variances in venues that participated. These variables can also contribute to numerous other changes in the data collected.

E. Ethics

Ethics approval was first given to a study entitled *Effects of Complete and Partial Smoking Bans on the Respiratory Health of Hospitality Workers in Brandon and Winnipeg, Manitoba* (H2002:102). That study (Taylor et. al., 2002) used the same procedures and methods and supplied a portion of the early data obtained for this study.

When ethics approval was needed for this study, the prior approval (2002) was extended to this project by the University of Manitoba Research Ethics Board.

Confidentiality was preserved; neither the participant nor the workplace was identified in any of the analyses. Instead, every individual was assigned a number reflecting their establishment and the order in which they were tested. Data collection was done in a discreet area of the venue to prevent drawing attention to the activities so that business at the workplace would not be hindered due to the study.

The initial data in Winnipeg were collected before any complete smoking ban had taken effect. The second sets of data in Winnipeg were collected after the partial ban prohibiting smoking where minors are allowed was implemented. The last set of data for Winnipeg was collected after the complete ban on smoking in public places commenced. In contrast, the data in Brandon were collected before and after a ban on smoking in bars and restaurants. The data were collected in Milan, Italy took place before any laws against smoking in bars and restaurants were enacted. No post-legislation testing was possible in this case due to the duration of the study.

The statistical analysis for symptom questions was performed using the chi squared test. To analyze the differences observed in CO levels a repeated-measures ANOVA was performed. Statistical significance in this study was defined at the ≤ 0.05 level.

F. The Methodological Defence

A similar study researching the effects of ETS on bartenders' health before and after a smoking ban used a sample size of 53 participants (Eisner et al., 1998). However,

Eisner et al. (1998) used the same participants before and after the legislation. This study used a total of 112 participants, but could not use the same volunteers before and after the smoking ban was enacted due to a high employee turnover in the hospitality industry and refusal of some of the establishments to participate on both testing dates. Since the statistical power of a study is dependent on sample size, this too had to be considered sufficient based on other studies using a similar sample size.

A similar study by Dimich-Ward et al. (2005) had 88 participants complete the same questionnaire as used in this study, but used FEV_1 (forced expiratory volume in 1 second) instead of expired breath CO levels to assess ETS exposure.

The participant selection method used in this study was a convenience sample since agreement to participate was essential and difficult to obtain. Instead, hospitality industry venues were found within local yellow pages of the local telephone directory and solicited for their participation. As well, a newspaper advertisement was placed in the Winnipeg Free Press to recruit any venues willing to participate who were not contacted personally. Since the data collected were not simply observational, participant consent was required. The study by Eisner et al. (1998) used a stratified sample based on their local yellow pages directory. Using a stratified sample in this study could have produced a list of unpopular (not well attended) bars or of lounges of only a certain size etc., which could skew the results. Thus, for this study, a more targeted selection of sites was used in the attempt to provide a more representative group of venues. This approach was supported by a study by Bates et al. (2002) that used volunteers rather than selected participants and found that method produced results no different than if a randomly selected group was used.

The data in this study were collected using both a questionnaire and a CO breath analyzer. The questionnaire was used to provide information on both personal characteristics of the participants and any immediate health effects caused by exposure to ETS. The questionnaire used had been slightly adapted from a questionnaire used in a study by Burney et al. (1989). The questionnaires used to assess ETS in both the studies by Eisner et al. (1998) and Dimich-Ward (2005) were adapted from this same questionnaire.

To estimate ETS exposure during a shift of hospitality workers, a variety of markers may be measured. In some previous studies (Bates et al., 2002 and Johnsson et al., 2003) cotinine levels in either hair or urine samples were used. Cotinine is a derivative of nicotine, a commonly known tobacco constituent and usually provides very accurate results as one of the best available biomarkers (Brownson et al., 2002). However, the tests for cotinine are more invasive and introduce complex problems with specimen handling and analysis (requiring either hair or urine samples) making it more difficult to obtain willing participants.

A test for lung capacity using a peak flow meter was used in a pilot study (Taylor et al., 2002), but not for this study because it was found that there were many variables in collecting the samples that interfered with obtaining precise results. In particular, a bias was introduced when the participants appeared to "compete" to get a better score (i.e., larger lung capacity), especially at the end of the shift when the second reading was taken.

In contrast, the CO monitors, while still depending partially on the ability of the participant to follow procedures consistently, could not be altered greatly by the

participants. Thus, the measures of CO did not vary between repeated trials as greatly as the lung capacity test.

Expired CO levels were measured from non-smoking employees at the beginning and the end of their shift. This was done in smoking and in non-smoking venues. The repeated measures ANOVA was used to see if a significant difference existed in CO levels from the beginning to the end of a shift at work between smoking and non-smoking venues. The ANOVA test was chosen because of the assumption that the CO variable is normally distributed since continuous measurements of the CO level were taken. Another reason for using the ANOVA test was that means of interval type data (CO) were compared across different groups (non-smoking/smoking/Brandon). Repeated measures ANOVA is used to do the comparison of before and after shift within the individuals in each of the groups.

Participants were asked whether or not they experienced each of the symptoms presented in the questionnaire common to exposure to environmental tobacco smoke. A chi-squared test was run on the questionnaire data to compare the frequency of symptoms experienced across groups (i.e., to see if the frequency of a particular symptom is associated with the groupings of smoking venue and non-smoking venue).

Chapter 4 – Results

A. Legislation

The cities of Winnipeg and Brandon were among the first to enact bylaws prohibiting smoking in the hospitality industry in Canada. The partial ban in Winnipeg took place on January 1, 2002, preventing smoking in public places that allowed minors (those under 18 years) to enter. A complete ban was introduced in Brandon on September 1, 2002, followed by a complete ban in Winnipeg on September 1, 2003. The complete bans in the two cities prevented smoking in any venue under its jurisdiction. However, anecdotally there appeared to be less acceptance of the bylaw in Brandon than there was in Winnipeg. In Brandon, patrons of bars and restaurants appeared to continue to smoke in venues covered under the smoking bylaw, although they attempted to not make their actions obvious. The results showed very little difference in the amount of CO exposure from before a smoking bylaw existed to after the smoking bylaw was enacted.

Table 4.1 Summary of Areas Smoking Permitted in Canada Before and After the Manitoba Law and in Italy during the Time of the Study

Public Location	Manitoba (Canada) Pre-Legislation	Manitoba (Canada) Post-Legislation	Lombardia (Italy) 2003 Legislation
Airplanes, Trains, Taxis, Buses, Subways	No smoking allowed	No smoking allowed	Airplanes – No; Trains – Designated areas only; Taxis – No Buses – No; Subways – No
Shopping centres and stores	No	No	No
Banks	No	No	No
Hospitals	Designated areas only	Designated areas only (outside property)	Designated areas only
Schools	No	No	No
Offices	No	No	Only in private offices
Factories	No	No	No
Movie theatres	No	No	No
Museums, libraries, etc.	No	No	No
Restaurants	Designated Areas Only	No	Yes
Bars and lounges	Yes	No	Yes
Penalties for Hospitality Owners		1st offence – $500-3000 2nd offence – $750-5000 3rd offence – $1000-15,000	N/A
Penalties for Citizens		1st offence – $100-500 2nd offence – $200-750 3rd offence –$300-1000	25-250 Euros
Enforcement	Enforced by local owner, employer or head	Enforced by owners/employers & by inspectors appointed by the Minister of Health	Not often enforced

The most obvious difference between the laws was seen after the smoking law was passed encompassing all of Manitoba (excluding Native land and federal government buildings). The Manitoba law prohibits smoking in all enclosed public places, which covers a large proportion of areas where citizens previously were allowed to smoke. This law appeared to have a stronger level of acceptance and adherence when it included all of Manitoba than when it was restricted to the particular cities such as Brandon.

B. Demographics of Participants

All 112 participants in the study were 18 years of age or older and worked in the hospitality industry. Of the 112 participants in the study, 85 of these people were from Manitoba with the remaining 27 participants located in Italy. These 85 participants from Manitoba comprised 0.71% (nearly 1%) of the population of food and beverage servers (12,000 employees) in the province (Statistics Canada, 2006).

Both males and females participated in the study (51 males and 61 females). As shown in Figure 4.1, the Italian participants were mostly males (20 males, 7 females) and the participants in Winnipeg pre-bylaw were mostly females (7 males, 20 females). Within Manitoba there were 31 males and 54 females participating in the study reflecting 1.2% and 0.57% respectively of their gender in the industry. This difference in proportions was significantly different (chi square value = 0.0363). However, a study by the Public Health Agency of Canada (2003) has shown that perceived risk due to ETS does not differ among sexes. Additionally, men and women do not appear to have different acute reactions to ETS, but there are some gender-specific conditions relevant

only to women, including difficulty conceiving and a greater likelihood of spontaneous abortions and ectopic pregnancies (Sundaram et al., 2004).

The participants were all self-reported non-smokers. This was confirmed by a question asked on the questionnaire; any identified smokers were not included in the study. Data collected were therefore reflective of exposure to environmental tobacco smoke, not primary smoke. Non-smokers are more likely than smokers to perceive a causal link between ETS and chronic diseases such as lung cancer, heart disease, stroke and emphysema (Public Health Agency of Canada, 2003).

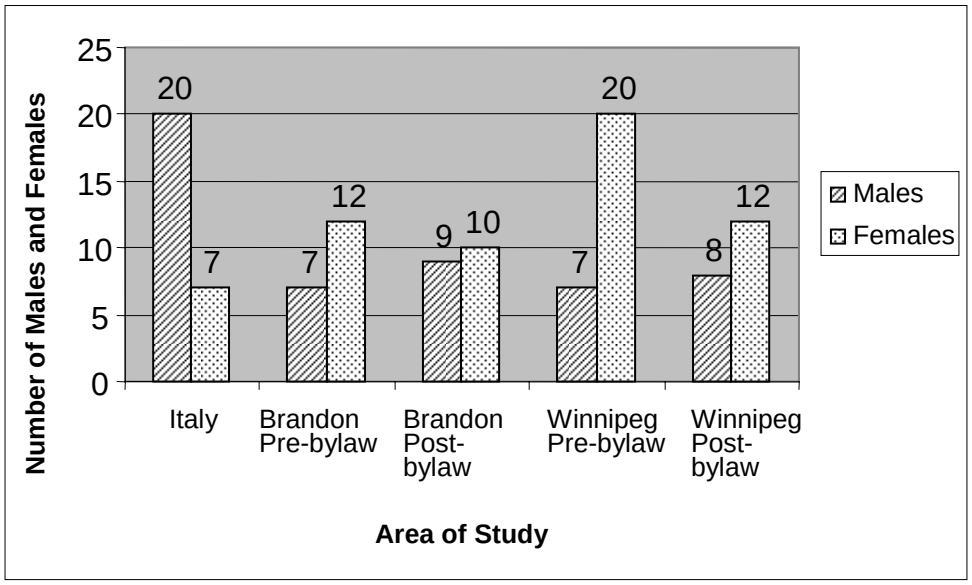


Figure 4.1 Number of Males and Females in Different Sections of Study

C. Demographics of Venues

The venues tested include restaurants, lounges, bars/clubs and bingo halls (Figure 4.2). Bingo halls were tested only in Winnipeg and there were proportionally more bars/clubs tested in Milan than in Winnipeg or Brandon. Winnipeg had the most even distribution of the types of venues tested, while Italy had a very uneven distribution. The venues in Canada were generally more closed environments than those in Italy. Venues in Canada never had doors left open intentionally, while in Italy doors were left open to the outside creating increased ventilation of outside air in the venues. In Italy, more venues regularly open doors due to a milder climate, allowing a greater intake of fresh air (3 out of 10 venues in Milan had doors to the outside open during a shift).

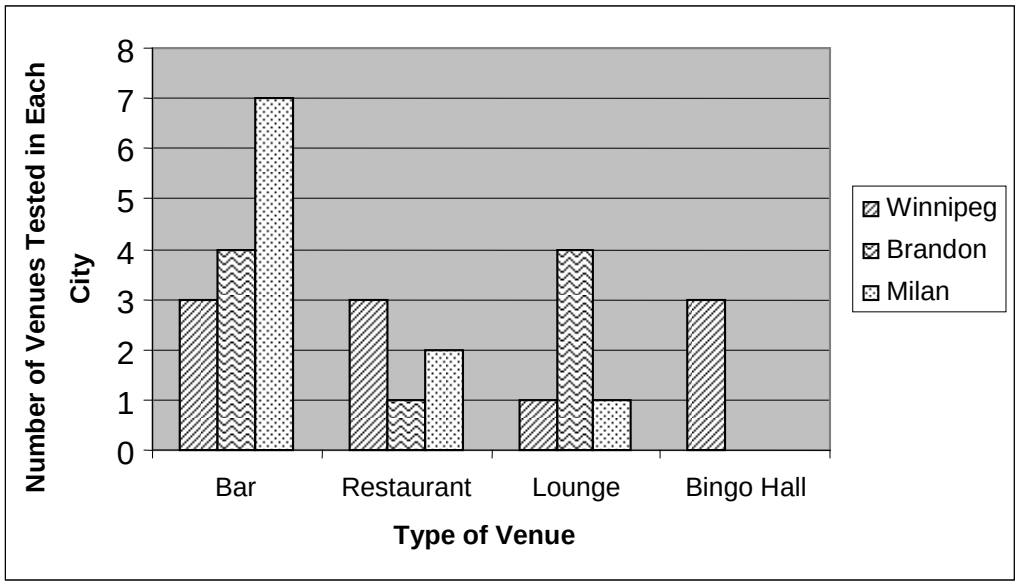


Figure 4.2 Number of Bars, Restaurants, Bingo Halls and Lounges

D. Exposure Differences between Canada and Italy

An analysis was performed with data from Canada and Italy to determine if there was a difference between exposure to ETS in Canada and Italy when legislation in both countries was very similar. Smoking legislation at this point of the study in both Canada and Italy was inadequate, meaning patrons were permitted to smoke in hospitality industry venues (noting that Canada had smoking and non-smoking sections in restaurants). Data from 46 participants were used to analyze CO levels and data from 60 participants were used to analyze the symptoms experienced from ETS exposure. The discrepancy in the number of participants who had completed the CO test and the questionnaire is due to the fact that 14 participants left the venue immediately after their shift and failed to participate in the second part of the CO test.

Significantly higher levels of CO were found both at the beginning and at the end of the shifts in Canada than in Italy (Table 4.2 and Table 4.4). The difference in CO produced during a shift was also greater in Canada than in Italy. There was a significant difference in the level of CO in exhaled air during shifts in Canada ($p = 0.0018$ at the $p \leq 0.05$ level), but there was not a significant difference found in Italy during shifts ($p = 0.2644$ at the $p \leq 0.05$ level).

Three of the symptoms related to ETS exposure reported by the participants were found to be a significantly different between the two countries (Table 4.5). There was a significantly higher number of participants in Canada than in Italy who suffered from the symptom of "coughing up phlegm" (Question 6). Also seen in Canada was a significantly higher number of participants experiencing a runny nose than in Italy

(Question 9). However, a greater number of Italian participants experienced a scratchy throat than Canadian (Question 10).

The symptoms of irritated eyes and teary eyes (Questions 7 and 8) were reported by a majority of participants in both countries (Table 4.5). There was no significant difference for these symptoms when comparing the two countries.

The symptoms of shortness of breath, wheezing and coughing in the morning (Questions 1, 2 and 3) were less commonly reported by participants in both countries (Table 4.5). There was no significant difference seen for these symptoms between the two countries.

E. The Difference between Venues before and after Legislation Prohibiting Smoking in the Hospitality Industry

Data sets for CO levels and symptoms were collected for Winnipeg and Brandon both before and after legislation banning smoking in the hospitality industry existed. After the smoking bylaw was enacted in Brandon, some customers at venues used in the study continued to smoke cigarettes on the premises. The Brandon data may not be truly representative of a smoke-free environment.

Therefore, the data can be presented a) using Brandon as a third group instead of comparing only the two countries, b) grouping Brandon's data both from before and after the legislation in with smoking venues, and c) completely excluding Brandon data from analysis. The following three paragraphs show the difference in results when we analyze the CO data and symptom data for scenarios a), b), and c).

Scenario A:

When change in CO during a shift is analyzed by separating the venues in Brandon from those in Winnipeg (rather than combining all smoking and non-smoking venues into two groups) the repeated measures ANOVA was nearly significant at p=0.0533. This does not clearly demonstrate a significant difference between change in CO levels in participants working in smoking venues and those working in venues where smoking is prohibited as $p \leq .05$ was chosen as the level to test significance. However, this value was extremely close to the p-value and may be considered to show a difference in CO values. CO could then be found in higher levels in participants working where smoking was permitted than in participants where smoking was prohibited. Chi-squared analysis found that only symptoms that were significant were coughing at night and irritation of the eyes (0.0466 and 0.0009).

Scenario B:

When both the data from Brandon before and after the smoking ban was enacted is grouped with the smoking venues for comparison, the repeated measures ANOVA generated a non-significant p-value (0.5348) for non-smoking venues over the period of a shift. A significant difference ($p = 0.0099$) was found for smoking venues over the period of a shift. Therefore, when analysing levels of CO in this scenario, participants at non-smoking venues do not experience an increase in CO during a shift while participants working at smoking venues do see a significant increase in CO during a shift. As well, when the CO values at the end of a shift in a smoking venue were compared to the values at the end of a shift in a non-smoking venue, a greater exposure to ETS was

found in smoking venues ($p = 0.0001$) than in venues where it is prohibited. The symptoms that were found to be significant (at the $p \leq 0.05$ level) when all Brandon venues were considered smoking venues were irritation of the eyes and a scratchy throat with p-values of 0.0011 and 0.027 respectively using the chi square test.

Scenario C:

When the data from Brandon were excluded from the Canadian analysis the repeated measures ANOVA found a non-significant difference ($p = 0.5326$) for non-smoking venues (i.e., Winnipeg alone), meaning there was no difference between the levels of CO found over the course of a shift. When testing the smoking venues (Italy and Winnipeg only) a significant difference was found ($p = 0.0030$) demonstrating an increase in CO levels during the period of a shift in smoking venues. When comparing the difference between CO levels of Brandon participants over a work-shift period when the smoking ban was not being followed there was no change during a shift a p-value of 0.7241 is generated, which is not significant. This would be expected in a non-smoking establishment, but the mean levels of CO were as high as what was seen in smoking venues. When the data was analyzed excluding Brandon, three symptoms were found to be significant: the irritation of eyes, teary eyes, and a scratchy throat (p-values of 0.0003, 0.038 and 0.029 respectively).

Final Analysis:

The scenario believed to present the most accurate results is scenario c) with Brandon excluded from the analysis. This is because bar patrons in Brandon did not fully obey the smoking bylaw, and patrons continued to smoke where it was prohibited. The purpose of the study was to learn if hospitality industry employees experienced improved health when smoking venues become non-smoking venues following legislation prohibiting smoking in public places. The lack of enforcement of the smoking bylaw in Brandon made this analysis impossible in that jurisdiction. However, the lack of compliance will be discussed later as points of interest because these issues are so closely linked with the results of the topic of interest.

Tables 4.2, 4.3, and 4.4 demonstrate the average change in CO and the percentage of symptoms seen in venues in Milan (Italy), Winnipeg (Canada), and Brandon (Canada) respectively. The number of people tested expresses the number of participants in the study from each venue tested. The average change in CO (expressed in ppm) represents the difference in CO values (the value at the beginning of a shift subtracted from the value at the end of a shift) taken from each individual participant added together and then divided by the number of participants. The average percent of symptoms is the number of symptoms experienced by an individual divided by the total number of symptoms they could respond either affirmatively or negatively to in the questionnaire with the average taken of all participants in that venue.

Table 4.2 Average Changes in CO and Average Percentage of Symptoms Reported for Employees at Hospitality Venues in Milan, Italy

	Pre-legislation			**Post-legislation**		
	# of People Tested	**Avg. Change in CO (ppm)**	**Avg. % of Symptoms**	**# of People Tested**	**Avg. Change in CO (ppm)**	**Avg. % of Symptoms**
Venue #1	5	2.0	63.6%	Sites in Milan only tested once. Change in smoking legislation concerning the hospitality industry occurred after data collection was completed.		
Venue #2	4	0.75	90.9%			
Venue #3	1	1.0	36.4%			
Venue #4	3	2.67	27.3%			
Venue #5	2	1.5	27.3%			
Venue #6	2	1.0	18.2%			
Venue #7	1	2.0	27.3%			
Venue #8 (*)	2	-1.5	18.2%			
Venue #9 (*)	3	-2.0	18.2%			
Venue #10 (*)	1	-2.0	18.2%			

(*) – Venues had open doors to the outside air.

Table 4.3 Average Changes in CO and Average Percentage of Symptoms Reported for Employees at Hospitality Venues in Brandon, Manitoba, Before and after the Enactment of ETS Legislation

	Pre-legislation			**Post-legislation**		
	# of People Tested	**Avg. Change in CO (ppm)**	**Avg. % of Symptoms**	**# of People Tested**	**Avg. Change in CO (ppm)**	**Avg. % of Symptoms**
Venue #1	6	2.5	81.8%	6	0	63.6%
Venue #2	2	0.5	81.8%	3	0	63.6%
Venue #3	4	-0.75 (*)	54.5%	4	0	27.3%
Venue #4	5	3.6	72.7%	3	0	81.8%
Venue #5	2	0	0	*Not a valid venue to test.		

*Venue #5 had a very low population density for the number of patrons in comparison with other venues that participated.

Table 4.4 Average Changes in CO and Average Percentage of Symptoms Reported for Employees at Hospitality Venues in Winnipeg, Manitoba, Before and After the Enactment of ETS Legislation

	Pre-legislation		
	# of People Tested	**Avg. Change in CO (ppm)**	**Avg. % of Symptoms**
Venue #1	4	0.25	27.3%
Venue #2 (non-smoking venue)	4	0	0
Venue #3	6	0.83	90.9%
Venue #4	7	3.29	63.6%
Venue #5	1	1	27.3%
	Post-Legislation		
Venue #1	6	-2.5	9.1%
Venue #2	2	-1.5	0
Venue #3	5	-0.2	9.1%
Venue #4	3	0.33	42.4%
Venue #5	4	-1.0	6.8%

Table 4.5 Percentage of Hospitality Industry Employees Reporting Each Symptom Pre-Legislation

Percentage in Canada Pre-Legislation with Positive Response	Percentage in Italy with Positive Response	Significant Difference between Countries; P value
"Are you short of breath with the activities of daily living?"		
12.0	7.4	No; P = .5448
"Do you wheeze?"		
9.1	11.1	No; P = .7952
"Do you cough in the morning?"		
15.2	11.1	No; P = .6469
"Do you cough during the day?"		
21.2	7.4	No; P = .1363
"Do you cough at night?"		
24.2	11.1	No; P = .1910
"Do you cough up phlegm?"		
21.2	3.7	**Yes; P = .0472**
"Are your eyes irritated?"		
63.6	70.4	No; P = .5820
"Are your eyes teary?"		
45.5	37.0	No; P = .5106
"Does your nose run every day?"		
27.3	3.7	**Yes; P = .0148**
"Do you frequently have a scratchy throat?"		
12.1	37.0	**Yes; P = .0232**
"Do you frequently have a cold?"		
18.2	7.4	No; P = .2219

Table 4.5 shows the average number of participants reporting the symptoms found in questions 1 to 11 of the questionnaire (see Appendix A) and whether or not there was a significant difference in that symptom found between the two countries. The percentage in Canada with a positive response is found by taking the number of participants in both Winnipeg and Brandon before the smoking bans were implemented with that symptom and dividing it by the total number of participants from those two cities. The percentage in Italy with a positive response was found the same way as for Canada but with only one city to record data from. A chi-squared test was performed for each symptom to see if the difference between Canada and Italy was statistically significant for each question.

F. Summary

When considering scenario c), the results of this study demonstrate a reduced level of a biomarker (CO) and a decrease in respiratory symptoms in employees in the hospitality industry where there are more inclusive laws prohibiting smoking in public. The legislation has continued to be more inclusive in Manitoba though the course of this study and has already changed in Italy since the data for this study were collected. Fewer respiratory symptoms were seen in employees of the hospitality industry after a ban prohibiting smoking in this area was created and enforced. As well, the law prohibiting smoking in restaurants and bars has decreased the level of carbon monoxide in the breath of the employees. However, when comparing results between countries, more participants in Canada appeared to have respiratory symptoms than in Italy when no smoking ban was in effect.

Chapter 5 – Discussion

A. Overview

Exposure to ETS has been assessed by various techniques including area monitoring, personal monitoring, biological monitoring, and questionnaires (Akbar-Khanzadeh and Greco, 1996). This study used both personal monitoring and questionnaires to assess the level of exposure during periods of various smoking legislation. The data found that the legislation that intended to reduce the exposure of hospitality workers to ETS could improve their health by reducing their intake of carbon monoxide and by extension other toxic cigarette constituents. Along with improved health for workers of hospitality venues (Eisner et al., 1998), public smoking bans also can contribute to many other benefits in society such as a general decrease in consumption of tobacco products (Colman, 2001) and a general increase in public health contributing to a decrease in healthcare costs (Skerritt, 2006; Clark and Etile, 2006; Chan-Yeung and Dimich-Ward, 2003), and a reduction in gambling rates (Lett, 2003). Controversy over secondary issues connected to ETS must also be discussed including human rights, workers rights, and the economic health of the hospitality industry.

B. Methodology

I – Collecting the data

Venues were selected by the principal investigator considering factors such as the popularity of the venue (which should correlate with potential exposure) and the potential for the owner/manager to agree to allow her/his employees to participate if they desired.

This was a convenience method for selecting venues for data collection, as there was difficulty in obtaining permission to test in many venues.

Before the bylaws in Brandon and Winnipeg came into effect, 63 venues were asked to participate resulting in 10 venues (5 in Winnipeg and 5 in Brandon) that agreed to participate. After the bylaw came into effect in Brandon, the same bars and restaurant managers were approached to participate again and they all agreed. One restaurant was excluded from the second round of testing because it was rarely frequented by smoking patrons before the bylaw and therefore, the environment did not match the other venues used. Therefore, there were five venues initially used and then only four venues used after the Bylaw (see Table 4.3). In Winnipeg, after the bylaw was enacted, the same venues initially used were also approached for a second round of testing, but only one of the venues agreed. Therefore, another seven venues were asked to participate with four venues agreeing to do so, providing a total of five venues participating (see Table 4.4). The rate of positive responses was much better for the second round of testing because venues were selected through personal contacts.

In Italy, venues were only studied during a period where no legislation prohibiting smoking in restaurants and bars existed. These venues were approached by the Italian researcher, Dr. Roberto Mazza, who worked for the National Cancer Institute in Milan studying smoking in places such as the hospitality industry. Dr. Mazza ensured that the Italian venues met the same criteria as the Canadian venues. Dr. Mazza was also involved in translating the English waiver form and questionnaire into Italian and in translating during the interviews for those participants who could not speak English.

II – The Biomarker of ETS Exposure

The National Research Council (1986) has proposed criteria for selection of valid markers of ETS levels. The markers must be unique or nearly unique to ETS, easily detectable, emitted at similar rates for many ETS products, and should have a constant ratio to other ETS components of interest. This study used carbon monoxide (CO) levels to determine exposure to ETS. Other studies have used cotinine, nicotine, nitrosamines, benzo(a)pyrene, particulate matter and 3-Ethenylpyridine as biomarkers as well. It is also possible to use ETS constituents such as PAH-albumin adduct, and urinary tobacco-specific amines, but the analyses for these chemicals is technically difficult (Benowitz, 1999).

Cotinine is presently considered the best available biomarker for ETS in epidemiologic studies, because it is the most sensitive and the most specific (Wu-Williams and Samet, 1990; Letzel et al., 1987). However, there is currently no reliable biomarker for past or long-term exposure to ETS (Brownson et al., 2002). Cotinine levels can be measured in blood, urine, saliva or hair samples from the participants (Chan-Yeung and Dimich-Ward, 2003), all of which are invasive and handling biological specimens adds a layer of complexity. For example, the hair sample has to include the root to get the required data from the sample. It can be very difficult to engage participants to be involved in a study with such invasive measures; thus, cotinine was not used as a biomarker in this study. It was difficult enough to be allowed to conduct the testing performed for this study, and the technique for measuring carbon monoxide exposure is much less invasive.

Nitrosamines, benzo(a)pyrene and other such biomarkers are not often used to detect levels of ETS exposure because they are difficult to measure (due to either low concentrations or lack of appropriate instrumentation). In addition, it costs a great deal to collect or analyse the samples, or their use is very limited (Leaderer, 1990). In fact, it is difficult to find any studies that have used biomarkers other than CO, cotinine or nicotine. Cotinine has been used in many instances instead of nicotine because it has a longer average half-life, therefore the concentration is less dependent on exact sampling times (Dhala et al., 2004).

CO meets the criteria developed by the National Research Council for biomarkers of ETS exposure. CO is not completely unique to ETS and can come from other indoor and outdoor sources (Leaderer, 1990), but it is very easy to detect. The instrumentation used in the study was readily available and is used by medical professionals to detect CO levels due to ETS exposure. Carbon monoxide levels have been used to detect ETS exposure in many other studies (Laranjeira et al., 2000; Jo et al., 2004). CO levels from human respiration were used in the study rather than collecting ambient levels of CO in the atmosphere of the workplace venue. The study wanted to identify personal exposure to ETS; therefore, it was felt that exhaled CO from hospitality employees would provide a more accurate account of the amount of CO they intake than ambient CO.

III – The questionnaire

The questionnaire was adapted from a validated questionnaire originally put forth by the International Union Against Tuberculosis (IUAT) as published in the European Respiratory Journal (1989) volume 2, pages 940-45. A change that was made to the

questionnaire for this study was that a second component was added to the questions on symptoms participants may have experienced during the round of testing after the bylaw was enforced. They answered yes or no to currently experiencing the symptom (just as in the initial round of testing) and then were asked if there was any change since the bylaw came into effect. "No change" meant that they experienced the symptom to the same degree that they did before the bylaw. The symptom was "better" meant that they experienced the symptom to a lesser degree than they did before the bylaw. The symptom was "worse" meant that they experienced the symptom to a greater degree than they did before the bylaw came into effect.

In epidemiological studies, exposure to ETS is most frequently estimated by questionnaires (Wu-Williams and Samet, 1990). The use of a questionnaire in this study was helpful in obtaining additional information on the venue and the participants. Although questionnaires can only provide indirect data and cannot provide specific exposure levels, they can still provide information on perceptions of exposure (Leaderer, 1990) and indirect data on general exposures and health outcomes.

IV – Sample size

The sample size for this study was 112 participants. The same participants were not used pre and post-enacting of the public smoking bylaw that occurred in Manitoba. Other studies such as one by Eisner et al. (1998) used the 53 same participants both before and after the enactment of or the change in smoking legislation. Another study by Bates et al. (2002) used 95 participants. Since there was no reliable way to estimate the predicted change in CO or symptoms, formal sample size calculation was not possible.

However, when comparing the number of participants in this study with other studies that do exist, the sample size appears to be appropriate.

V – The venues tested

The venues and the amount of access to fresh air have effects on the results. The venues tested all varied in physical dimensions and seating capacity. However, the density of patrons in the venues was always quite similar, and the intensity of exposure to ETS was estimated to be similar for all venues pre-smoking ban.

However, there were some general differences between the venues in Canada and the venues in Italy that may have influenced the results. Due to a more temperate climate, the venues in Italy were more often open to fresh outdoor air compared to the venues in Canada. Therefore, the CO levels of the employees in Italy may be particularly low with this particular sample of venues. If this is a common practice for bars and restaurants in Italy it could mean that employees in Italy have had a reduced exposure potential to ETS because of increased circulation of ambient air. Conversely, even though there is stricter legislation in Canada, smoking on outdoor patios at bars and restaurants is still permitted and employees in the hospitality industry may still be exposed to some ETS.

VI – The Statistical Analysis

This study used the repeated measures ANOVA to see if a significant difference existed in CO levels from the beginning to the end of a shift at work within and between smoking and non-smoking venues. The ANOVA test was chosen because of the

assumption that the CO variable is normally distributed. Another reason for using the ANOVA test was that means of interval type data (CO) were compared across different groups (non-smoking/smoking/Brandon). To identify a significant occurrence of a particular respiratory or sensory irritation symptom in either a smoking or non-smoking venue (as defined by legislation and personal observation) a chi squared test was performed. Similar studies using these statistical tests on the same types of data sets include Dimich-Ward (2005), Akbar-Khanzadeh and Greco (1996), and Eisner et al. (1998).

VII – The Various Forms of Smoking Legislation

The legislation in Canada was obtained from government websites that provided laws for viewing by the general public. A table is provided for comparison of the changes in locations where public smoking was prohibited in the different sections of the study (see Table 4.1). The main change in the smoking legislation in Canada was to prohibit smoking in the hospitality industry, which was the focus of this study. The legislation concerning smoking in public places for the country of Italy was collected from various experts in the field in the Lombardia region of Italy where the Italian portion of the study took place, in which Milan is located. Dr. Roberto Mazza with whom the data were collected in Italy also provided the Italian legislation, which was later translated in Winnipeg by an Italian translator and instructor at the University of Manitoba, Ms. Savaria Torquato.

After the data collection was completed (January to May, 2003) new legislation (Legge Sirchia) was enacted in Italy banning smoking in public places (January 2005).

This legislation prohibited smoking in the hospitality industry, except where there is an enclosed room with adequate ventilation for smoking that would separate the air from the rest of the establishment. Information on the law was collected and translated by Mario Grasso, a contact from the University in Trento, Italy. As a result of this option, Italy had a more inclusive list of places that were designated as non-smoking. However, overall Italy was less restrictive than Canada in smoking legislation before any new legislation was enacted in either country and had a lower degree of enforcement of these laws as seen in Table 4.1.

C. Results

I – Comparison in Public Smoking Legislation

The province of Manitoba was one of the first provinces in Canada to have comprehensive public anti-smoking legislation. Both Manitoba and New Brunswick enacted a complete ban on smoking in public places on October 1, 2004. Saskatchewan followed soon after with the same complete protection against ETS on January 1, 2005. However, there are still some provinces that are far behind in the trend towards smoke-free public places. The Yukon still does not have any smoking bans in place and British Columbia, Prince Edward Island, and Alberta still allow smoking in restaurants and bars under varying regulations.

The partial smoking ban that was created in Winnipeg on January 1, 2002 was not very successful. There were two main reasons for its lack of success. The first was that there were still many employees of the hospitality industry that were exposed to ETS while at work. Employees of restaurants were protected by this legislation, but those in

lounges and bars were not. The second reason for its lack of success was that it had a negative appeal to the public because smoking was only prohibited in restaurants, but not in bars and casinos. This created an "uneven playing field" between various businesses. As well, the message being sent that ETS was a public health hazard was very weak.

Workplace Safety and Health legislation in Canada dictates that employers are responsible for the safety and health of their employees while they are on the job and mandates that employers provide a safe environment for their employees. The Canada Labour Code Part II states,

> *"Every employer shall ensure that the health and safety at work of every person employed by the employer is protected"*

(Human Resources Development Canada, 2003). This statement makes the owner of any business liable for any employee becoming ill due to conditions experienced while at work. In addition to this specific workplace legislation, Bill C-45, otherwise known as the Westray Bill received Royal Assent on November 7, 2003. This Bill amends the Criminal Code with section 217.1, which states,

> "*217.1 Every one who undertakes, or has authority, to direct how another person does work or performs a task is under a legal duty to take reasonable steps to prevent bodily harm to that person, or any other person, arising from that work or task*".

The current study indicates that the legislation in Canada appears to be having a positive effect in terms of limiting the exposure of non-smokers to ETS. Other studies analyzing the effects of legislation prohibiting smoking in public places have seen an improvement to the health of hospitality industry employees (Bates et al., 2002; Eisner et

al., 1998). Throughout the course of data collection for this study, Italy did not experience a change in legislation and there was very little enforcement of the few smoking laws that did exist. Since that time, new smoking legislation was enacted in Italy on January 11, 2005 prohibiting smoking in the hospitality industry with few minor exceptions.

A study has already occurred in Italy to assess the effects of the new public smoking legislation that came into force in January of 2005. In this study, Gallus et al. (2005) found a 9% decrease in the amount of cigarettes sold in Italy from 31.1 million kg to 28.5 million kg in the first four months following the implementation of the smoking bans in January 2005. The study also showed that the majority of the population (90.4%) were either moderately or strongly in favour of public places such as cafes and restaurants being smoke-free. As well, businesses in Italy do not seem to be negatively affected by the smoking ban. Even though 7.4% of people polled report that they go less frequently to cafes and restaurants, 9.6 % report going more frequently than before, thus making up the difference (Gallus et al., 2005). This study can be seen as proof that smoking bans can have a positive health effect on non-smokers even in locations where smoking is part of a cultural norm.

II – Differences Between ETS Exposure in Hospitality Workers in Canada and Italy Before the Introduction of Anti-Smoking Legislation

The comparison between Canada and Italy was made using the data sets collected when neither country had legislation prohibiting smoking in the hospitality industry. In this era (pre-legislation), hospitality industry employees in Canada experienced a

significantly higher level of exposure to CO than the employees in Italy both before and after a shift at work ($p<0.0001$ when comparing the values for both countries both at the beginning and at the end of work shifts). This suggests that Canadians in bars and restaurants were exposed to a greater amount of ETS than Italians in bars and restaurants. This difference was unexpected due to the higher smoking prevalence in Italy, but there are other cultural reasons why this may have been true. Since smoking is more culturally accepted in Italy than in Canada, citizens will have more places that they feel comfortable smoking as opposed to in Canada where more places were already considered smoke-free by the population. Therefore, Canadians may have smoked more in restaurants. As well, Italian restaurants would have had a greater opportunity to have their doors and windows open when the testing was occurring due to the time of year and the warmer temperatures experienced in Italy during their testing period.

As well, before smoking bans the difference in ETS exposure during a shift at work was greater in Canadian than in Italian employees. The difference in exposure to CO during a shift in Canada was significant showing higher intensity of exposure, but the difference in CO during a shift in Italy was not significant. This is unexpected given that Italy had a higher smoking rate (i.e., 27.6% in Italy versus 21% in Canada).

The differences between the two countries could partially be due to the two different instruments used to collect the data in the two countries. The *Bedfont* Smokerlyzer® is slightly more advanced than the *Vitalograph* BreathCO monitor because it has an auto-zero button and a breath-hold countdown timer that lets the person using the instrument know how long to hold their breath and when to breathe into the instrument. However, this discrepancy is accounted for because the principal investigator

would instruct the participants on how long to hold their breath and when to exhale it into the instrument. As well, the instructions for the testing may have been partially lost in the translation from English to Italian. This could have caused a slight variation in how the participants performed during the test.

The symptoms of irritated eyes and teary eyes were experienced in high percentages of the samples of employees in both countries and at similar rates. However, these two symptoms may be most noticeable and easiest to express. The symptoms of coughing up phlegm and having a runny nose were reported by significantly more Canadian hospitality workers while a scratchy throat was noted in significantly more Italian workers. One concern is that the symptoms may have generally been under-reported, which may be due to becoming accustomed to smoking working conditions.

IV – CO levels and respiratory symptoms with increased public smoking restrictions

When smoking was banned in hospitality venues in Canada, the amount of exhaled CO at the end of a shift was very similar to the amount of CO at the beginning of a shift. Other studies have also seen that more restrictive bar and restaurant smoking regulations are associated with lower levels of ETS exposure in employees and in local residents (Albers et al., 2004; Eisner et al., 1998; Dimich-Ward et al., 2005; Bates et al., 2002).

Results for the difference in CO in a shift at work before and after a smoking ban were calculated in three ways. The results to be discussed were those created when the data from Brandon, Manitoba were eliminated from the calculations. This is because even though data were collected for Brandon both before and after legislation prohibiting

smoking was enacted, the exposure to ETS was similar both time periods due to the fact that some bar patrons of Brandon did not abide by the smoking bylaw.

When combining the data from smoking venues in both Canada (prior to the smoking ban) and Italy, the change in carbon monoxide (CO) exposure during a shift showed a significant difference ($p = 0.0030$) from the beginning to the end of a shift at work. However, when looking at individual analyses for Canada and Italy, a difference is seen between the two countries during the same type of shift in a smoking venue. In Canada, the amount of CO in the breath of an employee increased significantly by an average of +1.6487 ppm CO ($p = 0.0018$) for the time period they were exposed to ETS at their workplace. In Italy, the change in carbon monoxide (CO) exposure during a shift was only +0.6667 ($p=0.2644$). The unexpected results in Italy could have been due to various factors already discussed as well as some of the limitations discussed later in this study.

The most common acute symptoms found from data surveys in the literature are coughing, wheezing and the production of phlegm (Wu-Williams and Samet, 1990), which are respiratory symptoms. This study found the most common symptoms to be irritated and teary eyes, which are sensory irritation symptoms; although, some of the responses varied depending if the data were from Canada or Italy. In Canada, the symptoms with the largest positive response rates from the questionnaire were having teary eyes, irritated eyes and the nose running every day with positive response rates of 63.6%, 45.5% and 27.3% respectively (see Table 4.5), with coughing and phlegm production rates following close behind. In Italy, the symptoms with the largest positive response rates from the questionnaire were having teary eyes, irritated eyes and a

scratchy throat with positive response rates of 70.4%, 37.0% and 37.0% respectively (see Table 4.5), with coughing and phlegm production with the next largest rates although much lower than in Canada. The symptom results seen for both countries are not what is to be expected when we compare them to former studies such as that by Wu-Williams and Samet (1990).

D. Strengths and Limitations of the Study

I – Strengths

One of the strengths of the study was the opportunity to examine the effect of changing legislation that occurred in Manitoba, which allowed assessment of the legislation on health. The city of Winnipeg began with minor restrictions in the hospitality industry, which mandated smoking and non-smoking sections in restaurants. In January of 2002, a partial ban was implemented in Winnipeg, which only permitted smoking in hospitality industry venues where minors (those under 18 years of age) were not allowed. Then in September of 2003, the city of Winnipeg created a smoking ban in public places, including all sectors of the hospitality industry with a few minor exceptions. Finally, the same legislation enacted in Winnipeg was enacted for the entire province of Manitoba (with the exception of any federally controlled facilities and aboriginal lands). This allowed the study a single geographical area to analyse the differences in exposure to ETS with varying degrees of legislation, but a uniform social perspective on the issue of ETS.

Another strength of the study was the use of breath analysis techniques to collect the data for ETS exposure. This method is a feasible, cost-effective and non-intrusive

approach to personal exposure detection of ETS (Jo et al., 2004). Other studies (Laranjeira et al., 2000) have used ambient collections of CO or have used other ETS constituents as biomarkers, but these other methods can present additional problems. For example, ambient levels of CO allow for the collection of general ETS exposure not taking into account the various interactions CO has in the human body.

A third strength of this study was the ability to use an interpreter in the Italian portion of the study who has conducted similar studies in Italy and has a fluent knowledge of both Italian and English. A large number of people who participated in the study in Italy were not able to communicate in the English language. Dr. Mazza could translate all waiver forms and questionnaires as well as communicate all information about the CO data collection and how to perform the expired breath CO test using the personal monitor. If the study was explained to the participants by someone who was fluent in their language, but lacked knowledge in the subject area, they may not have been given the correct information even though the words were understood fully. Participant understanding of the study is vital for consent and both language and technical communication are important to reaching this goal. Full disclosure is required to be ethical; participants may otherwise be agreeing to an incorrect interpretation of the experiment.

II – Limitations

One of the limitations of the study was the inability to select participants using a simple random sample. However, the issue of ETS in the hospitality industry can be a very political issue in nature; therefore, some employees may fear participating because of possible repercussions on the job and some managers/owners may fear participating due to fear of threats to their business and livelihood. Still, bias may have been introduced - selecting participants based on their willingness to volunteer for the study may have produced a sample that was more interested in the results of the study, thereby resulting in skewed data showing a higher prevalence of symptoms than actually experienced stemming from their concern for ETS in their workplace.

The use of CO as a biomarker for ETS was in many ways a strength of the study, but one of its weaknesses as well. CO can be released into the air of hospitality industry venues from kitchens, barbecue fires, and car exhaust fumes from the outside (Laranjeira et al., 2000). Consequently, we may never be certain that the CO exhaled from a participant was caused solely from exposure to ETS.

The time frame of the study is another limitation. A complete smoking ban in the hospitality industry began January 1, 2005 in Italy. If this study had more time and funding, a complete comparison of the difference in ETS exposure before and after the legislation in Canada and the difference in ETS exposure before and after the legislation in Italy could have been made.

Another limitation of the study was a lack of information about each venue, which might have been used for comparison or adjustment purposes. Venues before and after legislation in Manitoba and venues in Italy could have all had different densities of ETS exposure. Even though the venues did appear to have fairly similar levels of ETS

intensity this was only an estimation and was consequently open to error. It would have been helpful to record the amount of smoke in each venue and assess the various forms of ventilation available, in order to determine the degree of exposure to ETS.

Finally, there may have been confounders, factors associated with ETS and poor health. When assessing whether a particular factor, such as ETS, contributes to a (disease or its symptom) condition, other factors that may contribute should also be considered. Age, gender, socioeconomic status, and other indoor pollutants are all possible confounders for respiratory diseases (Jaakola and Jaakola, 2002).

E. Other points of interest

I – Enforcement of the Legislation

Legislation can only be a useful tool in decreasing workplace ETS exposure if the laws are enforced. If there is no one to see or report the infraction, then the legislation is nothing more than words on paper. The government needs to establish a system of monitoring venues covered by ETS legislation and obtain support from the general public to ensure that the law is obeyed.

The smoking legislation enacted in Manitoba was to be enforced by the owners and employers of hospitality venues. To ensure that this enforcement was occurring, the government provided personnel such as police and health inspectors to monitor the establishments and identify and fine those who were not in accordance with the law.

Because the enforcement officers cannot be in all places at all times, widespread public support towards the legislation is needed (Pederson et al., 1991). Individual compliance can be influenced by environmental support (smoking cessation programs,

signage and posting of indicators of penalties for non-compliance with the legislation), personality characteristics (independence, assertiveness, risk-taking and need for approval), and attitudes towards restrictions (Pederson et al., 1991).

Some in Italy believe that the government is good at writing laws, but not as good at enforcing them (Crumley, 2003). For example, under the Penal Code it is illegal to sell cigarettes to children under 14 years of age, but the streets of Italy contain vending machines that allow anyone with money to buy cigarettes from them. Enforcement of laws needs to be accompanied by support from the general public. It is impossible to police an entire population all of the time; therefore, the society encompassed by a smoking ban must believe that there is some justification and merit to the law. The support for ETS legislation in Italy in the past has not been very high. Europe has a deep cultural belief that ambient tobacco smoke is acceptable, habitual and harmless (Crumley, 2003). Smoking fines in Italy have historically been treated as casually as fines for parking violations, something of little fear and consequence.

Public awareness of the severity of the effects of ETS on the health of the general public, and particularly hospitality workers, is a useful tool in creating public support for the smoking bans. The smoking ban in California in 1998 was promoted by a campaign launched by the Department of Health Services to emphasize the effects of ETS on the health of bar employees and patrons (Tang et al., 2003). The goal of this campaign was to change social norms in regards to tobacco use via the media and educational means.

II – Tobacco sales pre and post- bylaw

As shown in Table 6.1, the number of cigarettes sold in Manitoba over the last four years has decreased. During this time there has been an increase in the inclusiveness of legislation concerning smoking in public places, particularly an increase in prevention of public smoking in the hospitality industry. This decline in sales was seen in Canada as a whole over the years 2001-2004.

Table 6.1 Imported and Domestic Cigarette Sales in Manitoba 2001-2004

Year	Number of Cigarettes Sold (millions)
2001	1,301
2002	1,146
2003	1,084
2004	1,062

Health Canada, 2005

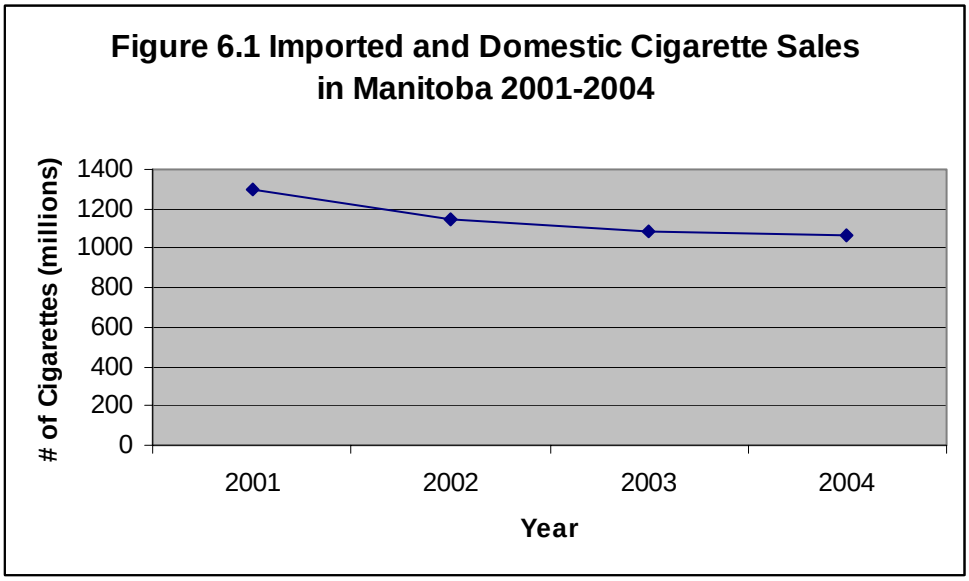
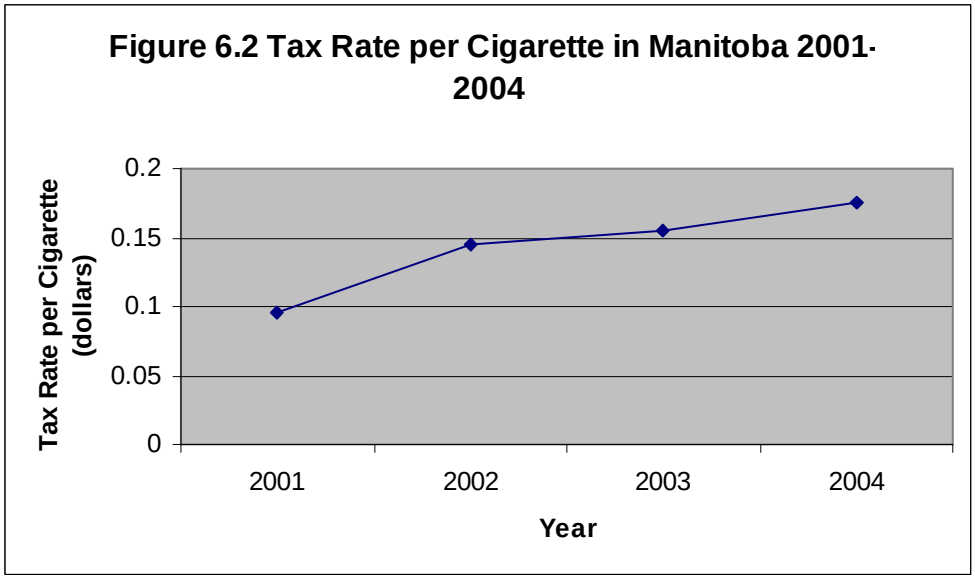


Table 6.2 Tax Rate per Cigarette in Manitoba 2001-2004

Year	Tax Rate Per Cigarette ($)
2001	0.096
2002	0.145
2003	0.155
2004	0.175

Taxation, 2005



This change in cigarette sales also coincided with an increase in the tax rate on cigarettes sales and therefore, with an increase in the price of purchasing cigarettes. Other studies have shown that an increase in the prohibition of smoking in public places decreased the number of people smoking in that area as well as decreasing the intensity of those who continue to smoke (Farrelly et al., 1999). A study by Trotter et al. (2002), found that the smoking behaviour of smokers (especially young smokers) can be influenced by the imposition of smoke-free bylaws in the hospitality industry.

Other researchers have seen smoke-free environments lead to a drop in cigarette consumption (Hieronimus, 1992; Colman, 2001). A study by Fichtenberg and Glantz (2002) found that smoke-free workplaces can cause a 29% reduction in cigarette consumption among smoking employees. Therefore, smoking bans and anti- public smoking legislation is not only a benefit to the health of non-smokers, but to smokers as well.

Tobacco manufacturing companies have already realized the influence smoke-free policies can have on current and future smokers. A reduction of 3 to 5 cigarettes smoked per day by smokers as a result of smoking bylaws can affect manufacturer profits by $1 billion per year (Muggli et al., 2001). This is why tobacco companies fear increased cessation as well as a loss of venues to introduce young people to smoking (Trotter et al., 2002).

Many smokers are socially-cued, meaning they smoke more often in social venues such as those in the hospitality industry. Socially-cued smokers are also 6 times more likely to be under 30 years of age (Trotter et al., 2002), which suggests that targeting socially-cued smokers also targets the younger generation of smokers. There has been a

decline in the social acceptability of smoking over the last decade (Dearlove et al., 2002). This decline could have also been a contributor to individuals smoking less and therefore, a drop in cigarette revenues.

III – Revenues in the Hospitality Industry

In Winnipeg, MB, where the majority of the study participants worked, it was observed that bars and restaurants remained just as populated after the smoking ban as they were before the ban was enacted. There have been "many positive comments from non-smokers about the fresh air now available in Winnipeg's bars, restaurants and the casinos" (Lett, 2003).

Restaurant owners in Winnipeg have complained, via local media, of a reduction in revenue since the various smoking bans came into effect, but there has been no proof of this actually occurring. In Brandon, MB it was claimed that there was an initial decline in revenues in bars and restaurants after the anti-smoking legislation was enacted, but then revenues rose back to pre-bylaw status (Santin, 2004).

Casinos in the province of Manitoba claim to have seen a drop in revenue. The Manitoba Lotteries Corporation claimed to experience a loss of more than $5 million in VLT (video lottery terminal) and casino net revenues during the first six weeks of the City of Winnipeg's smoking ban (Lett, 2003). Manitoba has one of the highest gambling rates in Canada with a net loss per adult in the province from gambling of $491.78 in 2000 (Azmier, 2001). The combined gambling rate in Manitoba between probable pathological gamblers and problem gamblers is 4.3% of the population and the provincial treatment expenditure is $1.6 million. This is 0.68% of the net gambling revenue, and

this percentage is the third largest in Canada (Azmier, 2001). These statistics suggest that the smoking ban may inadvertently be reducing gambling addictions as well expenditures for treating them.

Scientists have been paid in the past by the tobacco industry to convey the message that ETS does not produce detrimental health effects for non-smokers. For example, the University of Geneva, in Switzerland, investigated the activities of one of their faculty members, Professor Ragner Rylander (Geneva University, 2005). Professor Rylander was a highly paid consultant to the tobacco industry for years, and the subsequent inquiry indicated that he manipulated his research results to show that ETS was not harmful (Geneva University, 2005).

Studies of anti-smoking legislation have not seen any detrimental financial effects to the hospitality industry due to the prohibition of smoking in their establishments (Torabi and Seo, 2004; Cowling, 2000; Glantz, 2000). Scollo et al. (2003), reviewed studies of economic effects of smoke-free policies on the hospitality industry. They found that studies that were weaker and of lower quality showed an adverse impact from smoke-free policies on the hospitality industry and that frequently these studies were also funded by the tobacco industry (Scollo et al., 2003). A study by Biener and Fitzgerald (1999), found that smoke-free policies can be beneficial for businesses like bars and restaurants. In their study, 46% of non-smokers reported having avoided a smoky establishment due to health concerns instigated by the lingering smell (Biener and Fitzgerald, 1999). The state of California enacted a tobacco smoking ban in 1994 (California Assembly Bill 13), preventing smoking in any place of employment including restaurants and finally including bars and taverns in 1998. The California Department of

Health Services (2003) witnessed an increase in patronage and sales for restaurant and bar owners after the smoking ban was enacted for these establishments as evidenced by taxable sales data.

Overall, the majority of the public favours a smoking ban in the hospitality industry. A study by Torabi and Seo (2004), found that an average of 65% of respondents favoured a smoking ban. More non-smokers favoured the ban than smokers with percentages in favour of 76% and 29% respectively, but these numbers still show that even some smokers feel they do not need to smoke in public places.

IV – Other Economic Factors

The social costs of addiction are greatly reduced when public health policies decrease the number of smokers (Clark and Etile, 2006). These social costs can be broken down into three categories: 1. external tangible costs (including treatment of ill health, environmental effects, and smoking-related accidents), 2. intangible costs encompassing the psychological costs to family and friends of smokers, and 3. costs smokers incur by mistakes made when deciding to smoke, i.e. had they known the consequences they would have never made the decision to smoke (Clark and Etile, 2006). The costs to the health care system are the easiest to measure.

The burden on the health care system is directly proportional to the population's exposure to tobacco smoke. In Italy, 15.4 billion Euros are put into treating diseases caused by smoking annually (Crumley, 2003). The Canadian Centre for Substance Abuse (CCSA) has a study based on data from 2002 that that finds the total economic costs from tobacco in Canada to be $17 billion annually, $4.4 billion of that money is in

direct healthcare costs. In the province of Manitoba alone the total economic cost from tobacco is $676 million (CCSA, 2006). Other research shows that an average family exposed to ETS puts a greater burden on the healthcare system and experiences greater demands on their family's personal financial resources (Chan-Yeung and Dimich-Ward, 2003).

All workplaces and industries benefit from having non-smoking policies in their work environments. Non-smoking workplaces benefit the health of both the non-smoker and the smoker. Both types of employees are exposed to less tobacco smoke and in the case of smokers, it can increase their there chances of successfully quitting.

A healthy workforce means a more productive workforce. Employees who do not smoke are in better shape to perform their duties and spend less time off of work due to sick leaves and smoking behaviours. Those who smoke often take more frequent breaks to have their cigarettes when they feel the craving. A study has estimated a loss of 8 minutes per day per smoker spent on smoking rituals (Kristein, 1983), while employers estimate that 30 minutes per day is wasted to smoke breaks (Weis, 1981). One study on this issue placed the average cost to employers of smoking workers at $4,611 per smoker per year, which represents work absences, medical costs, increased insurance costs, worker unproductivity, and maintenance fees (Byrd, 1992).

V – Municipal vs. Provincial smoking bans

A province-wide ban is favoured over a municipal ban not only by the non-smoking public, but also by bar and restaurant owners as stated in a *Winnipeg Free Press* article in October of 2003 (Janzen, 2003). This is because with all cities abiding by the

same legislation in a province there is less concern about the public taking their business to another city that permits smoking indoors. When all public establishments have to abide by the same laws and ban smoking, no businesses can complain that they are treated unfairly and they cannot complain that customers will go elsewhere (Janzen, 2003). The restaurant and bar owners will be more likely to abide by smoking laws if they are enforced by the city or the province so their customers can direct the blame towards the government instead of the business (Janzen and Fallding, 2003).

VI – Human Rights

Both smokers and non-smokers portray themselves as victims in the smoking-in-public debate. On one side of the argument there are the people who say because they are legally allowed to smoke as adults, they should have the freedom to express themselves in this way wherever they choose. In an article in the *Winnipeg Free Press* a smoker expressed his rights to freedom of choice by stating, "It's a legal substance … People should have the option of not to go to a place where there is smoking" (Rabson, 2003). Individual rights in our society can be defined as actions that society judges to be moral entitlements (those entitlements being life, liberty and the use of property) of each of its members (Katz, 2005). Individual rights can be used to defend both sides of the controversy, as the use of the word "rights" has most often been used to counteract tobacco control efforts (Katz, 2005). Society frequently views "rights" as freedoms, which in the case of public smoking refers to the freedom to do as one chooses and live one's life as deemed appropriate. Since tobacco use is not illegal for adult consumption, interfering with the right to smoke can be deemed as interfering with basic human rights

and freedoms. The individual right to use property can also be argued as being violated when prohibiting smoking in public (Katz, 2005). Cigarettes are a form of property and smoking them is how individuals in society choose to use them.

On the other side are those who argue their right to breathe clean air, especially at their place of employment. Exposure to ETS can be considered an infringement on an individual's right to life because of its interference with their physical and mental health. An individual's right to life can be considered the most important right from a general public health perspective (Katz, 2005). Workplace Safety and Health legislation grants employees the right to have their safety and health protected while they are at work. For example, in Canada, the Canada Labour Code Part II, states: "Every employer shall ensure that the health and safety at work of every person employed by the employer is protected". If an employee can prove that an employer is in breech of this legislative duty and this breach has led to significant personal injury or death, the employer could have civil action taken against them (Dimond, 2003). Poor working conditions are inappropriate even if employees are willing to accept them. All employees are legally entitled to safe and healthy working conditions, including air free of tobacco smoke.

Non-smokers' rights could be utilized more often considering the priority of the right to breathe clean air (life) is above the right to consume cigarettes (use property). However, tobacco control groups and public health organizations are still attempting to prohibit smoking in public, specifically workplaces, in as widespread an area as possible. The Non-Smokers' Rights Association is a voluntary non-profit health organization that has a mission to "promote public health by eliminating illness and death caused by

tobacco", including ETS (NSRA, 2006). They defend the rights of non-smokers by placing the blame on the tobacco industry.

Some non-smokers who have been exposed to ETS in the workplace are taking action for damage done to their health while working in smoky venues in the hospitality industry. A former employee in an Ontario casino was the first to be awarded Employment Insurance (EI) benefits after quitting a job in a casino due to ETS exposure (McCallum, 2005). The employee had developed sinus and lung infections and a severe case of asthma (McCallum, 2005).

The perceptions and beliefs of the general public can be influenced by the stance taken by the government. There are two approaches the government can rule by. One of these is that the power of the government should not extend beyond a role of informational protection against ETS, while still protecting the right of individuals to hold whichever beliefs he or she chooses and accept any sources they deem accurate (Hoek et al., 1995). The other approach to government action is to prevent people from harming themselves and others around them (Hoek et al., 1995).

VII – Alternatives to Legislation to Prevent ETS Exposure and Health Issues

Ventilation has been used by businesses to attempt to decrease exposure to ETS for customers and employees. Studies have shown that ETS cannot be effectively controlled by ventilation, air cleaning, or spatial separation (Repace et al., 1999). The tobacco industry invested a substantial amount of resources to develop its "ventilation solution" to target ETS (Drope et al., 2004), while at the same time lobbying to create a separate ventilation standard for the hospitality industry. Scientists funded by tobacco

industries have discovered that ventilation systems are able to provide adequate air quality when the room has "moderate smoking" levels. Other studies (not funded by tobacco companies) have seen that the levels of ventilation required to control the health risks of ETS are economically unfeasible (Repace, 2000). The compounds in ETS occur in both a gas phase and a particulate phase. Mechanical filters found in ventilation systems are not designed to remove components in the gaseous phase and therefore those harmful chemicals would never be removed from the air (Dewey, 1985). Dilution is the only approach ventilation systems can take to reduce, not eliminate ETS exposure.

Spatial separations are made by creating designated smoking areas. Designated smoking areas in restaurants and bars via partitions and separate smoking rooms are other forms of reducing exposure to ETS. Non-smoking customers would likely see a reduction in the amount of ETS they are exposed to, but non-smoking workers in the hospitality industry would still be exposed to ETS because of their requirement to work in these segregated rooms. Studies have already shown that designated smoking areas do not work well to prevent ETS exposure for non-smoking hospitality workers (Cains et al., 2004; Ducatman and McLellan, 2000). A designated smoking area can only reduce the exposure to ETS in the non-smoking areas by 50% and is not comparable with the protection offered by a non-smoking venue (Cains et al., 2004).

Chapter 6 – Conclusion and Future Recommendations

This thesis studied the change in respiratory health effects of hospitality industry employees when exposed to varying degrees of environmental tobacco smoke in times of changing public smoking legislation. The purpose of the research was to identify if an increase in public smoking restrictions surrounding the hospitality industry decreases the negative respiratory health effects experienced by workers who are normally exposed to ETS.

There is evidence that ETS is an environmental health concern for humans, especially those working in the hospitality industry. The more comprehensive the legislation prohibiting smoking in public places such as bars and restaurants, the greater the improvement to acute health effects (including respiratory and sensory irritation symptoms among) and the lesser the amount of ETS biomarker found within hospitality industry employees. Few studies have been conducted in which the change in health effects of hospitality industry employees with a change in ETS legislation was assessed in differing socio-cultural environments.

In order to address the research questions, data were collected from Canadian hospitality workers both before and after legislation prohibiting public smoking in bars and restaurants was enacted and from similar Italian employees before any legislation concerning public smoking in the hospitality industry was implemented. The data that were collected included CO levels at the beginning and end of a shift and employees' self-assessment of the amount of exposure to ETS and the respiratory and sensory irritation symptoms experienced due to that exposure.

The present research demonstrated that with an increase in the comprehensiveness of legislation prohibiting smoking in the hospitality industry, there is evidence of better health for those who work within the industry, including a decrease in respiratory and sensory irritation symptoms and a general decrease in the exposure to CO, a major toxin in cigarette smoke. Information provided by this study that has not been addressed in previous research included a comparison of the varying degrees of exposure to ETS in areas with similar smoking restrictions, but differing socio-cultural norms. While suggestive, the results of this portion of the study were not conclusive due to the number of variables that may have altered the results such as the lack of knowledge of the specific characteristics of the venues (size of rooms, population density, ventilation systems, etc.), language barrier between principal investigator and participants in Italy, two separate instruments collecting CO data (one in each country) and lack of a simple random sample to select the participants. Additionally, there was a difference in the social acceptability of ETS legislation between Canada and Italy, which may have influenced the responses to the questionnaire.

The strengths of this study included its feasibility, low cost and the less intrusive nature of the analysis techniques used to identify health effects, the timeliness of the changes in ETS legislation in Manitoba, and the ability to have an interpreter in Italy who was also an expert in the field of ETS exposure assessment.

An increasing amount of legislation governing smoking in public places has been enacted over the past decade. The results of this study provide additional knowledge about the impact of restrictive smoking legislation on ETS exposure and associated health effects, which will ideally increase the implementation and enforcement of complete bans

on smoking in public areas. Further work is needed to determine the effectiveness of ETS legislation in one culture compared to another. Since the enactment of the complete smoking ban in Italy (as of January 1, 2005) research can now be done to answer that question specifically. The same health parameters and analysis used in the current study could now be used to collect data in Italy, and the results combined to assess the effectiveness of legislation given different societal factors. ETS legislation is important for the protection of health of non-smokers, particularly those in the hospitality industry.

Appendix A

RESTAURANT AND BAR WORKERS RESPIRATORY HEALTH QUESTIONNAIRE

Subject ID Number _____

Date Questionnaire Completed: _____ Interviewer ID Number _____

Workplace: ☐ Restaurant ☐ Bar How long in current position? _____

Are you exposed to secondhand smoke at: ☐ Workplace How many hours per day? _____
☐ Home How many hours per day? _____
☐ Elsewhere How many hours per day? _____

Demographics: Age: _____ Gender: ☐ M ☐ F

Is smoking allowed at your workplace? ☐ Yes ☐ No

Do you smoke? ☐ Yes ☐ No If so, how long have you been smoking? _____
How many cigarettes do you smoke each day? _____

Do you smoke or use any of the following other nicotine products?

☐ Cigar ☐ Pipe ☐ Chewing Tobacco ☐ Nicotine Patch ☐ Nicotine Gum

Do you smoke any other substances? ☐ Yes ☐ No

Do you have any of these symptoms? (check all that apply)	**Currently**	
	Yes	**No**
Are you short of breath with activities of daily living?	☐	☐
Do you wheeze?	☐	☐
Do you cough in the morning?	☐	☐
Do you cough during the day?	☐	☐
Do you cough at night?	☐	☐
Do you cough up phlegm?	☐	☐
Are your eyes irritated?	☐	☐
Are your eyes teary?	☐	☐
Does your nose run every day?	☐	☐
Had a sore or scratchy throat in the past month?	☐	☐
Have you had a cold in the past month?	☐	☐

Appendix B

Questionario sulla salute respiratoria dei lavoratori di bar e ristoranti

N° di identif. del questionario _____

Data di compilazione: _____ …… l'intervistatore _____

Il posto di lavoro: ristorante ☐
bar : ☐ _____ da quanto tempo vi lavora? _____

Lei è esposto a fumo passivo : ☐ nel posto di lavoro: per quante ore al giorno? _____
☐ a casa: per quante ore al giorno? _____
☐ altrove: per quante ore al giorno? _____

Dati demografici: età: _____ : ☐ maschio ☐ femmina

Il fumo è permesso nel suo posto di lavoro? ☐ Si ☐ No

Lei fuma? ☐ No ☐ Si Se si, da quanto tempo lei fuma? _____
Quante sigarette lei fuma al giorno? _____

Lei fuma o usa altri prodotti o derivati del tabacco contenenti nicotina?

☐ Sigaro ☐ Pipa ☐ Cerotto di nicotina ☐ Chewing gum alla nicotina

Lei fuma altre sostanze? ☐ Si ☐ No

Lei ha qualcuno di questi sintomi?

	Si	**No**
Le capita di mancarle il respiro durante le normali attività quotidiane?	☐	☐
Lei ha problemi di asma?	☐	☐
Lei tossisce la mattina?	☐	☐
Lei tossisce durante il giorno?	☐	☐
Lei tossisce di notte?	☐	☐
Tossisce con presenza di muco?	☐	☐
I suoi occhi sono irritati?	☐	☐
I suoi occhi lacrimano?	☐	☐
Le gocciola il naso ogni giorno?	☐	☐
Le “gratta” frequentemente la gola?	☐	☐
Lei ha frequentemente il raffreddore?	☐	☐

Appendix C

RESTAURANT AND BAR WORKERS RESPIRATORY HEALTH QUESTIONNAIRE

Subject ID Number _____

Date Questionnaire Completed: _____ Interviewer ID Number _____

Workplace: ☐ Restaurant ☐ Bar How long in current position? _____

Are you exposed to secondhand smoke at: ☐ Workplace How many hours per day? _____
☐ Home How many hours per day? _____
☐ Elsewhere How many hours per day? _____

Demographics: Age: _____ Gender: ☐ M ☐ F

Is smoking allowed at your workplace? ☐ Yes ☐ No

Do you smoke? ☐ Yes ☐ No If so, how long have you been smoking? _____
How many cigarettes do you smoke each day? _____

Do you smoke or use any of the following other nicotine products?

☐ Cigar ☐ Pipe ☐ Chewing Tobacco ☐ Nicotine Patch ☐ Nicotine Gum

Do you smoke any other substances? ☐ Yes ☐ No

Do you have any of these symptoms? (check all that apply)	**Currently**		**Since Jan. 1/02 Smoking Bylaw**		
	Yes	**No**	**Better**	**Worse**	**Same**
Are you short of breath with activities of daily living?	☐	☐	☐	☐	☐
Do you wheeze?	☐	☐	☐	☐	☐
Do you cough in the morning?	☐	☐	☐	☐	☐
Do you cough during the day?	☐	☐	☐	☐	☐
Do you cough at night?	☐	☐	☐	☐	☐
Do you cough up phlegm?	☐	☐	☐	☐	☐
Are your eyes irritated?	☐	☐	☐	☐	☐
Are your eyes teary?	☐	☐	☐	☐	☐
Does your nose run every day?	☐	☐	☐	☐	☐
Had a sore or scratchy throat in the past month?	☐	☐	☐	☐	☐
Have you had a cold in the past month?	☐	☐	☐	☐	☐

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