ATTITUDES TOWARD SMOKING IN THE COMMUNITY INTERVENTION TRIAL FOR SMOKING CESSATION (COMMIT)

By

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ABSTRACT

The Community Intervention Trial for Smoking Cessation (COMMIT) was the largest community-based effort to date aimed specifically at the reduction of smoking. COMMIT involved 11 matched pairs of intervention and comparison communities from geographically diverse regions of North America. One community from each of the matched pairs was randomly allocated to receive a standardized intervention protocol implemented between 1989 and 1993. The main trial goal was to achieve higher quit rates amongst heavy smokers in the intervention communities compared to the comparison communities.

Intermediate trial goals were to increase the priority of smoking as a public health problem and increase social norms that support nonsmoking in the intervention communities. These goals were informed by contemporary health promotion theory which suggests that longstanding changes in behaviour are best achieved by altering social environments to support healthy choices. This thesis presents a conceptualization of the links between attributes of individuals, communities and attitudes toward smoking which provides the basis for empirical investigations of: COMMIT's success in promoting attitude change; the nature of the relationship between attitude and behaviour change for smoking; and the role of community context in constructing attitudes.

Five research objectives are addressed using several analytic and descriptive techniques: 1) to develop indices to measure smoking attitudes and attitude change; 2) to document changes in smoking attitudes over the course of the COMMIT trial; 3) to determine covariates of individual attitude change; 4) to examine the nature of the relationship between attitudes toward smoking and smoking behaviour; and 5) to describe the role of community context in shaping attitudes and to begin to account for the geographic variability in attitudes in COMMIT communities.

Attitude change was assessed primarily from prevalence surveys administered in 1989 (n=9,875) and 1993 (n=14,117). Data from cohorts of smokers and nonsmokers (n=5,450) were also used to examine covariates of attitude change and for the analysis of the attitude change - behaviour change relationship. Community profile data and legislative tracking were employed in the descriptive analyses of the relationship between community context and smoking attitudes.

Valid and reliable measures representing the primary constructs of belief in the priority of smoking as a public health problem and norms and values concerning smoking were developed. Attitude change, assessed by a cross-sectional approach, revealed that there were substantial changes in favour of stronger antismoking attitudes in both the intervention and comparison communities. Intervention effects were limited to changes in heavy smokers' beliefs about the seriousness of smoking as a public health problem. The strongest covariate of attitude change was shown to be quitting smoking during the trial for both measures, while changes in beliefs about smoking as a public health problem were demonstrated to be greater

for less educated groups in the intervention communities. The attitude change - behaviour change analyses revealed support for traditional theoretical positions in the debate. Conclusions reached, however, suggest that the type of behaviour change being measured (i.e., quitting or starting smoking) and the measure of attitude affect the results of attitude-behaviour analyses. Lastly, 'place' was shown have an important independent effect on attitudes toward smoking. Through case studies of several COMMIT communities, place attributes identified to have an important impact on individual smoking attitudes were economic reliance on the tobacco industry, socio-economic and cultural composition and legislative/political climates.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

1.1 Research Context

Cigarette smoking is known to be the leading cause of preventable death in both Canada and the United States (CDC, 1991a; CMA, 1991). Coronary heart disease, cancer (lung, oral cavity, esophagus, larynx and bladder), and a number of respiratory diseases account for the bulk of the excess deaths due to cigarette smoking (Fielding, 1992). Most of the efforts to control smoking have been targeted at individual smokers but such efforts are not likely to make great changes in smoking prevalence in the population (Lichenstein and Glasgow, 1992; USDHHS, 1989). The Community Intervention Trial for Smoking Cessation (COMMIT) was a scientific study designed to test a community-based strategy to control smoking. Such strategies are intended to accelerate changes in the larger social environment to encourage norms and attitudes that support nonsmoking.

This thesis involves the analysis of several aspects of attitudes toward cigarette smoking using data from the COMMIT trial. The research is partly motivated by a need for evaluation of a major public health intervention and partly by more basic research questions which could be addressed using the extensive data collected in the trial. This work is based broadly within socioecological research on smoking-related disease prevention which

understands health as the product of an individual's interaction with his or her social and physical environment (Green and Raeburn, 1990).

In the past two decades there has been an increasing emphasis on non-biomedical approaches to the improvement of health (e.g., Lalonde (1974), Epp (1986)) and reduction of risk behaviours which are related to disease. Advances in biomedicine have not been successful in reducing morbidity and mortality to the extent anticipated (Fincham, 1992) and so approaches to health which attempt to alter macro-environmental structures in which healthy or unhealthy behaviours occur have taken on greater importance in public health.

The leading causes of death and illness in advanced industrial countries are chronic diseases related to lifestyle risk factors. Of all the suspects linked to the onset of chronic diseases (e.g., poor diet, stress, alcohol intake), smoking is the lifestyle factor which has the most persuasive and consistent connection to cancer (especially cancer of the lung) and cardiovascular disease (Doll and Peto, 1981; Lichenstein et al., 1990-91). The unequivocal evidence implicating smoking and environmental tobacco smoke in death and disease makes smoking a logical target for public health intervention.

Since the 1960s, various smoking cessation treatments, such as conditioning-based approaches and pharmacologic interventions, have been emphasized (USDHHS, 1989). The proliferation of these techniques aimed at individual smokers, however, cannot account for the overall decline in the rate of smoking in both the United States and Canada. Fiore et al. (1988) report that about 90 percent of former smokers in the United States quit without the benefit of any program or pharmacological aid. Contemporary smoking cessation researchers recognize that smoking is a socially mediated practice (e.g., Jacobson, 1984; Nuering and

Markle, 1974; Pederson et al., 1987, USDHHS, 1989) and that efforts to create local environments that support nonsmoking and changing social norms and values are very important for making population-wide and longstanding impacts in tobacco reduction. As Mustard and Frank explain:

> Concentration on "lifestyle" often obscures larger circumstances. For example, the issue of smoking illustrates the difficulty of breaking out of the disease-health care intellectual framework. Tobacco is not only toxic, but addictive and addiction most commonly commences early in life. Consequently, the presumption that users rationally and voluntarily "choose" smoking as a "lifestyle" is particularly inappropriate. Furthermore, the observation that smoking behaviour is very sharply graded by socioeconomic class undercuts the argument that it represents an individual choice, and indicates instead a powerful form of social conditioning.(Mustard and Frank, 1991, p. 8)

A number of important intervention trials, particularly those aimed at the reduction of risk factors associated with cardiovascular disease, have employed community-based health promotion strategies. These are, for example, the North Karelia, Finland Project (McAlister et al., 1982), the Stanford Five Cities Project (Farquhar et al., 1985), the Pawtucket Heart Health Program (Elder et al., 1986) and the Minnesota Heart Health Program (Lando et al., 1995). The largest and most scientifically rigorous community trial to date, the Community Intervention Trial for Smoking Cessation (COMMIT) is aimed exclusively at the reduction of smoking. Eleven pairs of communities (ten in the United States and one in Canada) are involved in this study which tests the hypothesis that a community-based intervention program can increase the smoking cessation rate among smokers, with a particular emphasis on hard-to-reach heavy smokers (COMMIT Research Group, 1991). Two of the trial-wide objectives, which are in keeping with contemporary socioecological thinking on health promotion, are.

to increase the priority of smoking cessation as a public health issue; and to increase the societal norms and values that support nonsmoking. The research proposed here is situated within these two goals as it considers various aspects of changes in attitudes towards smoking and community norms during the course of the intervention.

1.2 Research Goals and Objectives

The primary goals of this research broadly reflect socioecologic thinking about disease prevention and health promotion (Green and Raeburn, 1990; McLeroy et al., 1988). The objectives aim to assess the success of a community-based intervention at changing attitudes about cigarette smoking with the intention that such a change is a necessary precursor to sustained changes in smoking behaviour. A socioecologic approach which understands health attitudes and behaviours as the outcome of several levels of social-environmental influence necessarily implies conducting analyses across multiple levels (e.g., the community and the individual). The following five research objectives and the methods employed to address them thus exhibit the underlying socioecologic theme of multiple levels of influence on health attitudes and behaviours. The research objectives are:

1 To develop indices to measure smoking attitudes and attitude change.

2 To document changes in smoking attitudes over the course of the COMMIT trial.

3 To determine covariates of individual attitude change.

4 To examine the nature of the relationship between attitudes toward smoking and smoking behaviour.

5 To describe the role of community context in shaping attitudes and to begin to account for the geographic variability in attitudes in COMMIT communities.

1.3 Organization of the Thesis

This thesis consists of eight chapters including this introductory chapter. Chapter Two introduces a geographic perspective on health promotion through a discussion of the conceptual connections between the human disease ecology tradition and contemporary health promotion. Recent developments in health promotion thinking are reviewed and the theoretical bases of the community-based approach are discussed. Highlighted are the potential difficulties arising when interventions are aimed at communities rather than individuals.

Chapter Three begins with the presentation of a model which specifies the connections between individual and community attributes, attitudes towards smoking, and attitude and behaviour change as they are conceptualized for this thesis. A discussion of the design and evaluation strategies of the COMMIT trial follows as do details regarding the data sources for this study. Advantages and limitations of cohort and cross-sectional approaches to health research are discussed and issues surrounding the treatment of missing data are addressed. The chapter concludes with an example of the permutation test technique which formed the basis of significance testing for attitude change in COMMIT.

Chapter Four describes the development of indices (objective one) to measure the two primary attitude constructs used in this study: beliefs about smoking as a public health problem (SPHP); and norms and values concerning smoking (NVS). The outcomes of item and factor analyses follow a clarification of the concepts of attitudes, beliefs and norms and a review of literature using existing instruments designed to measure smoking attitudes.

COMMIT's success in changing attitudes and norms about smoking is assessed in Chapter Five (objective two). This chapter begins with a review of current knowledge about the decline of the social acceptability of smoking in North America and provides details about the sample sizes of the 1989 and 1993 attitude prevalence surveys including response rates by community pair. Attitude change results as measured by the main constructs (SPHP and NVS) are presented followed by results for the subconstructs. The relationships between community attitude change and the degree of intervention receipt and smoking prevalence changes are also presented. The final results presented describe attitude change as measured by the cohort data. The closing discussion assesses the possible influences of the strong secular trend favouring nonsmoking on the attitude change results.

Objectives three and four are addressed in Chapter Six. Attitude change covariates are analysed at the outset of this chapter using an analysis of variance approach. With behaviour change (i.e., quitting smoking) determined to be the most important covariate of attitude change, the nature of the relationship between smoking attitudes and behaviour is explored further using a second analytic approach. Attitude profiles comparing groups whose behaviour changed with those whose behaviour remained constant were constructed and analysed for differences. The two approaches, analysis of variance with attitude change as a dependent variable and comparisons of attitude profiles for groups whose behaviour changed versus those who did not, were set in the context of past research on the links between attitudes and health-related behaviour. Remarks about the difficulties in making causal inferences in the area of attitude-behaviour research are stressed in the concluding discussion.

The final empirical results, directed toward objective five, appear in Chapter Seven. This chapter considers the geographic variability in attitudes toward smoking presented in the COMMIT trial. The empirical evidence for strong geographic variability comes from analyses of variance performed using the 1989 cohort data. These analyses indicated that place was an important factor affecting individual attitude scores. Communities with more extreme variations in attitudes toward smoking were selected for further investigation of their socio-political milieux using data derived from community reports and legislative records

The main themes arising from this thesis and its substantive, methodological and theoretical contributions appear in the concluding chapter. This research has a number of important contributions including the development of reliable and valid measures for smoking attitudes, the assessment of the efficacy of a large smoking cessation effort to change attitudes toward cigarette smoking and the further acknowledgement of the difficulty of attributing causality to attitudes in studies of the attitude-behaviour relationship. The unique contribution of the work is the theoretical and empirical examination of role of community context in the construction of attitudes towards smoking

CHAPTER TWO

RESEARCH CONTEXT - The Geography of Health and Community Health Promotion

> Certain at-risk behaviors have become so inextricably intertwined with our dominant cultural system (perhaps even symbolic of it) that the routine display of such behavior almost signified membership in this society . . .. To request people to change or alter these behaviours is more or less to request the abandonment of dominant culture. (McKinlay, 1990, p. 505)

2.1 Introduction

The first major task of this chapter to set the thesis in the context of broader research in the field of the geography of health and health care. The chapter begins with a short review of the traditional foci of the discipline, namely ecological analyses of disease and studies of accessibility and utilization of health care services. While the discipline has always viewed disease from a non-biomedical perspective, a continued "refocussing upstream" is called for in light of the disappointing results of modern medicine to combat chronic diseases. This refocus emphasizes the broader determinants of health rather than disease causation or access to health care once illness has resulted. The reorientation towards health and away from curative medicine has meant that health geography shares many themes with social geography and ecological models of health promotion.

The second major task of this chapter is to discuss the importance of community context for health promotion. Like the discipline of the geography of health and health care, community-based health promotion is not allied with the biomedical focus on the individual nor focused on the identification of causal pathways for disease or the medical management of high-risk cases. Instead, this approach has a much broader focus aimed at transforming social and physical environments to become more supportive of health. Unique demands are imposed, however, when the unit of intervention and analysis becomes the community. Principal among these is the difficulty both conceptualizing and then providing empirical support for multiscale influences on social change.

2.2 The Geography of Health and Health Care

The geographic subdiscipline of health and health care (also known as medical geography) is typically described as the study of geographical aspects of health or disease and the delivery of health services. Two research traditions are commonly identified within the subdiscipline, namely disease ecology and the accessibility, utilization and planning of health care facilities. Disease ecology has the longer history and is most closely associated with classical epidemiology. Research in the disease ecology tradition emphasizes relationships between the environment and human health and often focuses on spatial inequalities in health. The second, more recent research tradition of health care accessibility and utilization grew out of the more general trend within human geography in the late 1960s and early 1970s toward more socially relevant research. Urban geographers coined the phrase "territorial

justice" (Harvey, 1973) and medical geographers began an inquiry into the equity of the spatial allocation of health care resources.

Disease ecology will be the focus here given the conceptual links that can be drawn between that approach and modern public health and health promotion. The description offered by Meade and colleagues below suggests that the interactions between individuals and their social and physical environments are critical to the understanding of disease and disease prevention. These same themes will be revisited later in the discussion of community-based health promotion strategies. As Meade and colleagues explain:

> The human ecology of disease is concerned with the ways human behavior, in its cultural and socioeconomic context, interacts with environmental conditions to produce or prevent disease among susceptible people . . . Geography is . . . important, as its roots are firmly anchored in the study of cultural and environmental interactions. (Meade et al., 1988, p. 29)

The human disease ecology model states that human health is determined by three key factors: habitat, population and behaviour (Meade et al., 1988). *Habitat* is that part of the environment where people live and work which encompasses the built environment, communication, transportation and health care infrastructure and local physical and biotic conditions. The nature of the *population* is also seen to be important to the determination of health status in that population characteristics such as age structure, sex, and genetic predisposition contribute to disease susceptibility or resistance. *Behaviour* is understood to be "the observable aspect of culture" (Meade et al., 1988, p. 32) which includes social norms, health-related beliefs and socio-economic constraints on behaviour. The separate consideration of population and behaviour sets the ecological model apart from sociological

models of health. Meade et al. (1988) cite the example that education is considered an element of behaviour rather than of population status. They explain that education allows for expanded opportunities within the habitat. These experiences can then influence behaviour in ways that improve health by reducing harmful exposures, increasing protective capacity, and encouraging changes to the habitat itself.

Traditionally, disease ecology studies have focused on infectious diseases in low-income countries (e.g., May, 1958) but recently Learmonth (1988) has suggested that the ecological approach is also useful for an understanding of the patterning of chronic diseases such as heart disease and cancer. Learmonth (1988) concludes his book with a discussion of the potential links between health education and medical geography, although he notes that the connections have been few. He cites, for example, Budd and Budd's (1981) analysis of a British campaign using mass media to encourage healthier lifestyles. Their work examined spatial variations of respondent credibility in health information sources, noting that information from general practitioners was perceived as more credible than that from mass communication sources. The outcome was spatial variation in health knowledge based on the local rates of contact with general practitioners. Curtis and Tacket (1996) note that there are clear parallels between the holistic type of approach proposed by contemporary public health movements and analysis in human disease ecology. They note that "studies of the ecology of particular diseases can encourage a broad perspective on health and development, and may encourage efforts to involve whole communities in actions which will tackle problems that give rise to illness " (p. 186)

The parallels between contemporary public health and the human disease ecology tradition are perhaps even stronger than either Learmonth (1988) or Taket and Curtis (1996) state. Consider that Green and Raeburn's (1990) definition of an ecological model of health promotion sees health as "the product of the individual's continuous interaction and interdependence with his/her ecosphere -- this is the family, the community, the culture, the societal structure, and the physical environment." (p. 35) The ecological model of health promotion focuses attention on both individual and social environmental factors as intervention targets. In an ecological model, interventions are directed at changing individual, organizational, community and public policy levels, including interactions among levels. The similarities between the disease ecology framework in health geography and the ecological approach in health promotion are remarkably similar with their emphases on the role of the interactions between individuals and their environments for the promotion or creation of health and disease.

A defining theme of ecological models of health is the dismissal of the biomedical model as the basis for understanding disease causation. In the biomedical disease model, disease outcomes are simplified to biological malfunctions and causation for disease is assigned only to microorganisms, carcinogens and, toxins discounting the roles of both the social and physical environments. It has been suggested that the dominance of work at the individual level in disease prevention/health promotion has to do with its "congruence with the traditional medical model, wherein causal biologic pathways can be hypothesized and high-risk people individually managed by health providers." (McKinlay, 1993, p. 109) McKinlay (1993) points to the example of the MRFIT trial (MRFIT Research Group, 1982)

where high-risk individuals were identified to receive comprehensive personal counseling and even drug treatment. Identifying high-risk individuals and their behaviours implicitly places the source of the problem and any public health solution in the individual rather than in social structure (Alonzo, 1993).

The uneasiness with the dominance of the biomedical model along with the increasing academic recognition and public awareness that health cannot be equated with health care has led to the convergence of social and medical geographies. As medical geographers look further "upstream" for the sources of health and illness, the boundaries between social and medical geography become blurred. A relationship between the quality of the community and health holds in every community and every country around the world. In western societies, mortality and morbidity are patterned over space by socio-cultural factors including social status, gender, race and lifestyle, where health enhancing or health-threatening lifestyles are often markers for the complex set of social conditions and processes causally implicated in health. This societal stratification (particularly by social status) has been *the* central topic of social geography (Urry, 1989) with researchers pointing to spatial inequalities to account for the concentration of, for example, political allegiances and local culture.

As health geographers focus upstream on the root causes of health and illness, their work becomes closely allied with research of social geography. Noted here also is the strong similarity between the conceptual frameworks of the disease ecology tradition of health geography and ecological health promotion as described by Green and Raeburn (1990). What ties these disciplines together is their common emphasis on the roles of the social and physical environments for the determination of health and their dismissal of the biomedical approach.

In the next section the popularization of thinking about a broader understanding of the determinants of health is explored from the introduction of the Lalonde report in 1974 to the work of Canadian Institute of Advanced Research in the early 1990s.

2.3 The Determinants of Health

The 1974 green paper entitled *A New Perspective on the Health of Canadians* (Lalonde, 1974) set off a trend of thinking about disease causation that implicated social and economic processes. That being said, this paper did little to change health policy or practices straight away in Canada even though it was part of a larger movement throughout the Western world (O'Neill and Pederson, 1994). The report stressed the importance of public health and health promotion for the prevention of disease and argued that medical care was not the most important determinant of health. A major emphasis of the work was that future improvements in population health were likely to come from changes in individual lifestyles and so the term health promotion was a synonym for health education. This document called for research that investigated how Canadians could be influenced to take more individual responsibility for their health and for reducing the risks which they impose upon themselves. The strategies for health promotion suggested in the document included several educational campaigns to increase public awareness of health problems caused by poor eating habits, traffic accidents and the abuse of drugs and alcohol.

O'Neill and Pederson (1994) note, however, that the health education advocated by *A New Perspective on the Health of Canadians* came under widespread attack in the late 1970s in North America for its focus on individual behaviour. They explain that the health

education strategies came to be criticized for being overly individualistic - to the point where individuals were essentially being blamed for their own life circumstances. Terris (1980), for example, reacted very strongly to what he termed "the lifestyle approach to health policy." He states:

> A major weakness of this (Lalonde's) approach is that it conceives of individual lifestyles as though they exist in a vacuum. Society has nothing to do with the matter. Furthermore, society takes no responsibility; as Lalonde states 'Individuals' blame must be accepted'. (p. 332)

The broad sweeping critique led to a renewed understanding of health and a broader definition of health promotion which emphasized the role of society in individual health behaviour. Ideas about smoking cessation paralleled thinking in the wide North American public health community during this time. As the following quotation indicates, smoking went from being considered an individual choice to being thought of a complex socially-embedded behaviour.

> Smoking was viewed as a habit in 1964 and is now understood to be an addiction influenced by a wide range of interacting factors, including pharmacologic effects of nicotine; conditioning of those effects to numerous activities, emotions, and settings, socio-economic factors; personal factors such as coping resources; and social influence factors. (USDHHS, 1989, p. 24)

The next major knowledge shift in health promotion both internationally and in Canada was articulated through two documents released in 1986: *The Ottawa Charter for Health Promotion* (Charter, 1986) and *Achieving Health for All: A Framework for Health Promotion* (Epp, 1986). Both documents defined health promotion as "the process of enabling individuals and communities to increase control over and to improve their health" which O'Neill and Pederson (1994) acknowledge was first used in a 1984 WHO discussion

paper on the concept and principles of health promotion (World Health Organization, 1984, p. 3) The *Achieving Health for All* document provides a framework which 1) outlines three national health challenges (reducing inequities, increasing the prevention effort and enhancing people's capacity to cope); 2) suggests that health promotion provides an avenue for dealing with these challenges; and 3) explains health promotion mechanisms (self-care, mutual aid and healthy environments) and health promotion strategies (fostering public participation, strengthening community health services and coordination of "healthy" public policy) to achieve the goal of health for all.

The work of the 1974 green paper, the *Achieving Health for All* framework and the Ottawa Charter are evidence that, in Canada and internationally, policy makers are realizing that population health is determined by many factors, the least important of which is medical care. Members of the Canadian Institute of Advanced Research (CIAR) have written a number of working papers towards the goals of increasing understanding about the new perspectives on the determinants of health and assisting policy makers and societies at large with coming to terms with this new way of thinking about health.

The CIAR's writings (Evans et al., 1994; Evans, 1992; CIAR, 1991; Mustard and Frank, 1991; Evans and Stoddart, 1990) consider the impact on health of the social and physical environments and an individual's genetic endowment. They further take strong exception to the modern viewpoint which equates health with the availability of health care and suggest that there is a threshold for effective spending on health care services. Their point is that beyond a certain threshold, health may suffer not only because the medical procedures

might be of questionable benefit but also because fewer resources remain for economic and social policy.

Evidence for the CIAR`s position comes from a wide variety of research from around the world. One of the most convincing arguments for the link between socioeconomic status and health is the persistent gradient in mortality and morbidity for social classes in several countries. A longitudinal study of United Kingdom civil servants showed that mortality and morbidity was strongly connected to job rank, with those in highest job classifications surviving longer and suffering less from the major causes of death than any of the other groups (Marmot and Theorell, 1988). While the difference in health status was largest between the highest and lowest groups, it also was present between the highest and next highest job categories, establishing a gradient of effects. Whatever is responsible for the gradient seems to alter individuals' "basic host defense" against a variety of diseases.

The importance of the gradient in health status for the civil servants is strengthened by the fact that the gradient could not be explained by differences between the groups in smoking, drinking or other behavioural factors. That smoking could be implicated in the differences between social groups in mortality raises an important issue. As Mustard and Frank put it, it raises "the question of exactly how this behaviour has come to be related to positions in the United Kingdom civil service hierarchy. . . It suggests that smoking behaviour is significantly determined by the social environment in which people live and work and not entirely a matter of free choice." (p.13)

At its most basic level, the debate about health as the responsibility of the individual or society parallels a broader debate in social science about the relative roles played by

structure (meaning tangible and intangible elements of social organization) and agency (meaning action potential of free individuals) in human behaviour. A key implication of this debate is the notion that the *extent* to which human beings are treated as puppets of structural constraints determines the assignment of responsibility and then, of course, the possibility of judgement (Jackson and Smith, 1984). In the area of health promotion research, we become involved in debates about individual versus societal responsibility for health and individual behaviour change versus broader, institutional and social change approaches to health promotion.

2.4 Community-based Strategies to Promote Health

The recent developments in health promotion theory and research on the determinants of health give more recognition to the roles played by the social and physical environments in health outcomes. A reasonable result of these changes is a focus on community-based strategies to prevent disease and promote health. Community-based programs are designed to change the physical and social conditions in community environments to improve health, avoid victim blaming and give people within a community a greater sense of power to make changes in their lives (Brown, 1991). In general, these programs use social marketing techniques and community-based media and communication networks to encourage people to change high-risk behaviours (e.g., smoking). They also try to modify the social environment to discourage such behaviours (e.g., support for smoke free public spaces), and they try to lower barriers to engaging in healthy behaviours (e.g., accessible cessation assistance). The community-based model espouses the belief that for most people, factors

outside of their individual control are greater determinants of their lives than are factors that they can individually control.

Thompson and Kinne (1990) also suggest that the focus on community comes out of the growing acknowledgment that long-term, large-scale behaviour change is best achieved not by focusing on individuals but rather by changing community norms (i.e., established and expected forms of social behaviour (Bullock et al., 1988)) regarding health-related behaviour. Change in norms and values, however, is rarely measured in community health projects owing mainly, claim Thompson and Kinne (1990), to the absence of a comprehensive theory explaining how such change occurs. Their work situates the process of change in social context and community norms in a broad theoretical framework of social change. A key part of their understanding of social change at the community level is a conceptualization of community as system; that communities behave as systems, defined as groups of *related* elements organized for a purpose (Bullock et al., 1988). A community system, by definition, is made up of various subsystems (e.g., political sector, health sector, economic sector, voluntary groups, grass roots organizations), individuals and, perhaps most importantly, the interconnections between them. Because of the inherent interrelatedness of the community system, change in any subsystem will necessarily affect other subsystems, individuals and the system as a whole.

To explain the process of how social change occurs, Thompson and Kinne (1990) point to macro-sociologic understandings, explicitly functionalist and conflict theories. For the functionalist, norms exist or function to keep the system running smoothly. Social change often occurs when external changes affect the system. Norms then shift accordingly in the

changed system to continue to serve their purpose of providing system stability. In the case of smoking, for example, North American norms shifted in response to the 1964 release of the U.S. Surgeon General's report declaring a link between lung cancer and tobacco smoke.

Conflict theories understand societal change to occur as a result of the dominance of one social group's interests over others. Rules and standards of acceptable social behaviour are then defined by the dominant group in whose interests the norms operate. Thompson and Kinne (1990) again provide the example of norms regarding tobacco use. The tobacco industry in North America fights to maintain the normative viewpoint that smoking is an individual choice and thus smoking debates should be framed as issues of individual liberties and not as health issues. Changes in these norms will only result when competing interest groups such as health lobbies can exert more influence over parts of the system (e.g., the political and economic subsystems) where the tobacco industry has traditionally defined the norms

Thompson and Kinne (1990) state that while these macro-level theories are important for understanding broader causes of societal change, they do not provide much insight into the specific processes of change, especially those processes occurring at community, subsystem and individual levels. Fincham (1992) has suggested that community-based health promotion/disease prevention programs have conceptual frameworks that include a number of overlapping theories. He complains that while much has been published on the theoretical bases for community-based strategies, there is little evidence connecting theory, practice and outcome. Part of the problem, he surmises, is that conceptual overlap between theories at various scales makes it hard to test specific theory-based hypotheses.

Change theories at the individual level include social learning theory (Bandura, 1977) and the theory of reasoned action (Ajzen and Fishbein, 1980), among others. These theories of individual change, however, include reference to the importance of social norms for individual behaviour and thereby indirectly incorporate 'the social'. Individual level change theories are still important even in system-change health promotion contexts. It is, after all, thinking individuals within their normative environments who behave and who experience health and illness. As Green and Raeburn (1990) point out, in their pure forms, system-level and individual-level models represent opposing perspectives that would indicate different policies and actions to promote health. In practice, however, they note that programs that become implemented rarely exclude either behavioural change or systems change components. Furthermore, they explain that few health educators or behavioural scientists in health promotion ever advocated ignoring system forces in behaviour or health. Likewise system advocates rarely reject the role of individual behaviour in the promotion of health. The key, they offer, is "to seek to merge these two perspectives into an integrated, total person-environment approach . . . where responsibility for health is shared between individuals and systems." (p. 32)

2.5 Communities as Settings for Health Promotion

COMMIT was a major community-based health promotion experiment. COMMIT was designed under the assumptions that individual-oriented smoking control efforts do not have broadsweeping impact on the overall smoking problem and that large-scale change can only be achieved by focusing on the social and environmental factors that influence smoking

(Lynn and Thompson, 1995).With the community as both the unit of intervention and analysis, naturally both conceptual and practical difficulties are anticipated for evaluation. In this section, the concept of community is discussed with reference to how the different meanings of community can affect our understanding of evaluation outcomes. Theories of health promotion at the community level are discussed with the key point being made that the links between the community level and the individual in community health promotion are appealing theoretically but lack much empirical support. This section concludes with a discussion of what was reasonable to expect from a community-based approach given the very real challenges faced by the approach.

It was noted above that the concept of community exists somewhere between the abstract societal system and the individual - in many ways it provides a middle ground between the two, often ideologically divisive, concepts. Mullen et al. (1995) note that communities have historically been important settings for health education/promotion associated with a tradition of community development. They note that the emphasis in evaluation when the community is the setting for health promotion is often community change, with a health behaviour change focus, beginning with the Stanford Five-City project (see Farquhar et al., 1990). Conceptually, in COMMIT, the community, worksite, school, and health care settings were contained under the broad umbrella of community. Mullen et al. (1995) note that these settings vary in their degree and type of organization. The types of relationships between gatekeepers and the population of interest - citizens, workers, students and patients - vary in terms of authority and power, the style and frequency of interaction, and the degree to which aspects of health are a priority.

For the purposes of COMMIT, community was defined as "a well-defined portion of a major metropolitan area or two small cities in the same geographic region." (Lynn and Thompson, 1995 p. 27). The term "community", however, has at least two commonly-used meanings. Community can refer to a physical locality with boundaries where people live and work (i.e., in the COMMIT sense) or it can imply a group of individuals who interact with one another whether or not they are in the same place (Jackson, 1988). A prominent theorist on the subject of community was the German sociologist Ferdinand Tönnies. In 1887, Tönnies articulated these fundamental differences in the meaning of community with the German words *gemeinschaft* and *gesellschaft*. The former represents a social relationship between individuals based on affection or familial ties while the latter is based on the division of labour and contractual association based on self-interest (Bullock et al., 1988; Burgess, 1973; MacIvor, 1970). A similar type of distinction was made by American sociologist Jessie Bernard, who referred to the two concepts as "community" and "the community" (Jackson, 1988). The first symbolizes shared values, interests and a common sense of identity. The second refers to places and the events and actions that take place within them.

It is hard to imagine how the COMMIT cities, given their sheer size, could be considered "communities". With their status as both the units of intervention and analysis, the implied assumption is that they can be defined in terms of shared values, interest and identity. The COMMIT concept of community as geographical boundary is challenged on the grounds that community implies a stronger social tie and homogeneity in values, norms and outlooks than can be expected in (post) modern North American cities. Jackson (1988) warns that it would be difficult to find any town or city that would satisfy these criteria. In his words:

> Any given locale is as likely as not to exhibit within its boundaries harmony and disharmony, conflict and consensus, order and disorder as various social groupings struggle over resources. The idea of "community" is therefore better retained as an empirical question in relation to particular communities as locale, or to "the community." (P.642)

Jackson's viewpoint stands in opposition to MacIver who wrote in 1936:

> By community I mean any area of common life, village, or town, or district, or country, or even wider area. To deserve the name community, the area must be somehow distinguished from further areas, the common life may have some characteristics of its own such that the frontiers of the area have some meaning. All the laws of the cosmos, physical, biological, and psychological, conspire to bring it about that beings who live together shall resemble one another. Whenever men [sic] live together they develop in some kind and degree distinctive common characteristics--manners, traditions, modes of speech, and so on. . . The one extreme is the whole world . . . , one great but vague and incoherent common life. The other extreme is the small intense community within which the life of an ordinary individual is lived, a tiny nucleus of common life with a sometimes larger, sometimes smaller, and always varying fringe. Yet even the poorest in social relationships is a member in a chain of social contacts which stretches to the world's end.

If we combine these two viewpoints then community becomes a matter of degree. The interrelationships are more or less intense at different scales. These variations in understanding of community mean that diffusion of ideas can be enhanced by the degree of homogeneity and cohesiveness within a community. The COMMIT design was a standardized protocol implemented in 11 very diverse communities. The diversity of the communities implied that a standardized protocol would be received very differently by the various communities and social groups within the communities. The question arises as to whether COMMIT set itself up for an impossible task given that the needs of science and the needs of the individual communities might have been at odds.

COMMIT investigators, however, were not blind to the fact that differences between communities could pose threats to the scientific evaluation of the trial. It was recognized, for example, that community mobilization for action around the smoking problem and implementation of protocol activities would necessarily vary somewhat between communities. As Lynn et al. (1995) explain:

> Each community has its own structures, history, and resources necessitating some variation between communities in the process of mobilization. The logic and philosophy of the trial provided each community, through standard mobilization features, with some discretion in local trial management. The basic mobilization model was designed to provide scientific integrity while allowing some local flexibility to establish structures and implement activities in a manner congruent with local practice. (p. 43)

Furthermore, even though the protocol was developed before community randomization and therefore communities had no input into its content, communities were expected to devise their own approaches while working within the broader structure of the protocol (Lynn et al., 1995). Thompson et al. (1995) reiterate the point that researchers were aware that too much "top down" structure might threaten local involvement and participation but remind us that for the purposes of COMMIT, scientific goals outweighed community development goals.

Another essential point is the fact that the communities do not exist in isolation. Instead, they are part of states or provinces, nations and the broader global community. Because the systems are inherently interconnected, changes in state or provincial legislation or changes in nation-wide norms naturally affect communities and individuals within communities. Lynn et al. (1995) note several external factors that were present during the trial that could have had an impact on the trial results. For example they recognize that California

passed Proposition 99 in 1988 which called for a increase in the cigarette tax of 25 cents. This new-found revenue would be earmarked for research and educational programs in tobacco control. There was a 17% decline in smoking prevalence in California in the 3 years following the Proposition 99 campaign (1988), the increase in the excise tax (1989), and the initiation of programs (1990) (Breslow and Johnson, 1993). In Canada, cigarette prices rose to an all-time high in the early 1990s, as a result of a series of tax increases, and were shown to be effective at reducing national cigarette consumption (Pross and Stewart, 1994). At the national level in the United States, the U.S. Environmental Protection Agency classified environmental tobacco smoke (ETS) as a Class A (i.e., known human) carcinogen (U.S. Environmental Protection Agency, 1992). Such a designation stimulated the introduction of further public smoking restrictions and increased employers' concerns about the liability of smoking in the workplace (Lynn et al., 1995).

Thus while COMMIT was a controlled community experiment, it was impossible to control for a number of important external perturbations that would likely have had important impacts on the open community systems. As the following passage explains, some of investigators went so far as to suggest that the protocol might have been too stringently designed to take account of and react to conditions external to the community:

> The community is not an entity in and of itself; rather, it exists in a broader social context that also may be changing. When a community rides the secular trend, it is difficult to judge the effects of an intervention; it may have been better to build more flexibility into the protocol so that different tactics could have been used when the external environment changed. (Lynn et al., 1995, p. 49)

Community-based programs acknowledge local social system contributions to the generation and prevention of risky behaviours. Such an acknowledgment implies that broader changes occurring beyond the defined community cannot be controlled for in a community-based experiment such as COMMIT. If wider secular changes are strong or if state/provincial or national level policies change, local efforts could go undetected. Also the extent to which communities are truly communities in the sense that individuals identify with the geographic entities and share common outlooks, will affect the pace of community change. Community-wide receptivity to ideas will also be affected by the degree of cohesion present within a community.

2.6 Summary and Conclusions

In this chapter health geography was introduced as a discipline with two traditions: disease ecology and accessibility and utilization of health care. Disease ecology was explored in more depth due to its similarities, in terms of conceptual frameworks, to contemporary health promotion. Disease ecology's emphasis on the tripartite relationship between habitat, population and behaviour for the understanding of disease distributions and causation is closely matched with contemporary health promotion's emphases on human-environment interactions.

This chapter also recounted developments in health promotion thinking in Canada from Lalonde, through to the Ottawa Charter, Epp and the CIAR. Critics of individual-level health promotion claimed that interventions aimed at individual behaviours were limited in that such efforts do not take into account the context in which those behaviours are generated

and sustained. Critics like McKinlay (1990) and others suggested that risky behaviours are part of the dominant culture in the Western world and that change would only come through a recognition of the relationship between society and individual behaviour. Community-based efforts like COMMIT take a middle ground between purely structural and purely individual (behavioural) change approaches. Some of the difficulties arising from the middle-ground approach with the community as the unit of intervention and analysis include problems associated with the meaning of 'community' and the possibility of community systems being affected by structural changes (e.g., legislative changes) at state/provincial and national levels.

The next chapter provides the conceptual framework for the empirical work in the thesis and provides details of the COMMIT intervention activities and evaluation strategies. The framework operationalizes many of the concepts discussed in this chapter including how individual-level and community-level influences on attitudes and behaviours are conceptualized for this thesis. Together, the framework and the details about the COMMIT intervention, provide the necessary groundwork for the four empirical chapters that follow.

CHAPTER THREE

RESEARCH DESIGN

3.1 Introduction

This chapter has two main purposes The first is to introduce a conceptual model which makes explicit the relationships between attributes of individuals and communities and smoking attitudes and behaviours. The model is intended to provide a conceptual 'roadmap' for the empirical chapters that follow. The second is to supply requisite details about the COMMIT trial including its purpose and methods of intervention and evaluation. Particular emphasis is placed on the surveys involved in this thesis, namely the evaluation cohort survey and the attitude prevalence survey. Details regarding the use of statistical procedures and the handling of missing data in the thesis are also discussed.

3.2 Conceptual Links Between Individuals, Communities, Attitudes and Behaviours

The empirical work in this thesis is organized around a conceptual model that links together attributes of individuals and communities, attitudes towards smoking, attitude change and behaviour change (Figure 3.1). This model is informed by socioecological thinking about health attitudes and behaviour (Chapter One) and specifies that individual characteristics (age, sex, education, smoking status, race), and community characteristics

(intervention condition, smoking prevalence, attitude environment, legislative environment) are determinants of individual attitude scores in 1989. Attitude change during the trial is, in turn directly affected by the baseline attitude scores as well as indirectly and directly influenced by individual and community characteristics. The relationship between attitude change and behaviour change is multidirectional and influenced again both directly and indirectly by individual and community characteristics. Feedback mechanisms are also specified in the model given that once behaviour change in an individual occurs, individual characteristics are affected by a change in smoking status. Community characteristics are also altered with a change in smoking prevalence. Individual attitude change also feeds back to affect the community attitude environment.

The model articulates the combined influence of individual characteristics and structural or community level factors on health attitudes and behaviour. It also provides the rationale for the empirical chapters to follow. With the reliability and validity of the attitude indices established in Chapter Four, Chapter Five assesses attitude change resulting from the intervention taking account of smoking status. Chapter Six investigates the individual characteristics involved in attitude change using an analysis of variance approach and then addresses the directionality of the attitude-behaviour relationship by means of a descriptive analysis of attitude profiles. Most health education and health promotion campaigns suggest that attitude change is a necessary precursor to behaviour change (Bettinghaus, 1986). The model presented here suggests that in the case of smoking, attitude change can influence behaviour but also acknowledges the potential for behaviour change to influence attitudes. What the attitude profiles in Chapter Six attempt to do is to indicate the conditions under

which the different relationships hold. The final empirical chapter (Chapter Seven) examines the links between attitudes towards cigarette smoking and the attributes of the COMMIT communities using a case study approach. This analysis examines the explanatory role of the community on individual attitudes towards smoking at the outset of the trial in 1989. It further begins to explain community variation in smoking attitudes through an analysis of the social environments of selected COMMIT communities.

3.3 Overview of the Community Intervention Trial for Smoking Cessation (COMMIT)

Despite the overall decline in smoking prevalence in North America, smoking is still responsible for one out of every six deaths in the United States (USDHHS, 1989) and accounts for approximately 35,000 deaths in Canada annually (CMA, 1991). It is widely accepted now that smoking is the leading cause of preventable death in North America and the U.S. Surgeon General (1989) has declared the reduction of tobacco use to be "the most important public health issue of our time."

COMMIT was not the first community-based health promotion program to include smoking cessation endeavors but it was the first to concentrate solely on this risk behaviour. Other community-based projects such as the Minnesota Heart Health Program (Mittlemark et al., 1986), The Pawtucket Heart Health Program (Carleton et al., 1987), the Stanford Five-City Project (Farquhar et al., 1990) and the North Karelia Project (Puska et al., 1985) were aimed at many lifestyle factors implicated in the onset of chronic diseases including diet and exercise along with cigarette smoking. These earlier projects were unable, then, to answer questions about the effectiveness of a focused community-based approach to reduce the

riskiest of behaviours (smoking). Interpretation of the results of these projects was further hampered by design problems such as small sample sizes and nonrandomization of communities. In the earlier projects the small numbers of communities involved and the nonrandom assignment to treatment condition made it difficult to distinguish between effects due to intervention and those caused by expected differences between communities (COMMIT Research Group, 1995a).

The sheer magnitude of the smoking problem and the sentiments within the public health community that it was time for a rigorous test of a community-based intervention led the U.S. National Cancer Institute (NCI) to fund the Community Intervention Trial for Smoking Cessation in 1986. The largest of its kind to date, COMMIT involved 11 pairs of treatment and comparison communities (Figure 3.2) (upwards of two million participants) in the United States and Canada (Table 3.1). A research institution was responsible for the administration and management of research and intervention protocols in its respective local intervention community. Sites were selected on the basis of the quality of the research institutions guiding the local activities, geographical representation and the ability of the local research groups to suggest two well-matched communities. Impetus for the inclusion of a Canadian pair of communities in what was a U.S. based study came from a desire to test the effects of the COMMIT protocol in a Canadian context.

The research design resembled that of a traditional controlled clinical trial, the gold standard for determining the usefulness of an intervention, except that communities, not individuals, received the "treatment" (intervention protocol). Sites were chosen based on the quality of research institutions and their ability to identify a pair of nearby communities

matched on variables believed to influence smoking cessation rates (e.g., size, sociodemographics, mobility/migration patterns, smoking prevalence, health care and media resources (Mattson et al., 1990-1991)).

One community from each of the matched pairs was randomly allocated to receive the standardized intervention protocol beginning in the fall of 1988 through to the fall of 1992. The most promising strategies emerging from NCI's smaller scale Smoking, Tobacco, and Cancer Program (STCP) trials included programs offered through physicians and dentists, mass media, worksites, community organizations, and telephone hotlines. These strategies were evaluated by the COMMIT research investigators who then developed a "state-of-the-art" intervention protocol (Lichenstein et al., 1990-1991). Over the four years of the trial, 58 activities stipulated by the standardized protocol were delivered through four channels: (1) worksites and other organizations (see Glasgow et al., 1992; Sorensen et al., 1992; 1990-1991) (2) health care providers (see Ockene et al., 1990-1991); (3) smoking cessation resources (see Pomrehn et al., 1990-1991); and (4) public education through the media and community-wide events (see Wallack et al., 1990-1991). A summary of the key mandated activities delivered through these channels appears in Table 3.2. The challenge arising for COMMIT was the development of intervention strategies that could be standardized but still useful given the inherent diversity of the communities.

On the ground, each intervention community had a field director whose primary responsibility was the implementation of the protocol. The field director was accountable to a local community board consisting of key community representatives and the research institution. In addition, task forces, charged with implementation of measurable objectives,

were assigned to head each of the four delivery channels. Thus COMMIT's overall design was quite unique: local communities worked with 11 participating research centres (guided by a steering committee, responsible for protocol content and decisions about trial design and evaluation), who in turn worked with a coordinating centre responsible for data management and the NCI (COMMIT Research Group, 1995a, 1991).

The primary hypothesis of COMMIT was that a community-level, multi-channel, 4-year intervention would increase quit rates among cigarette smokers, with hard-to-reach heavy smokers (≥ 25 cigarettes per day) of priority (COMMIT Research Group, 1995a). The assumption was that intervention efforts would result in a 10 percent higher quit rate for heavy smokers in intervention versus comparison communities (i.e., 25% versus 15%) (COMMIT Research Group, 1991). Heavy smokers were designated as a priority group given that they represent about one third of all smokers but they account for about half of all morbidity and mortality associated with smoking (USDHHS, 1984). They furthermore are the group who most expose family, friends and co-workers to the risks of environmental tobacco smoke and typically have the most difficulty quitting smoking (Wilson et al., 1992). It was therefore an arguably ambitious goal of COMMIT to reach that subgroup who place themselves and others at highest risk but who are least likely to achieve cessation.

COMMIT also had four intermediate trial goals (COMMIT Research Group, 1991), including: 1) *increasing the priority of smoking as a public health issue* (i.e., raising the profile of smoking as an important health problem for communities and not just individuals); 2) *increasing the community capacity to modify the smoking behaviour of its residents*, (i.e., promoting quit attempts and cessation maintenance through cues in everyday environments

such as workplaces) 3) *enhancing the influence of existing political and economic factors that discourage smoking within the community*, (e.g., local ordinances that restrict smoking in public places/ youth tobacco access and taxation increases), and; 4) *increasing social norms and values that support nonsmoking* (e.g., enhancing perceptions that it is socially unacceptable to smoke). This thesis focuses on outcomes for the goals of increasing the priority of smoking as a public health problem and shifting norms and values to support nonsmoking

3.4 Evaluation of the COMMIT Trial

Extensive evaluation of outcomes was a key feature of the trial's design given its primary role as a research study (Table 3.3). To this end, evaluation schemes were needed to test both COMMIT-related changes in smoking behaviour and the assumptions underlying the community-based strategy. The following four components were designed to address these needs (Mattson et al., 1990-1991): (1) *outcome evaluation* (changes in smoking behaviour); (2) *impact evaluation* (changes in factors understood to be important for promoting community-wide smoking behaviour changes, e.g., attitudes and social norms); (3) *process evaluation* (how activities serve short-term objectives, how activities are carried out, and what other factors contribute to outcomes, (Corbett et al., 1990-1991)); and, (4) *economic evaluation* (cost-effectiveness of the COMMIT intervention).

3.4.1 Baseline Survey

Prior to the interventions, and prior to randomization of the communities (between January and April, 1988), the baseline survey was performed in all 22 communities (COMMIT Research Group, 1988). The baseline survey was a centrally conducted random household survey designed to accomplish several tasks simultaneously including: the determination of the baseline prevalence of adult smoking and adult heavy smoking in each community; the identification of various smoker and nonsmoker groups for later recruitment into the endpoint and evaluation cohorts (see below); the measurement at baseline of the proportion of adults in the community who stopped smoking in the previous five years, and; an assessment of community demographics. Approximately 5400 households within each of the 22 communities were surveyed; a sample of this size was necessary to assure the identification of the required number of heavy smokers (COMMIT Research Group, 1991). Access to the adult population in the COMMIT communities was through the telephone housing unit identified by area code and exchange prefix combinations. Details of the sampling frame and data collection can be found in Palit (1994) and are summarized briefly here. There were two stages to the baseline data interview. In the first stage, the interview proxy (18 years of age or older) was asked to identify and list the age, sex and smoking status of all individuals 18 years of age or older in the household. Depending on their smoking status, all eligible individuals in the household were considered for the second stage, self-report extended interview. Current smokers between the ages of 25 and 64 years and a quota sample of recent quitters (quit smoking within the past 5 years) were interviewed about their smoking behaviour, desire to quit, past quit attempts, methods used in trying to quit, and

socio-demographic information. The focus on adults between 25 and 64 in the COMMIT surveys was due to the fact that heavy smoking (of primary interest to the trial) is most prevalent in adults aged 34 to 64 (USDHHS, 1989; COMMIT Research Group, 1988). Information about smoking attitudes and norms was not collected in the baseline survey.

3.4.2 The Endpoint Cohort

The primary and secondary outcome measures of the COMMIT trial, respectively, were the cessation rates of approximately 400 heavy smokers (defined as those who smoke 25 or more cigarettes daily) and 400 light-to-moderate smokers (defined as those who smoke fewer than 25 cigarettes daily) from each of the 22 communities. These "endpoint cohorts" were drawn from the baseline survey and were contacted annually through the duration of the trial. In addition to the annual questions about smoking status, the final 1993 contact included questions about awareness of or participation in smoking control activities. There were 10,019 individuals in the heavy smoker endpoint cohort and 10,328 individuals in the light-to-moderate endpoint cohort for which main outcome quit rates were calculated (COMMIT Research Group, 1995a).

3.4.3 The Evaluation Cohort

These groups of smokers and nonsmokers provide the primary data on attitudes toward smoking for COMMIT and for the empirical work in this thesis. The remaining 20% percent of smokers identified at baseline (i.e., those not recruited to the endpoint cohorts) were randomly assigned to the "evaluation cohorts." These cohorts of both smokers and

nonsmokers served to assess three issues related to trial goals: (1) recognition of smoking as a public health problem; (2) change in the social acceptability of smoking; and (3) the impact of COMMIT on smoking program awareness, receptivity, and participation. The evaluation cohorts consisted of 100 each of heavy smokers, light-to-moderate smokers, recent quitters and never smokers from each of the 22 COMMIT communities. These groups were contacted by telephone at the outset of the trial in 1989, at trial midpoint (1991) and at the conclusion of the intervention period in 1993. The main topics assessed in the evaluation survey interview, namely smoking attitudes and norms and awareness of smoking control activities (Table 3.4) reflect the trial goals stated above. Indices developed in Chapter Four to measure beliefs in smoking as a public health problem and norms and values concerning smoking are derived from questions posed in topics 2, 3 and 4 of the evaluation cohort survey. There were 5,450 respondents who answered up to the beginning of the attitude items in *both* 1989 and 1993 who represent the evaluation cohort for analytic purposes in this thesis.

Cross-sectional changes in community attitudes are also explored in this thesis (Chapter Five). Community attitudes at the beginning of the trial were estimated from the 1989 responses of the evaluation cohort survey. These data were weighted to adjust for differential age- and sex-specific nonresponse rates to create an estimate of attitude prevalence for each of the communities (see Corle, 1994). Thus the baseline community-level attitude data used in Chapter Five (to examine community-level change) and also in Chapter Seven (to examine community-level attitudes in 1989) were estimated from the 9,875 responses to the 1989 evaluation cohort survey. Community attitudes at the end of the trial

in 1993 (used to derive community attitude change scores in Chapter Five) were obtained from a subset of respondents to the final prevalence survey described below.

3.4.4 The Final Prevalence Survey

The primary purpose of the final prevalence survey was to determine community smoking prevalence rates at the end of the trial. The sampling methods used in the final prevalence survey were similar to those used in the baseline survey. Current smokers, smokers who had stopped smoking within the past 8 years, and a random sample of longer term ex-smokers and never smokers aged 25-64 years participated in an extended interview to gather information on smoking status. Subsamples of participants in this survey, stratified by smoking status, were asked a set of questions to assess their attitudes about smoking as well as their intervention program awareness and participation (perceived receipt of smoking control activities). Attitude data were obtained from approximately 100 respondents in each of five strata: heavy smokers, light-to-moderate smokers, recent quitters (within the last five years), long term quitters (more than five years) and never smokers. The total sample size was 14,117 including 7059 in the intervention communities and 7058 in the comparison communities. The data collected in both prevalence surveys (baseline and final) were weighted to compensate for differing sample selection probabilities in an effort to produce estimates for the population of all occupied housing units (i.e., with and without telephones) in each community. The attitude data and receipt awareness data from the final prevalence survey were further standardized using the age-sex distributions of the 1990 (1991 in Canada) U.S. census (Corle, 1994). As reported in the COMMIT prevalence results (COMMIT Research

Group, 1995b) the census standardization procedure adjusted for changes in age-sex distributions between baseline and final surveys and for differential age- and sex-specific nonresponse rates which could be caused by differential refusal rates or differential telephone coverage rates that might be dependent upon age and sex characteristics.

3.5 Main Outcomes of COMMIT

The two main outcome papers assessing changes in smoking behaviour attributable to the COMMIT trial were published in the *American Journal of Public Health* (COMMIT Research Group, 1995a,b). Recall that the main hypothesis of COMMIT was that the smoking control activities delivered through the many channels in the intervention communities could increase quit rates (quitting was defined as having smoked no cigarettes for at least the preceding 6 months at the end of the trial) 10% above those in the comparison communities. The end result, however, showed that the mean heavy smoker quit rate was virtually the same for both intervention (18.0%) and comparison (18.7%) groups. Despite the disappointing result for heavy smokers, an intervention effect was found for light-to-moderate (smoked < 25 cigarettes per day) smokers (quit rates of 30.6% and 27.5% for intervention and comparison groups, respectively - a statistically significant difference of 3%). The mean overall quit rates were 19.8% (intervention) versus 18.5% (comparison) while adult smoking prevalence decreased by 3.5% in the intervention communities versus 3.2% in the comparison communities. The differences between intervention and comparison communities in overall quit rates and changes in adult smoking prevalence were not statistically significant. Some additional promising evidence that COMMIT did indeed have an impact came from results

that differences in receipt indices between intervention and comparison communities were correlated with corresponding differences in quit rates using data from the cohort and prevalence surveys. This relationship between awareness of and participation in COMMIT activities and smoking cessation suggests that the intervention was valuable in producing behaviour changes.

Another important finding was that among light-to-moderate smokers where COMMIT was shown to have an effect, the intervention appeared to have more of an impact on those with less education. The mean quit rate for lighter smokers with no college education in the intervention communities was 30.2% while it was 24.8% for the same group in the comparison communities. The greater than 5 % difference was statistically significant (one-sided P = .007). One interpretation of this result for lower educated lighter smokers is that the types of messages and resources offered by COMMIT were effective in accelerating smoking cessation in a group that has not been as affected as more highly educated smokers by the continent-wide trends in smoking cessation (Pierce et al., 1989).

3.6 Cohort and Prevalence Approaches and the Issue of Missing Data

The nature of the surveys described above indicates that it was possible to assess both outcomes (quit rates, prevalence changes) and impacts (attitude changes) using cross-sectional or cohort approaches [1] A key concern with the cross sectional approach for both

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[1] Longitudinal research designs, whether experimental or observational, have been variously termed cohort studies, follow-up studies and panel studies. Although the term "cohort" is also used to refer to birth cohorts (persons born in a particular year) it is used here to refer to samples of individuals followed through the trial.

outcome and impact assessment is that migration patterns may affect smoking prevalence differentially in the paired communities (Gail et al., 1992). Cohort surveys are well-suited for the measurement of individual change but a common source of bias introduced by the cohort approach is *conditioning*, or the notion that posing questions repeatedly to the same individuals will, over time, affect their responses (Dwyer and Feinleib, 1992). Conditioning, however, was not expected to be a major source of bias in COMMIT as it was assumed that the effects of repeated contact would be the same for respondents in both intervention and comparison communities.

The biggest limitation of the cohort approach is the problem of cohort attrition. In the words of Lehnen and Koch (1974), "The major statistical shortcoming of [cohort] designs is the inability to control attrition in the original sample when administering subsequent interviews (p. 40)." Bias in cohort studies may be introduced when there are differences between those who remain in the study and those who are lost to follow-up. In health surveys for example, lost cases may be atypical for social class and health status making it difficult to assess the overall effectiveness of an experimental treatment.

Little and Rubin (1987) provide an overview of the diagnosis and historical approaches to the treatment of missing data in statistical analyses. What follows is a discussion based on their work which explains the assumptions involved in the analysis of data with missing cases. This discussion further includes a rationale for the treatment of missing data in the context of the research presented here.

Consider a simple case where the outcome measure (Y) is a continuous variable representing smoking attitudes and there is an independent categorical variable (X) say,

locality (e.g., community) which is recorded for every case (i.e., not subject to nonresponse). Given that X is categorical and Y is continuous, the data have a one-way analysis of variance structure, with values of Y missing within cells defined by values of X. Data with this pattern can be classified according to whether the probability of response (1) is independent of X and Y, (2) depends on X but not on Y, or (3) depends on Y and possibly X as well.

If the probability of response is independent of X and Y, that is, a score on the attitude measure is equally available from all communities and for the range of values on our measure, then we can say that the missing responses are missing at random (MAR) and the observed data are observed at random (OAR). Put more simply by Rubin's (1976) terminology, the data in case (1) can be considered to be missing completely at random (MCAR). Rubin and Little (1987) label the missingness scenario in case (2) missing at random (MAR). In this case, explain the authors, "the observed values of Y are not necessarily a random subsample of the sampled values, but they are a random sample of the sampled values within subclasses defined by values of X (p 14)." The MAR scenario applied to our example would mean that observed attitude scores are randomly distributed within each community but not necessarily between each community thus making the missing data mechanism dependent on X. For case (3) the data are neither MCAR nor MAR. Again to invoke the example, if the probability that an attitude score is recorded varies according to the magnitude of the score within each community, then the data are neither missing randomly nor observed randomly. It is the mechanism responsible for the third case that is nonignorable for likelihood-based inferences.

If we confine our analyses to *complete cases* (all variables are present) or *available cases* (the variable of interest is present) we need to be concerned whether the selection of

complete cases leads to biases in sample estimates unless the argument can be made that the data are MCAR. Under MCAR, the completely recorded or available cases are, in effect, a random subsample of the original cases and discarding them will not bias estimates. There are methods, however, for filling in (imputing) missing data which are particularly appropriate under conditions where the MCAR assumption is weak. These techniques are described in Little and Rubin (1987) and are summarized below.

The simplest form of imputation is the estimation of missing values from the mean of the recorded values. Known as *mean imputation* this method generally underestimates the true variance in the missing variable unless the means are formed within cells similar to those formed for weighting procedures. There are serious limitations to the mean imputation approach including the problem of reduced variance and the related problem of the distortion of the empirical distribution. *Hot deck imputation* involves the selection of an imputed value from the empirical distribution formed by the observed values (rather than the mean of that distribution as in mean imputation). This technique does not distort the empirical distribution of the observed values the way mean imputation does. *Cold deck imputation* substitutes a missing value of an item by a constant value from an outside source such as a previously completed survey. *Regression imputation* is a modeling procedure where missing values are replaced by predicted values from a regression of the missing items on items observed. There are instances when the ideas from the above techniques are combined into composite methods. Little and Rubin (1987) provide the example where hot deck and regression imputation can be combined by calculating predicted means from a regression but then adding a residual randomly chosen from the empirical residuals to the predicted value.

The main outcome analysis in COMMIT did make use of imputation methods (COMMIT Research Group, 1995a). Recall that the endpoint cohort was selected to assess the difference in quit rates between intervention and comparison communities for heavy and light-to-moderate smokers. Quit rates of intervention and comparison communities were compared first under the MCAR assumption and then under the MAR assumption. The MCAR analysis omitted those with missing data in 1993 but the MAR analysis allocated individuals separately within each community into 16 strata based on factors related to the final smoking outcome. Within each stratum, the quit rate for those not missing at final follow-up was used as the imputed probability of quitting for those with missing data The authors suggested that the best estimates of cohort quit rates were based on the within-stratum imputation under MAR even though the results under MCAR and MAR proved quite similar. The mean heavy smoker quit rates observed under MCAR were 18.5% and 19.0% for intervention and comparison communities, respectively, (P1 = . 63; 90% CI = -3.0%, 2 1%).[2, 3] For the light-to-moderate cohort the corresponding quit rates were 30.9% and 28.0% - a statistically significant difference of 2 9% (P1 = .004; 90% CI = 1 5%, 4.5%) Under MAR, the mean heavy smoker quit rates were 18.0% (intervention) and 18.7% (comparison) - again a nonsignificant difference for the heavy smokers. The quit rates for light-to-moderate smokers using imputation were 30.6% and 27.5% showing again a

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2 Throughout the text. probabilities associated with two-tailed tests are indicated by 2P. Those of left-sided and right-sided one-tailed tests are indicated by 1P and P1. respectively.

3 Note that the 90% confidence intervals (Cis) reported correspond to one-sided tests at the P = .05 level

significant difference in favour of the intervention communities for this group (P1 = .004, 90% CI = 1 4%, 4.7%)

The cohort data used in this thesis, as previously mentioned, are from the evaluation survey. The analyses here (Chapters Four, Five, and Six) make the assumption that the data are missing completely at random. It is fully recognized that this can be an overly strong assumption but justification can be made on several grounds including: computational ease, benefits gained from the stratified sampling approach at the data collection stage, an investigation of differential missingness between intervention and comparison communities and imputation results from the endpoint cohort Each of these is considered in turn.

Statistical software packages are generally not designed to handle the imputation of missing cases. Imputation for attitude scores on multi-item indices (Chapter Four) is further complicated by the fact that there are two ways for nonresponse to occur: (1) loss due to follow-up; and (2) missing responses to one or more items within an index score which results in a missing value on the index even if the respondent answered some or even most of the questions. With regards to loss due to follow-up, it is difficult to know the mechanism leading to the patterns of missing and observed data for smoking attitudes and therefore difficult to know what response to choose. If, for example, nonresponse is related to smoking attitudes then the mechanism leading to missing data in subsequent survey contacts should not be ignored. It will be seen in subsequent chapters that heavy smokers, light-to-moderate smokers, recent quitters and never smokers score very differently on the attitude measures described in Chapter Four and, because of the stratified sampling design of the evaluation survey, approximately equal numbers of these groups were contacted and subsequently

remained in the cohort. Furthermore, approximately equal numbers of each group remained in both intervention and comparison communities (see Chapter Five). Thus even if the missing data mechanism is related to unobserved attitude scores, the sampling design compensates for the likely range of attitude scores by the stratification based on smoking status and these groups were retained in final contact.

Tests to demonstrate whether the missing values in the intervention communities were similar to the missing values from the comparison communities were carried out The approach here was to run tests of association on contingency tables containing counts of missing responses on the main attitude measures between the treatment condition and baseline smoking status and between treatment condition and education level There were no significant differences between intervention and comparison communities in attrition rates overall ($2P = .30$ and .66, for SPHP and NVS indices in 1993, respectively) or by smoking group ($2P = .67$ and .56, for SPHP and NVS indicies in 1993, respectively). There was similarly no association between intervention condition and education level for the missing cases on NVS in 1993 ($2P = .11$). A significant association between education level and intervention condition for missing cases on the SPHP index ($2P = .05$) (Table 3.5) was, however, detected. More cases were missing from the comparison communities and this was related to education level. While this finding does not indicate an abandonment of the complete case approach and MCAR assumption, results in subsequent chapters should be interpreted with some caution.

Finally, the finding from COMMIT's endpoint cohort (COMMIT Research Group, 1995a) that results for quit rates using imputation for nonresponse (MAR) and observed cases

only (MCAR) were virtually identical provides further justification for the decision to proceed with available cases here The evidence of diminishing returns from the imputation exercise for the endpoint cohort, together with the reasoning presented above provides sufficient justification for the choice of the MCAR analyses in this thesis.

3.7 Testing for Differences in Outcomes Between Intervention and Comparison Communities

Answers to questions about the difference between intervention and comparison communities on key outcomes such as quit rates, prevalence changes and attitude changes required the use of statistical techniques well-suited to COMMIT's randomized experimental design In both the cohort and prevalence outcome analyses (COMMIT Research Group, 1995a,b), significance testing was done using nonparametric permutation tests (see Good, 1994, Edgington, 1987). It follows that in the analysis of attitude change the same testing methods were used. Given that the reader might be unfamiliar with the concept of a permutation test, an explanation and brief hypothetical example (adapted from Good, 1994), are given below.

When an experiment is analyzed with a parametric test, say Student's *t*, one compares the observed value of the test statistic with the values in a table of its theoretical distribution. The same experiment analyzed by a permutation test would compare the observed value of the test statistic with the set of what-if values acquired by rearranging and relabeling the data. The test statistic must be calculated for each possible what-if scenario which can create an immensely computationally tedious exercise. Good (1994) notes that although the concept

of a permutation test was introduced by Fisher and Pitman in the 1930s, computing limitations hampered widespread application of permutation tests

Consider an example of attitude scores on fictional indices for 6 communities - 3 assigned to treatment conditions and 3 assigned to comparison conditions (Table 3.6). The a priori hypothesis for this experiment is that exposure to media messages in the treatment communities will result in significantly lower attitude scores for that group. The first row in the table represents the observed mean community attitude scores by intervention condition. At the end of the experiment we note that the intervention group scored 1, 2, 3 on the indices and the comparison group scored 4, 5, 6. Thus the mean score for the intervention communities was 2 and for comparison communities 5 - a difference of 3. This mean difference value serves as the test statistic. We now permute the observations until all 20 distinct rearrangements have been considered. The mean difference between groups for the original observations, 3, is never equaled or exceeded in the subsequent random permutations. The observed difference of 3 in this contrived example is a rare event - it occurs one in twenty times. The decision in the example then is to reject the null hypothesis at the one-tail five percent (one in twenty) significance level and conclude that the treatment was a smashing success

Good (1994) makes the point that the key analytic advantage of a permutation test in the case where subjects have been randomly assigned to treatment or control conditions is that experiments are then analyzed in the manner in which they were designed. The results are determined by the specific set of subjects unique to the experiment and it is therefore unnecessary to rely on a theoretical sampling distribution. The permutation approach is

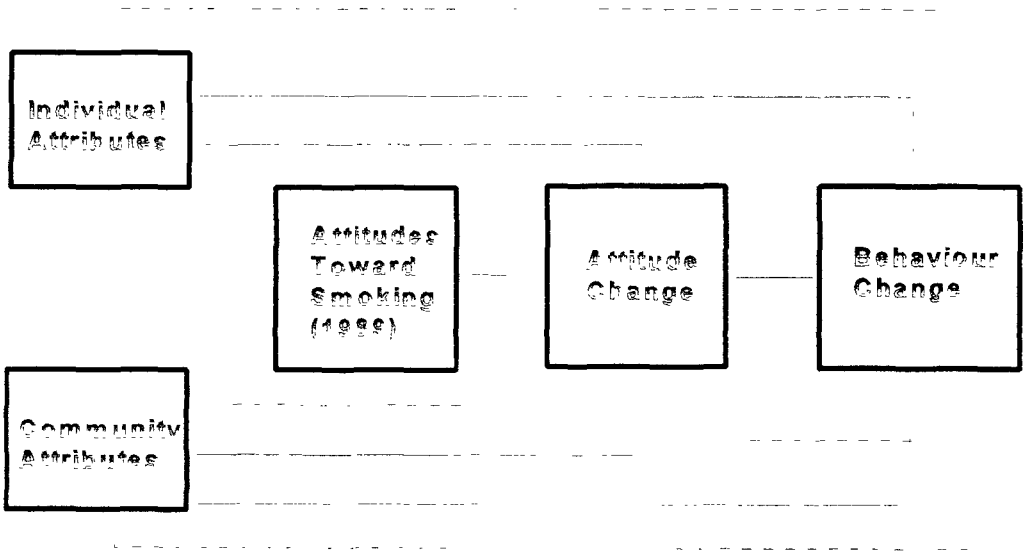
further advantageous in that it does not rely on numerous assumptions. In the above example, the data could have been derived from a normal distribution or from another; the only important consideration is that the population distribution for both treatment and control samples is the same.

3.8 Summary

This chapter began with the presentation of a conceptual model designed to make explicit the connections between individual and community attributes, attitudes towards smoking, attitude change and behaviour change as they are discussed in this thesis. The connections identified in the model provide the blueprint for the analyses performed in the four empirical chapters that follow. Development of the attitude measures is the first of these in Chapter Four followed by a study of attitude change in COMMIT in Chapter Five. Chapter Six explores the individual covariates of attitude change as well as the complicated connection between attitude change and behaviour change. The final chapter takes a closer look at the community attributes aspect of the conceptual model with case studies focusing on the connections between the community social environment and attitudes towards smoking.

This chapter also provided a general overview of the design of the COMMIT trial and presented more detailed information about the data sources and techniques used in this thesis COMMIT was a community-based, multi-channel four year intervention aimed at the reduction of cigarette smoking with a particular emphasis on heavy smoking. Because evaluation was a major component of COMMIT there are rich data sources available that provide a unique opportunity to investigate important public health and social science-based

research questions The principal questions to be addressed in this thesis, as outlined in Chapter One, relate to attitudes towards cigarette smoking. Smoking attitude data collected for COMMIT come from longitudinal and cross-sectional sources and both are used in the research here. Longitudinal approaches necessitate that researchers consider the possible bias introduced through loss-due-to-follow-up. In this chapter the case was made for analyses using only available cases thereby making the assumption that data are missing completely at random. The defense of the missing completely at random assumption was made largely on the grounds that the missing data mechanism was the same for both intervention and comparison communities. The chapter concluded with a discussion and hypothetical example of the concept of permutation testing for differences between intervention and comparison communities.



——— Direct Effects

--------- Feedback Effects

Figure 3.1 Conceptual Model of Links Between Individual/Community Attributes and Attitude/Behaviour Change

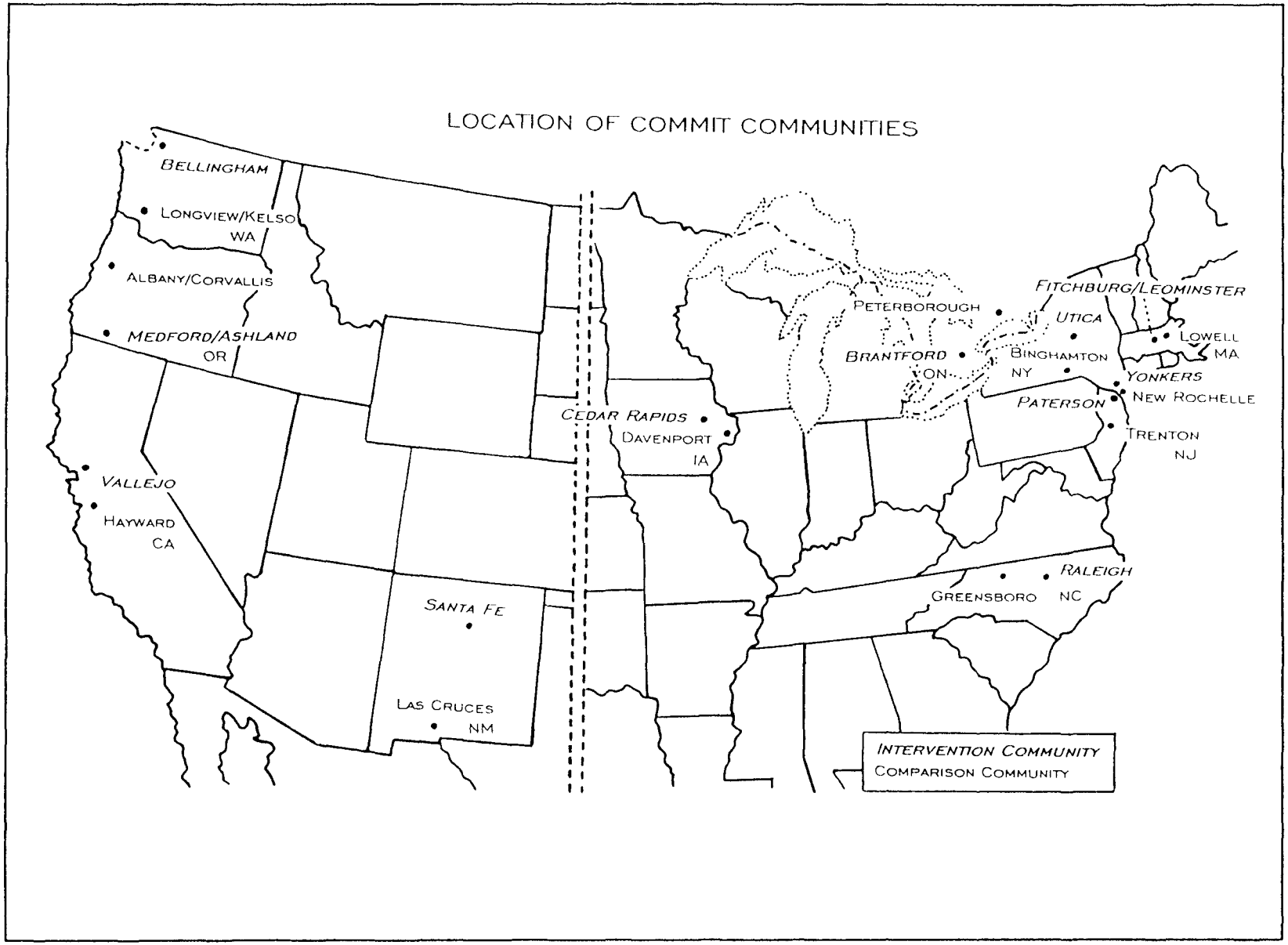


Figure 3.2 Map of COMMIT Communities

Table 3.1 Research Centres and the 11 Community Pairs Participating in COMMIT

Research Centres	Community Pairs*	Population Size	Smoking Prevalence**(%)
American Health Foundation New York, New York	Yonkers	63,278	29.4
	New Rochelle	57,493	28.9
Fred Hutchinson Cancer Center, Seattle, Washington	Bellingham	65,632	23 9
	Longview/Kelso	60,424	28.5
Kaiser Foundation Research Institute Oakland, California	Vallejo	89,046	28.7
	Hayward	121,134	28.0
Lovelace Medical Foundation Albuquerque, New Mexico	Santa Fe	57,572	23.2
	Las Cruces	53,757	22 6
New Jersey Univ. of Medicine and Dentistry Newark, New Jersey	Paterson	138,317	31.3
	Trenton	91,726	34.7
Oregon Research Institute Eugene, Oregon	Medford/Ashland	58,929	24 5
	Albany/Corvallis	73,452	23.1
Research Triangle Institute Research Triangle, North Carolina	Raleigh	163,036	24 9
	Greensboro	166,824	29 3
Roswell Park Cancer Institute Buffalo, New York	Utica	85,490	32.4
	Binghamton/Johnson	76,418	31 4
University of Iowa Iowa City, Iowa	Cedar Rapids	144,835	29.1
	Davenport	136,408	26.8
University of Mass Medical School Worcester, Massachusetts	Fitchburg/Leominster	75,805	31.2
	Lowell	92,418	33 7
University of Waterloo and McMaster University Ontario	Brantford	86,985	35.2
	Peterborough	84,800	33.7

* Shading indicates intervention communities

** Smoking prevalence estimates are based on the baseline survey of adult smokers between the ages of 25-64 years conducted in 1988

Source: Mattson et al., 1990-1991

Table 3.2 Key Channel-Specific Activities

Public Education
Provide media advocacy training for community board members
Implement kick-off event
Publicize smoking control plans
Design and implement community-wide events (e.g., quit contests; Weedless Wednesday)
Publicize activities in other task force areas
Health Care Providers
Train physicians and dentists as trainers of peers in cessation techniques
Provide basic and comprehensive training for physicians/dentists in smoking cessation techniques
Provide office consultation for motivating and training office staff to support cessation activities
Promote smokers' network (mailing list)
Promote smoke-free policies in health care facilities
Worksites
Offer presentations and on-site consultations to promote smoke-free policies in worksites
Hold annual smoking policy workshops
Offer promotional activities accompanying community-wide events
Promote worksite stop-smoking incentives
Provide self-help materials
Promote smokers' network (mailing list)
Cessation Resources
Develop and maintain a cessation resources guide
Recruit heavy smokers into a smokers' network (mailing list) through community events
Prepare and distribute a semiannual newsletter to smokers' network members

Source: COMMIT Research Group, 1995a

Table 3.3 Features of Major COMMIT Surveys

Survey	Objectives	Data Collection Strategy	Year(s)	Sample Size	Content of Survey
Baseline	- estimate prevalence - identify smoker cohorts	- centrally conducted telephone survey	1988	- 6000 household per community	- smoking history -smoking status of household members - demographics - cohort tracking information
Endpoint Cohort	- estimate cessation rate in heavy and light-to-moderate cohorts - measure exposure to smoking control activities (1993 only)	- centrally conducted telephone survey	1989-1993 (annually)	- 400 heavy smokers in each community - 400 light-to-moderate smokers in each community	- current cigarette smoking status
Evaluation Cohort	- measure attitudes about smoking - measure exposure to smoking control activities	- centrally conducted telephone survey	1989 1991 1993	from each of 22 communities: - 100 heavy smokers -100 light-to-moderate smokers - 100 recent quitters - 100 nonsmokers	- knowledge of dangers of smoking - beliefs about benefits of stopping - attitudes about restricting smoking - exposure to smoking control activities
Final Prevalence	- estimate smoking prevalence - measure attitudes about smoking	- centrally conducted telephone survey	1993	- 1500 households per community	- smoking status of household members - attitudes about smoking - demographics - exposure to smoking control activities

adapted from Mattson et al., 1990-1991.

Table 3.4 Main Topics Assessed in the Evaluation Cohort Survey

1. Current Smoking Status

- cigarette smoking status
- use of other forms of tobacco
- reported cessation in the past year
- among current smokers: amount smoked daily and type of cigarettes usually smoked (e.g., filtered vs. unfiltered)

2. Beliefs About Cigarette Smoking

- dangers associated with active smoking
- dangers associated with environmental smoke exposure
- among current smokers: perceived likelihood of experiencing health problems associated with smoking; perceived benefits gained by stopping smoking

3. Attitudes About Cigarette Smoking

- smoking as a public health problem
- restrictions of smoking in public places
- restrictions on selling tobacco to minors
- restrictions on advertising tobacco products

4. Social Norms Concerning Smoking

- usual response to smoking in public places (e.g., ask to be seated in smoking or nonsmoking section of restaurants)
- rules about smoking at home and in car

5. Awareness of and Participation in Smoking Control Activities

- Awareness of:	- local stop smoking programs - hotline to call for help in quitting - Great American Smokeout (National Nonsmoking Day in Canada) - information on smoking in the media - worksite smoking policies
- Participation in:	- stop smoking programs - hotline for cessation information - Great American Smokeout (National Nonsmoking Day in Canada) - worksite stop smoking programs
- Among current smokers:	-advice received from doctor or dentist to encourage cessation

6. Demographic and Cohort Tracking Information

Source: Mattson et al., 1990-1991

Table 3.5 Relationship Between Intervention Condition and Education Level for Missing Cases on SPHP in 1993 (observed and *expected* counts shown)

	Intervention	**Comparison**	**Row Total**
Less than high school	64 *(72.7)*	87 *(78.3)*	151 (19.0%)
High school graduate	73 *(81.3)*	96 *(87.7)*	169 (21.2%)
At least some college	230 *(247.0)*	246 *(229.0)*	476 (59.8%)
Column Total	383 (48.1%)	413 (51.9%)	

Pearson Chi-Square 6.04, 2P = .05.

Table 3.6 Example of a Simple Permutation Test

Permutation	First Group			First Group Mean	Second Group			Second Group Mean	Mean Difference
1	1	2	3	2.00	4	5	6	5.00	3.00
2	1	2	4	2.33	3	5	6	4.67	2.33
3	1	3	4	2.67	2	5	6	4.33	1.67
4	2	3	4	3.00	1	5	6	4.00	1.00
5	1	2	5	2.67	3	4	6	4.33	1.67
6	1	3	5	3.00	2	4	6	4.00	1.00
7	1	2	6	3.00	3	4	5	4.00	1.00
8	2	3	5	3.33	1	4	6	3.67	0.33
9	1	3	6	3.33	2	4	5	3.67	0.33
10	2	3	6	3.67	1	4	5	3.33	-0.33
11	1	4	5	3.33	2	3	6	3.67	0.33
12	2	4	5	3.67	1	3	6	3.33	-0.33
13	1	4	6	3.67	2	3	5	3.33	-0.33
14	3	4	5	4.00	1	2	6	3.00	-1.00
15	2	4	6	4.00	1	3	5	3.00	-1.00
16	3	4	6	4.33	1	2	5	2.67	-1.67
17	1	5	6	4.00	2	3	4	3.00	-1.00
18	2	5	6	4.33	1	3	4	2.67	-1.67
19	3	5	6	4.67	1	2	4	2.33	-2.33
20	4	5	6	5.00	1	2	3	2.00	-3.00

adapted from Good (1994)

CHAPTER FOUR

THE DEVELOPMENT OF SCALES TO MEASURE ATTITUDES IN THE COMMIT TRIAL

4.1 Introduction

The previous chapter presented the research design of the COMMIT trial more generally and this thesis more specifically. A fundamental stage of the methodology for this research is the development of suitable measures for smoking attitudes. These scales are developed from items originally designed by the COMMIT Research Group at the initial planning stages of the trial (COMMIT Research Group, 1988). The credibility of the results that follow in subsequent chapters depends upon the reliability and validity of scales chosen to represent the intangibles of human attitudes. This chapter describes the development of indices to measure the two primary attitude constructs: beliefs about smoking as a public health problem (SPHP); and norms and values concerning smoking (NVS). Rational and factor analytic methods were used to determine the internal consistency of the indices. Tests of association between index scores and smoking status were also conducted to assess predictive validity. Before the description of the methods and results of the analyses, the next

section sets the research in the context of the literature on the measurement of attitudes towards smoking

4.2 Attitudes Towards Smoking

At the outset it is useful to clarify the meanings of the key terms *attitudes*, *beliefs* and *norms* as they are used in this thesis. *Attitudes* represent a person's summary evaluation of attitude objects (i.e., smoking (the attitude object) is good vs. bad); *beliefs* represent the characteristics that one attributes to, or associates with, attitude objects (e.g., smoking causes cancer); and *norms* represent beliefs about what one thinks others do or ought to do (e.g., don't smoke in public places).

The need for an effective way to measure attitudes and social norms derives from models of human behaviour linking attitudes and norms to behavioral outcomes. Perhaps the most widely recognized of these models, and one that has recently been applied to the study of smoking behavior (Godin et al., 1992), is Ajzen and Fishbein's (1980) theory of reasoned action. According to the theory, an individual's intention to perform (or not perform) a particular behavior is the single best determinant of that behavior. Intention, in turn, depends on both an individual's attitude toward the behavior and the individual's anticipation that important others will approve or disapprove of the behavior in question. Thus in the case of smoking, people will have strong intentions to smoke if they evaluate smoking favorably, and if they believe that others who are important to them think that they should smoke. The relative importance of the attitude and subjective norm components depends upon the intention, population and the individual in question (Sutton, 1989).

Grube and others (1986) argue that the theory should be modified to include the effects of behavioral norms, or the perceived behavior of others, as well as subjective norms. Their analysis suggests that behavioral norms are distinct from subjective norms and can contribute independently to intentions and behavior. They also indicate that there may exist interactive effects between attitude and normative beliefs. Godin and colleagues (1992) further suggest that investigators using the theory of reasoned action for smoking research should also examine the perceived control of the individual over the smoking behavior. They argue that the theory of reasoned action is most valuable when describing behaviors that are totally under volitional control.

Despite specific refinements to Ajzen and Fishbein's theory, it appears that there is general agreement that attitudes and subjective norms are important antecedents of human behavior. Pandey, Neupane and Gautam (1988) indicate that the beliefs, especially about the harmfulness and social niceties of smoking behavior, contribute to the high prevalence of smoking in Nepal (compare Nepal's prevalence of daily smokers at 73.7 percent (Pandey et al., 1988) to Canada's 29.0 percent (Pederson, 1993). The influence of beliefs and attitudes on smoking behavior is not culturally specific as shown by a Scottish study (Aitken et al., 1982). Other studies on smoking behavior have included survey items to measure specific smoking beliefs and attitudes, (e.g., Burke et al., 1992; Elder et al., 1992; Pederson et al., 1992; Dixon et al., 1991; Eiser et al., 1989; Mullen, 1987; Grube et al., 1986) however, to date no effort has been made to develop composite measures to monitor attitude change over the course of an extended community trial.

In the smoking literature, attitudes about smoking are generally operationalized as questions about beliefs in the health risks of smoking and, more recently, annoyance/tolerance of environmental tobacco smoke. It is thought that those who evaluate smoking behavior negatively do so at least in part because they have knowledge of the negative health effects of smoking and this negative evaluation contributes to the intention to not smoke. Indeed many studies, including those reviewed in the 1989 U.S. Surgeon General's Report, (USDHHS, 1989) have shown a consistent relationship between smoking status and belief in the harmfulness of smoking (Klesges et al., 1988). In a 1983 cross-sectional survey in Toronto, Pederson and her colleagues (1987) reported that for both active and passive smoking, never smokers had greater knowledge of health effects than former smokers, who, in turn, were more knowledgeable than current smokers. This population-based survey was repeated five years later and whereas no change in knowledge scores was noted, more individuals in 1988 reported that they were always bothered by smoke and that they perceived fewer of their associates as smokers (Pederson et al., 1992). The authors conclude that increasing knowledge about the harmful effects of smoking may not be as important for attitude change as are other factors such as social norms.

The social acceptability of smoking in public has declined since the first U.S. Surgeon General's Report in 1964 (USDHHS, 1989). Recent literature, reflecting this secular trend, has placed increasing emphasis on the normative component of smoking behavior In particular, studies considering predictors of adolescent smoking behavior, (e.g., vanRoosmalen and McDaniel, 1992; Eiser et al., 1989; McAlister et al., 1984; Banks et al., 1982; Pederson and Lefcoe, 1982) and smoking in the workplace, (Parker and Warner, 1989;

Sorensen et al., 1986) have stressed the influence of the social environment on an individual's smoking behavior. The instruments developed in these studies, however, are not directly applicable to the assessment of community-wide changes in attitudes in the context of an intervention trial such as COMMIT.

Indices that have previously been developed are not readily applicable to COMMIT as most were designed to assess why people smoke and, in turn, to guide cessation interventions. They were not designed to measure attitude change *per se*. Cessation-related scales such as the Situation-Specific Model, (Best and Hakistan, 1978) Self-Efficacy Scales, (Candiotte and Lichenstein, 1981) and the Inventory of Smoking Situations (Epstein and Collins, 1977) also have poor reliability (Corty, 1983). The widely-used Reasons for Smoking Scales (RFSS) have poor validity (Joffe, 1981, Shiffman and Prange, 1988) and focus only on the motivational aspects of smoking. A similar scale, McKennel's (1970) Smoking Motivation Questionnaire also addresses the question why people smoke but uses items related to the situations in which people smoke. Again, this scale has poor validity (Shiffman and Prange, 1988).

Klesges and colleagues' (1988) Smoking Attitudes Survey assesses the beliefs and health problems associated with smoking. The focus is on gathering information on the knowledge of respondents related to smoking and health. Velicer and others (1985) developed a 24-item paper and pencil measure to study the decision-making process in smoking cessation. Although encompassing items related to smoking attitudes and norms in their Pro Smoking and Con Smoking Scales, their aim was to develop adequate scales for the measurement of motivation to stop smoking.

In summary, the recent literature on attitudes towards smoking is instructive in conceptual and methodological terms for the development of attitudinal indices for COMMIT. On the other hand, no instruments exist which are directly suited to the needs in COMMIT to measure beliefs about smoking as a public health problem and norms and values concerning smoking.[4] Large scale public opinion surveys (USDHHS, 1989) have been analyzed as a series of individual items, compromising reliability. Wording changes from one survey to the next can result in large differences in item interpretation and response. It follows that the approach in COMMIT has been to develop new measures based on broad dimensions of smoking attitudes and the remainder of the chapter describes the methods and results of index construction.

4.3 Approach to Index Construction

There are two general approaches to index construction: the rational method and the factor analytic method. Both were used in this research. The first assumes that items have been selected to measure predefined constructs. Item analysis is then conducted to determine the reliability of individual items and the internal consistency of composite indices. The second method involves the use of factor analysis to define independent and unidimensional constructs from an item pool selected based on general relevance to the construct(s) of interest. The first method is usually advocated because it presumes that research is directed by theory rather than methods of analysis. The two approaches, however, are not mutually

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[4] based on computer searches of sociological abstracts (Socioline) and medical abstracts (Medline) from 1976 using the key words SMOKING, SURVEY, [ATTITUDES or NORMS.]

exclusive. Factor analysis is a very useful means of testing for construct validity among groups of items selected to measure predefined constructs. Moreover, reservations expressed about the use of factor analysis as an initial stage in index construction tend to be relaxed in the context of developing measures of attitudes where there is good reason to expect the emergence of strong factors (Nunnally, 1967).

The data used for index construction were a subset drawn from the evaluation survey. This subset consisted of respondents from each of the 11 COMMIT intervention communities in 1989. The main topics covered by the evaluation cohort survey were introduced in Chapter Three (see Table 3.4). Recall that these were current smoking status, beliefs about cigarette smoking, attitudes about cigarette smoking, social norms concerning smoking, awareness of and participation in smoking control activities and demographic and cohort tracking information.

From these topics there were 31 questions designed to measure the two constructs of primary importance for evaluating the community-wide impact of COMMIT: beliefs about smoking as a public health problem; and norms and values about smoking. Twelve questions were included related to the first construct and 19 to the second. They represented a combination of 12 used in previous studies (Gallup, 1987; National Center for Health Statistics, 1987; Centers for Disease Control, 1986; Roper, 1978) and 19 that were new questions devised for this survey. Selecting questions in this manner implies that there are no indices for this set of questions already defined in the literature. Furthermore it implies that the constructs provide an intuitive guide for index construction and that the development of

reliable and valid indices depends primarily on statistical analyses of the relationships among questions.

For each construct, questions were selected to tap specific subconstructs, five related to smoking as a public health problem and four related to norms and values concerning smoking (Table 4.1). The definition of subconstructs and the selection of the items was informed by the literature but relied to a considerable extent on an intuitive understanding of the constructs and on the face validity of the questions.

The item pool for index construction consisted of those questions answered by *both* smokers and nonsmokers (Table 4.2). This applied to all 12 questions related to beliefs about smoking as a public health problem and to 12 of the 19 questions asked about norms and values concerning smoking. The other seven questions in the second group were asked of either smokers or nonsmokers only. One question from the first group (SPHP) had several parts increasing the number of items from 12 to 20. As a result the total number of questions in the pool for index construction was 32 (20 for beliefs about smoking as a public health problem and 12 for norms and values concerning smoking). The response scales for the items varied from two to five point scales and were scored such that high values indicated a prosmoking attitude (i.e., less concern about smoking as a public health problem; and norms and values supportive of smoking).

The reliability and validity of the two attitudinal constructs were evaluated in four analytical steps. First, an item analysis was conducted to determine the internal consistency of the indices as defined a priori by the 20 and 12 items, respectively, for the two attitude constructs. Second, a factor analysis of the 32 items was conducted to determine whether the

factor structure confirmed the a priori definition of constructs and subconstructs. Third, the correlations between the a priori and factor scales were calculated as a further measure of the correspondence of the indices derived by rational and empirical methods. Fourth, tests of association between index scores and measures of smoking status were performed to determine whether the pattern of association was consistent with the expectation that smokers would report significantly stronger prosmoking attitudes.

4.4 Results

4.4.1 Item Analysis

Item analyses for the two indices were performed using only those cases for which there were no missing data: 3157 cases (1627 females, 1530 males) for the 20 items on beliefs about smoking as a public health problem (SPHP); and 2420 cases (1247 females, 1173 males) for the 12 items on norms and values concerning smoking (NVS). The number of cases for each item varied from 3307 to 3963. The items with the higher numbers of missing cases were those designed to tap norms and values concerning smoking. By deleting cases with missing data, the implicit assumption was that these cases were missing completely at random (Little and Rubin, 1987). For the purpose of index construction the validity of this assumption was not a major concern as the focus was on correlation among the items.

For the SPHP index, the summary statistics showed a mean inter-item correlation of 0.29 (min. = 0.11, max. = 0.74) and an alpha coefficient of 0.88. The corrected item-total correlations varied from 0.33 to 0.64 with a mean of 0.51. For no item did the alpha increase

when it was deleted from the index. These results indicated the strong internal consistency of the index as a whole and the substantial contribution of each item (Nunnally, 1967).

The statistics for the NVS index were not quite as strong. The mean inter-item correlation was 0.23 (min. = 0.02, max. = 0.64) and the coefficient alpha was 0.76. The corrected item-total correlations varied from 0.19 to 0.62 with a mean of 0.42. There was a marginal improvement in the alpha when the two items with the lowest item-total correlations were deleted from the index. Overall, the results showed that the index has good internal consistency and that 10 of the 12 items made strong contributions to the total score.

Split-half reliability tests were also conducted as additional checks on the internal consistency of the indices. The correlations between forms for the SPHP and NVS scales were 0.67 and 0.59, respectively, providing further evidence of the reliability of the indices.

4.4.2 Factor Analysis

Factor analysis of the 32 items was performed using principal components and an oblique rotation. The oblique solution was selected because of the observed correlation between the SPHP and NVS indices (r = 0.58).[5] Factor scores were calculated and subsequently correlated with scores on the two indices. Cases were included in the factor

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[5] A varimax rotation was also performed and produced similar results. The seven factors produced by the variance maximization rotation in order of strength of loading were: 1) Legislative control; 2) Smoking control in public places; 3) Exposure to secondhand smoke and its health implications; 4) Smoking control in health settings and confined spaces; 5) Social actions concerning smoking; 6) Beliefs regarding the harmfulness of smoking; and 7) Smoking control in school. Factor 3 had items loading from both a priori constructs.

analysis based on pairwise deletion[6] of cases with missing values. Factor scores were calculated for the 2184 cases (44.3 percent of respondents) with complete information on all 32 items.

The factor structure contained seven factors (eigenvalue > 1.0) accounting for 55.0 percent of the variance (Table 4.3). The first two factors accounted for 28.0 and 6.8 percent of the variance, respectively. The grouping of items by factor loading (> 0.30) showed the separation of the SPHP and NVS items. The SPHP items uniquely identified factors 1, 3, 4, and 7, whereas the NVS items were uniquely associated with factors 2 and 5. The exception was factor 6 which had items loading from both a priori constructs. In this case, however, the two SPHP items referring to smokers' and nonsmokers' rights have the weakest factor loadings while the four NVS items have the strongest. The factors were labeled according to the commonality of the highest loading items and, excepting factors 6 and 7, corresponded with the subconstructs previously listed (Table 4 1). In general, the results of the factor analysis confirm the factorial validity of the two indices based on their identification with the first two factors and the overall separation of the SPHP and NVS items in the pattern of the factor loadings.

4.4.3 Correlation of Index Scores and Factor Scores

The relationships between the two indices and the factors were assessed directly by correlation analysis (Table 4.4). The results confirmed the relationships implied by the item loadings. The SPHP index was most strongly correlated with factors 3, 4 and 1, and the NVS

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[6] Correlation coefficients were computed using cases with complete data on the pair of variables correlated, regardless of whether the cases had missing values on other variables in the index.

index with factors 2 and 5. The pattern of the correlations provided further evidence of the validity of the indices and of the constructs and subconstructs they were intended to measure.

The pattern of the correlations of the subconstructs nested within the two main a priori constructs was informative. For smoking as a public health problem, the high correlation (0.82) with factor 3 showed the prominence of legislative control as a primary subconstruct. The correlations with factors 4 (0.65) and factor 1 (0.63) suggested that smoking control in special settings (e.g., health care environments, schools, flights) and in public places (e.g., government worksites, restaurants) were also important SPHP subconstructs that, while empirically linked, retain factor distinctiveness. For norms and values concerning smoking, the strongest correlation was with factor 2 (0.77) showing the importance of beliefs regarding the harmfulness of smoking as a normative subconstruct. The other strong correlation was with factor 5 (-0.71) indicating, as anticipated, that social actions concerning smoking (e.g., allowing others to smoke in your home or car) was a dominant subconstruct within the norms and values index.

As for the correlations between factors, factor 1 (smoking control in public places) showed relatively strong correlations with factors 3, 4 and 5. These latter three factors (smoking control in special settings, legislative control and social actions) contained an implicit reference to the social control of tobacco smoke and it was therefore reasonable to expect measurable relationships between these factors. The correlation between factor 1 and factor 5 (-0.39), two factors loading on different indices, indicated some conceptual overlap between the two a priori constructs. The low correlation (0.09) between the strongest subconstruct of the SPHP index (factor 1 - smoking control in public places) and the

strongest subconstruct of the NVS index (factor 2 - beliefs regarding the harmfulness of smoking) showed the clear empirical distinctiveness of these two main subconstructs.

4.4.3 Relationship Between Index Scores and Smoking Status

The relationship between smoking status and index scores (Table 4.5) confirmed that smokers, as predicted, report attitudes that were more prosmoking than nonsmokers. The results matched the general relationships found in previous studies which showed expected differences between smokers and nonsmokers on health beliefs about smoking (Tipton and Riebsame, 1987; Dawley et al., 1985) and attitudes toward public smoking restrictions (Green and Gerken, 1989). The differences in group means between current smokers and non-smokers were significant for both indices ($\alpha = 0.05$). Differences were also significant for other measures of smoking status (i.e., ever having smoked more than 100 cigarettes; having quit smoking in the last six years). Further evidence of the relationship between smoking status and attitudes about smoking was provided by the positive correlations between the number of cigarettes smoked on an average weekday/weekend and favorable attitudes towards smoking as measured by both the SPHP and NVS indices. Smokers and nonsmokers[7] were also compared on the seven individual factors (Table 4.6). In all cases smokers and nonsmokers showed statistically significant differences in factor scores. The differences were in the expected direction, based on the sign of the dominant factor loadings, indicating that smokers and nonsmokers also displayed the anticipated prosmoking/nonsmoking sentiments on the attitudinal and normative subconstructs.

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[7] Smoking status measured by the question "Do you smoke now?"

4.5 Discussion

The goals of the COMMIT study included increasing the priority of smoking cessation as a public health issue and increasing societal norms and values that support nonsmoking Achievement of these goals is assessed by monitoring changes in public attitudes towards smoking between the baseline and the endpoint of the trial in the eleven pairs of intervention and comparison communities. In the absence of existing indices of attitudes towards smoking suited to the evaluation of attitude change in the COMMIT study, two new indices were developed to measure beliefs about smoking as a public health problem and norms and values concerning smoking.

The results of this analysis, based on a large and geographically diverse sample, confirmed the reliability and construct validity of the two indices. The item analyses showed strong internal consistency based on the inter-item correlations and alpha coefficients The reliability of individual items was further supported by the strength of the item-total correlations. Factor analysis of the items demonstrated the empirical reproducibility of the indices and this was confirmed by the correlations between index scores and factor scores. The predictive validity of the indices was supported by both the relationships between index scores and smoking status, and factor scores and smoking status, which showed, as predicted, that smokers reported more prosmoking sentiments than did nonsmokers.

This study was an important step in the evaluation of a major community trial designed to encourage smoking cessation. The two indices described here are used in subsequent chapters to: 1) measure the extent to which COMMIT was successful in

promoting smoking as a public health problem and influencing societal norms that support nonsmoking (Chapter Five); 2) determine covariates of attitude change (Chapter Six); 3) explore the nature of relationships between attitude change and behaviour change (Chapter Six); and, 3) examine spatial variation in attitudes towards smoking at the outset of the trial (Chapter Seven).

The SPHP and NVS scales could prove useful to other researchers interested in measuring smoking attitudes for the purposes of evaluating readiness for acceptance of tobacco control legislation or readiness for behavior change in community populations. The measures are also appropriate for other types of interventions where smoking is a key risk factor (e.g., heart health initiatives) and for the monitoring of secular trends in smoking attitudes and norms.

Table 4.1 A Priori Attitude Constructs And Subconstructs

CONSTRUCT/Subconstruct	Number of Questions
SMOKING AS A PUBLIC HEALTH PROBLEM (SPHP)	12
smoker vs. nonsmoker rights	2
control over sales	4
control over advertising	2
restrict where smoking is allowed	3
seriousness of smoking	1
NORMS AND VALUES CONCERNING SMOKING (NVS)	19
nonsmokers' social actions	5
smokers' social actions	2
general beliefs re: harmfulness	9
personal beliefs re: harmfulness	3
TOTAL	31

Table 4.2 Questions Used For Index Construction

INDEX/Question	RESPONSE SCALE	SCORE
INDEX - SMOKING AS A PUBLIC HEALTH PROBLEM		
SPHP1 A non-smoker who wants smoke-free air should have priority over a smoker who wants to smoke.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
SPHP2 Smokers should have the right to smoke wherever they want.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	4 3 2 1
SPHP3 A law should be passed against the sale of all cigarettes.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
SPHP4 The sale of tobacco products should be as strictly controlled as alcohol products [a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
SPHP5 All tobacco advertising should be elimmated [c]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
SPHP6 Tobacco companies should not be allowed to sponsor sporting and cultural events.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
SPHP7 Cigarette vending machines should be eliminated from places where teenagers gather.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
SPHP8 Merchants who sell tobacco to those under age should be fined.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
SPHP9 Teachers and staff in elementary through high schools should not be allowed to smoke anywhere on school grounds [a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
SPHP10 Smoking by anyone should be prohibited on school grounds at all times, including meetings and sporting events [c]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4

SPHP11 Concerning smoking in the following places, do you think that smoking should be allowed without restriction, should be permitted only in designated areas or not be allowed at all in: a. Restaurants, b. Hospitals, c. Government Buildings, d. Private Worksites, e. Bars & Cocktail Lounges, f. Bowling Alleys, g. Doctor's Offices, h. Indoor Sporting Events, i. Flights > 2 hours.[d]	Allowed without restriction Permitted only in designed areas Not allowed at all	3 2 1
SPHP12 There are many health problems facing communities these days. How serious a health problem do you feel smoking is in your community?[a]	5-point scale where 1 is very serious and 5 is not serious at all	5 4 3 2 1
INDEX - NORMS AND VALUES CONCERNING SMOKING		
NVS1 When you are given a choice do you usually ask to be seated in the smoking or non-smoking section of restaurants and other public places?[c]	Smoking Non-Smoking Doesn't Matter	3 1 2
NVS2 In general, do you allow others to smoke in your home?[a]	Yes No	2 1
NVS3 In general, do you allow others to smoke in your car?[a]	Yes No	2 1
NVS4 The smoke from someone else's cigarette is harmful to a nonsmoker.[c]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
NVS5 Inhaling smoke from someone else's cigarette causes lung cancer in a non-smoker.[e]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
NVS6 Moderate use of cigarettes is less harmful than moderate use of alcoholic beverages.[c]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	4 3 2 1
NVS7 Air pollution is a greater health risk than cigarettes.[c]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	4 3 2 1
NVS8 Smoking cigarettes is less harmful than being 20 pounds overweight.[c]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	4 3 2 1
NVS9 This year far more people will die as a result of cigarette smoking than from cocaine.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	1 2 3 4
NVS10 Smoking low-tar cigarettes is safer than smoking high-tar cigarettes.[d]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	4 3 2 1

NVS11 If a person has smoked for more than 20 years, there is little health benefit to quitting.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	4 3 2 1
NVS12 The evidence that tobacco smoke is dangerous to the health of a non-smoker is exaggerated.[a]	Strongly Agree Somewhat Agree Somewhat Disagree Strongly Disagree	4 3 2 1

Source of survey items.

[a] New question.

[b] Gallup (1987).

[c] Centers for Disease Control (1986)

[d] Roper Organization (1978)

[e] National Center for Health Statistics (1987).

Table 4.3 Factor Analysis: Item Loadings On Rotated Factors

FACTORS AND ITEMS	FACTOR LOADING
FACTOR 1 - Smoking Control in Public Places	
SPHP11e Should smoking be allowed in bars and cocktail lounges?	.79
SPHP11f Should smoking be allowed in bowling alleys?	.78
SPHP11d Should smoking be allowed in private worksites?	.68
SPHP11c Should smoking be allowed in government buildings?	.57
SPHP11a Should smoking be allowed in restaurants?	.51
FACTOR 2 - Beliefs Regarding the Harmfulness of Smoking	
NVS6 Use of cigs. less harmful than alcohol	.71
NVS8 Use of cigs. less harmful than being overweight	.70
NVS11 Little health benefit to quitting, if smoked for > 20 yr	.55
NVS7 Air pollution is a greater risk than cigarettes	.47
NVS12 Health risks of secondhand smoke are exaggerated	.38
FACTOR 3 - Legislative Control	
SPHP5 Eliminate tobacco ads.	.77
SPHP6 Disallow sponsorship of events by tobacco companies	.74
SPHP3 A law to stop sale of cigs.	.68
SPHP4 Stricter control on sale of tobacco products	.43
SPHP12 Seriousness of smoking as health problem in community	.39
SPHP9 Ban smoking on school grounds by teachers and staff	.35
FACTOR 4 - Smoking Control in Special Settings	
SPHP11g Should smoking be allowed in doctor's office?	.83
SPHP11h Should smoking be allowed in indoor sporting events?	.73
SPHP11b Should smoking be allowed in hospitals?	.62
SPHP11i Should smoking be allowed on flights > 2 h	.44
SPHP10 Ban all smoking on school grounds	.40
FACTOR 5 - Social Actions Concerning Smoking	
NVS3 Allow others to smoke in car	-.82
NVS2 Allow others to smoke in home	-.79
NVS1 Preferred seating in restaurants	-.71
FACTOR 6 - Risks of Secondhand Smoke	
NVS10 Low tar cigarettes are safer	.60
NVS4 Secondhand smoke is harmful	-.45
NVS5 Secondhand smoke causes lung cancer	-.43
NVS9 More deaths from smoking than cocaine	-.39
SPHP1 Nonsmokers' rights to free air	-.36
SPHP2 Smokers' rights to smoke	-.33
FACTOR 7 - Youth Tobacco Access	
SPHP8 Fine merchants who sell tobacco to minors	.79
SPHP7 Eliminate cigarette. vending machines where teenagers gather	.60

Table 4.4 Correlation Of Index Scores And Factor Scores

INDEX/ factor	**SPHP**	**NVS**	1	2	3	4	5	6	7
SPHP	-	.58	.63	.18	.82	.65	-.58	-.16	.46
NVS		-	.36	.77	.47	.35	-.71	-.34	.11
1			-	.09	.34	.32	-.39	-.06	-.12
2				-	.14	.12	-.21	-.16	.00
3					-	.34	- 39	-.10	.24
4						-	-.34	-.06	.15
5							-	.12	-.12
6								-	-.01
7									-

Table 4.5 Relationship Between Measures Of Smoking Status And Index Scores

SMOKING STATUS		SPHP				NVS			
		n	Mean	SD	*t* Value	n	Mean	SD	*t* Value
Smoke now?	yes	1406	43.82	9.20	22.54 (P1<.001)	1088	27.47	5.50	31.22 (P1<.001)
	no	1751	36.48	8.98		1332	20.84	4.78	
Ever smoked > 100 cigarettes?	yes	2518	41.00	9.79	16.46 (P1<.001)	1944	24.81	6.06	21.02 (P1<.001)
	no	639	34.84	8.07		476	19.79	4.25	
Quit smoking last six years?	yes	624	37.46	9.13	3.51 (P1<.001)	506	21.25	4.94	2.03 (P1=.022)
	no	296	35.23	8.91		203	20.49	4.36	
			Pearson Correlation Coefficient				Pearson Correlation Coefficient		
Number smoked on average weekday		1386	.22 (P1<.001)			1071	.14 (P1<.001)		
Number smoked on average weekend		1379	.26 (P1<.001)			1067	.16 (P1<.001)		

Table 4.6 Relationship Between Current Smoking Status And Individual Factor Scores

FACTOR	CURRENT SMOKERS n = 970		CURRENT NON-SMOKERS n = 1214		*t* STATISTIC
	Mean	SD	Mean	SD	
1	.30	.88	-.23	.99	13.29 (P1<.001)
2	.19	1.02	-.25	.93	10.47 (P1<.001)
3	.22	.98	- 25	.93	11.44 (P1<.001)
4	.24	1.00	-.23	.89	11.43 (P1<.001)
5	-.70	.65	.59	.82	-41.26 (P1<.001)
6	-.13	1.08	14	.90	-6.26 (P1<.001)
7	.05	1.06	- 03	.90	1.94 (P1=.026)

P1 indicates one-sided test.

CHAPTER FIVE

ATTITUDE CHANGE IN COMMIT

5.1 Introduction

An important assumption underlying the COMMIT intervention was that attitudes and beliefs about smoking held by community members are important determinants of community-wide changes in smoking behaviour. An intermediate goal of the trial was to change the normative environment in which smoking occurs and, to this end, changing community beliefs and attitudes regarding smoking was a central objective. The previous chapter reported the results of a scale development exercise to determine the reliability and validity of the attitude measures to be used in this and subsequent chapters. It is the purpose of this chapter to report on the extent to which the COMMIT intervention activities resulted in measurable attitude change and addresses the second primary objective of the thesis.

5.2 Attitudes Towards Smoking in North America

A review of the major U.S. population-based opinion surveys conducted between 1964 and 1987 concluded that the social acceptability of smoking is declining (USDHHS, 1989). A majority of the U.S. public favours policies restricting smoking in public places,

work sites, prohibiting the sale of cigarettes to minors and increasing cigarette taxation (USDHHS, 1989). Between 1983 and 1988, Pederson et al. (1992) reported marked changes in the attitudes of Torontonians toward increasing restrictions on smoking. Specifically, in 1988 there was greater support for restrictions on where cigarettes are sold, banning cigarette advertising, lower insurance rates for nonsmokers and higher cigarette taxes as an aid to quitting.

Community-level health promotion theory suggests that community networks exert great influence over individual behaviour and lifestyle (Bracht, 1990). Community-based interventions like COMMIT and others (Farquhar et al., 1985; Elder et al., 1986) try to modify the social environment to discourage high risk behaviours. Gaining support in the community for smoke-free workplaces and restaurants and directing media attention toward smoking issues are examples of social-environmental transformations thought to be necessary for behaviour change. Smoking cessation, then, is best promoted and sustained by community-wide changes in attitudes and norms about the health risks and social acceptability of smoking. If the best promise for smoking control lies in continuing the process of changing social norms as Fielding (1992) suggests, then it is necessary to evaluate both secular trends and the ability of a sustained community-based intervention like COMMIT to enhance this process. The rationale for evaluating community attitude change within a smoking cessation intervention is strengthened by findings documenting attitude changes favouring nonsmoking in smokers contemplating quitting (Fava et al., 1995).

COMMIT's success in changing attitudes and standards of acceptable behaviour was evaluated by testing two primary hypotheses: that, between 1989 and 1993, (1) the priority

of smoking as a public health problem increased more in the intervention communities than in the comparison communities; and (2) norms and values that support nonsmoking increased more in the intervention than in the comparison communities. The hypothesis tests were conducted for all subjects combined and separately by smoking status. Changes on seven empirically-derived attitudinal subconstructs were also examined to achieve a more detailed understanding of specific components of change in smoking attitudes in the COMMIT communities

5.3 Methods

The general design and intervention of COMMIT have been described in Chapter Three. Recall that the COMMIT study incorporated both cohort and cross-sectional designs. In the case of attitude measurement, cohorts of smokers and non-smokers identified in the 1988 baseline survey were resurveyed in 1989, 1991 and 1993 to determine their attitudes towards smoking before, during and after the intervention. In addition, a sub-set of respondents to the 1993 final prevalence survey were asked the same attitude questions As a result, two approaches to examining community level changes in attitudes were possible. the cohort approach involving the comparison of attitudes across the three points in time; and the cross-sectional approach comparing the 1989 cohort survey data with the 1993 final prevalence survey. The inherent advantages of the cohort approach are that the data come from the same respondents through time who are known to have lived in the communities throughout the period of the intervention. The disadvantage is that the cohort is subject to attrition which may limit the validity of the data for determining community level estimates

of attitudes by the end of the trial. Another disadvantage is that the baseline (1988) smoking status of cohort members in intervention and comparison communities may have changed differentially during the trial so that inferences about attitude changes by smoking group could be misleading. The advantage of the cross-sectional data is that they do provide valid estimates of community attitudes pre- and post-intervention, but have the disadvantage that migration patterns may have a differential effect in the paired communities and so may distort the effects of the trial.

In this chapter, the cross-sectional data are the primary focus for assessing community level attitude changes associated with the COMMIT intervention. The justification for this focus is the substantial attrition in the cohort (29 percent of cases were lost between 1989 and 1993)[8] and the major limitation this imposes on estimating community attitudes at the end of the trial in 1993 using the cohort data. The strength of the cohort data lies in the basis they provide for examining within-person changes in attitudes through the course of the trial, the covariates of those changes, and their relationship to changes in smoking behaviour. These analyses are reported in the next chapter

5.3.1 1989 and 1993 Attitude Data

Community attitudes at the beginning of the trial were estimated from the 1989 evaluation cohort survey which was described previously (see section 3.2.3). To create community attitude estimates from the cohort interviews, the data were weighted to adjust

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[8] This 29 percent is based on 8204 individuals answering up to question 2.1 in 1989 and 5806 answering up to question 2.1 in 1993. There were 5450 individuals (66 percent) who answered up to question 2.1 in *both* 1989 and 1993.

for differential age- and sex-specific nonresponse rates. The total sample size for the 1989 attitude survey was 9875 comprising 4930 in the intervention communities and 4945 in the comparison communities.

The sampling methods and weighting procedures used in the final prevalence survey were reported previously (section 3.2.4). The total sample size for the 1993 attitude data was 14,117 including 7059 in the intervention communities and 7058 in the comparison communities. These data were also weighted to adjust for differential sampling fractions to provide post-intervention community estimates of attitudes for the different smoking and nonsmoking groups.

5.3.2 Measurement of Cigarette Smoking Attitudes Revisited

The results in Chapter Four established the suitability of the SPHP and NVS indices for measuring attitudes toward cigarette smoking using a subset (intervention communities only) of the cohort data from 1989. It became possible to confirm these results using data from 1989 and 1993 following the release of these data in 1994. Thus, reliability and factor analyses are repeated in this chapter using the cohort survey data for all 22 communities

The alpha coefficients and inter-item correlations for the SPHP and NVS indices (Table 5.1) show strong internal consistency for both years and confirm the findings of the earlier analyses that the two indices provide reliable measures of attitudes toward smoking. Additional analyses separating the intervention and comparison community data for both 1989 and 1993 showed no differences in the reliability statistics for the indices (not shown).

The empirical reproducibility of the two indices was confirmed by factor analysis of the 1989 and 1993 cohort survey data. Factor analysis of the 30 items was performed using principal components with an oblique rotation which was selected because of the correlation between the SPHP and NVS indices (0.61 in 1989 and 0.64 in 1993). The rotated factor structures for 1989 and 1993 were similar in. percent of variance explained (53% in 1989 and 55% in 1993); the number of significant factors (6 in both years with eigenvalues > 1); and the item composition of the factors defining attitudinal subconstructs. The grouping of items by factor loading in both years showed a clear separation of SPHP and NVS items which were strongly associated with three and two factors, respectively.

The item composition of the factors and their alignment with the two main constructs (SPHP and NVS) led to the definition of seven subconstructs which were used in the analysis to provide more detailed assessment of attitude change (Figure 5.1). Four of the subconstructs were related to SPHP; smoking control in public places, legislative control, smoking control in health settings, smoking control in schools, and three are related NVS; belief in the harmfulness of smoking, social actions concerning smoking, risks of secondhand smoke. Scoring for the subconstructs parallels that for the main constructs where lower scores indicate stronger anti-smoking attitudes and higher scores indicate attitudes favouring smoking.

5.3.3 Measurement of Perceived Receipt of Smoking Control Activities

Measures were designed to reveal the extent to which individuals could recall the presence of smoking control messages (e.g., media campaigns, community events) or

participated in COMMIT-generated activities (e.g., participated in a cessation program or called a telephone hotline). In the main outcome papers, the receipt of intervention measures allowed for an analysis of the degree of relationship between activity levels in individual communities and quit rates (COMMIT Research Group, 1995a) and smoking prevalence (COMMIT Research Group, 1995b). In this analysis, an overall measure of community receipt of intervention from the final prevalence survey (obtained by standardizing and summing eight separate indices) was used to assess the relationship between variation in community receipt of smoking control messages and activities and community attitude change

5.3.4 Statistical Analysis

Recall from the discussion in Chapter Three that significance testing for attitude change used a permutation test (Edgington, 1987) due to the fact that communities (rather than individuals) were randomized and that this randomization was performed within community pairs. To perform the permutation test for a specific outcome variable, (e.g., attitude change), the mean of the 11 pairwise differences between the intervention and comparison communities was calculated for each of the 2^{11} (= 2048) equally likely ways that the intervention assignments could have occurred during randomization. The rank of the observed mean divided by the 2048 possible means provided the one tail P-value (P1). Permutation tests were also used to determine test-based confidence intervals (CIs) for the differences between intervention and comparison conditions; 90% confidence intervals are reported, corresponding to one-sided tests at the $\alpha = .05$ level.

5.4 Results

The analysis of attitude change in COMMIT was designed to address four questions relating to one of the five principal thesis objectives of documenting attitude change over the course of the COMMIT trial. First, in relation to the two primary hypotheses of COMMIT, analyses were performed to examine changes over the course of the intervention (1989 to 1992) in the priority of smoking as a public health problem and in norms and values that support nonsmoking. For this purpose, scores on the two main constructs (SPHP and NVS) were the relevant measures. Analyses were conducted for all subjects combined and for subgroups defined by smoking status. Second, scores on the seven subconstructs were examined to determine more detailed changes in attitudes, again for all subjects combined and for the smoking groups Third, the relationships between intervention receipt and attitude change were analyzed to determine whether the level of awareness of or participation in smoking control activities was associated with community-level attitude change. Fourth, the relationship between community attitude change and smoking prevalence change was explored to determine the degree of association between community-level changes in smoking attitudes and smoking behaviour.

In tables of results, the community pairs are listed in arbitrary order and labeled 1 through 11; the order is the same across all tables but individual communities are not identified

5.4.1 1989 and 1993 Attitude Index Response Rates

The response rates for each community for the SPHP and NVS indices in the 1989 and 1993 surveys are shown in Tables 5.2 and 5.3. The numerator in the rate calculation is the number of respondents who completed the attitude sections of the surveys in 1989 and 1993 and for whom no data were missing. For the SPHP index in 1989, the mean response rate for the 11 intervention communities was 64.5%; the mean for the 11 comparison communities was 64.9%, a small and nonsignificant difference (P2 = .99). In 1993, the mean response rates were 78.3% and 79.8% for the intervention and comparison communities, respectively, which was also a nonsignificant difference (P2 = .96). For the NVS index in 1989, the mean response rate for the 11 intervention communities was 53.9%; the mean for the 11 comparison communities was 54.5%, again a small and nonsignificant difference (P2 = .99). In 1993 the mean response rates for the intervention and comparison communities were the same at 63.8%. For both indices, the lower overall response rates in 1989 compared with 1993 were due primarily to the loss-to-follow-up of the 1989 survey respondents between their recruitment in the 1988 baseline survey and the administration of the attitude survey in early 1989. The lower overall response rate for the NVS compared with the SPHP index was due to the fact that there were more missing data on the NVS items. Index scores were calculated for respondents for whom there was complete information on the relevant attitude items. Imputation for missing values was not attempted and so cases are assumed to be missing completely at random in both the intervention and comparison communities (Little and Rubin, 1987).

5.4.2 Changes in Cigarette Smoking Attitudes - SPHP Index and NVS Index

Community mean attitude scores in 1989 and 1993 and change scores (1989-1993) for all subjects combined and for each of the smoking groups are shown in Tables 5.4 (SPHP) and 5.6 (NVS). Differences in mean attitude scores were calculated by subtracting the intervention community mean from the comparison community mean so that positive differences indicate stronger anti-smoking attitudes for the intervention communities. Differences in change scores were determined by subtracting the comparison community change (1989-1993) score from the intervention community change (1989-1993) score so that positive differences again correspond with anti-smoking attitude change in the intervention communities.

For SPHP (Table 5.4), the 1989 scores showed no significant difference (two-tailed test) between intervention and comparison communities except for recent quitters where the mean scores showed stronger anti-smoking attitudes in the intervention communities at the outset of the trial. As expected, (Chapman et al., 1993; Dixon et al., 1991; Green and Gerken, 1989) the mean scores by smoking group showed a strong gradient (i.e., heavy smokers reported the strongest pro-smoking attitudes and never smokers the weakest pro-smoking attitudes). For three of the five tests (all subjects, heavy smokers and light-to-moderate smokers), 1993 scores showed a significant positive difference indicating stronger anti-smoking attitudes in the intervention communities compared with the comparison communities at the end of the trial. The relative magnitude of the difference scores across the smoking groups in 1993 indicates that the effect of COMMIT was concentrated in heavy smokers (difference of 1.40, P1 < .01, 90% CI· 0.78, 1.95) and light-to-moderate smokers

(difference of 1.11, P1 < .01, 90% CI: 0.39, 1.83) such that the significant overall effect for all subjects (difference of 0.57, P1 = .05, 90% CI· 0.01, 1.13) was due to the differences observed for those two subgroups.

The effect of COMMIT on increasing the priority of smoking as public health problem and on promoting norms and values that support non-smoking in the intervention communities relative to the comparison communities is examined most directly by an analysis of the change (1989-1993) scores. For the comparison communities, the change scores measure the secular trend in attitudes towards smoking in the absence of a targeted intervention. For the intervention communities, the change scores measure the secular trend plus the incremental effect of COMMIT.

For SPHP, the mean community change scores were all positive (Table 5.4) indicating a general secular trend in attitudes favouring nonsmoking between 1989 and 1993 in both the intervention and comparison communities. For heavy smokers, the trial effect was significant; for this group the priority of smoking as a public health problem increased more in the intervention communities than in the comparison communities (difference of 1.23, P1 = .03, 90% CI: 0.18, 2.26). This effect for heavy smokers was associated with a regression towards the community mean. In this regard, it is instructive to compare the differences in mean scores of heavy smokers and all subjects for 1989 and 1993 (Table 5.4). In the intervention communities there was a small reduction in the difference (7.22 in 1989 to 7.08 in 1993), whereas the corresponding figures for the comparison communities (7.04 and 7.91) showed an increase. It is also important to note the substantial community variability in change scores for heavy smokers (Table 5.5) across both the intervention and comparison communities and,

in particular, the relatively large negative change score (-2.04) for one of the comparison communities. When heavy and light-to-moderate smokers were combined, an intervention effect remained (difference = 0.67, P1 = .02, 90% CI: 0.18, 1.16), although there was no significant interaction effect between the intervention and smoker type. Thus smokers in the intervention communities showed significantly more change in their beliefs about smoking as a public health problem than did smokers in the control communities.

The results for the second main construct, NVS, appear in Table 5.6. There were statistically significant differences between intervention and comparison conditions in 1989 for all subjects (difference of 0.41, two-tailed P (P2) = .05, 90% CI: 0.07, 0.74) and heavy smokers (difference of 0.58, P2 = .02, 90% CI. 0.19, 1.00). For those two groups, stronger anti-smoking norms and values were reported in the intervention communities. The gradient noted for SPHP mean scores was also evident for NVS; heavy smokers reported the weakest anti-smoking norms and values and never smokers, as expected, reported the strongest NVS scores in 1993 showed no differences between intervention and comparison communities despite the relatively favourable starting (1989) position for all subjects and heavy smokers in the intervention communities. There was similarly no difference in mean change (1989-1993) scores between intervention and comparison communities for any of the groups. In fact the mean change (1989-1993) score differences were opposite (negative differences) to the hypothesized direction for all groups indicating that more positive (although not statistically significant) change in smoking norms was reported in the comparison communities.

It was recognized that by comparing SPHP and NVS scores for heavy and light-to-moderate smokers separately and combined in 1989 and 1993, an attitude change effect

produced by those smokers who quit during the trial could go unnoticed. To examine this effect, intervention and comparison community differences in mean change (1989-1993) scores were tested for heavy and light-to-moderate smokers combined at baseline (1989) and heavy and light-to-moderate smokers and recent quitters combined in 1993. These tests revealed no significant differences between intervention and comparison communities.

5.4.3 Changes in Cigarette Smoking Attitudes - Subconstructs

Analysis of scores on the subconstructs provided a more fine-grained analysis of attitude change with two purposes in view: first, to uncover possible differences between intervention and comparison communities not revealed at the level of the main constructs; second, to inform the interpretation of the differences already reported for SPHP

The subconstruct analysis consisted of 105 permutation tests (7 subconstructs x 5 groups x 3 time categories). The results showed a significant trial effect in six or 5.7% of the cases, about the number expected by chance alone (Table 5.7). In 1993, heavy smokers in the intervention communities reported stronger anti-smoking attitudes on the legislative control, smoking control in public places and social actions concerning smoking subconstructs. In terms of the difference previously reported for SPHP, these findings indicate that the effect for heavy smokers was primarily related to differences in their support for attitudes to control smoking in public places and through legislation. Further evidence to support this conclusion was a significant difference in the change scores (1989-1993) for heavy smokers on the legislative control subconstruct. The significant difference for heavy smokers on the social actions concerning smoking subconstruct revealed a trial effect that was not shown by the

NVS main construct analysis. There were two additional significant subconstruct differences, for recent quitters and all subjects, both related to legislative control.

5.4.4 Relationship Between Attitude Change and Intervention Receipt

The relationship between attitude change and receipt of intervention was examined by correlating SPHP and NVS change (1989-1993) scores for all 22 communities with their standardized summary receipt scores. There was a significant difference (0.34) in intervention receipt for all subjects combined (P1 = .04, 90% CI: 0.03, 0.67) indicating, as expected, that respondents in the intervention communities perceived more smoking control activities during the trial than did respondents in the comparison communities.

The variability in attitude change across the 22 communities as measured by the NVS index was positively correlated (Figure 5.2) with the variability in receipt of smoking control activities (Pearson correlation coefficient = .39, P1 = .04). There was no similar correlation for the SPHP index and receipt of intervention. The subconstruct measuring changes in beliefs about the harmful effects of smoking was strongly correlated with the receipt index (Pearson correlation coefficient = .64, P1 < .01). Thus the magnitude of change in norms and values about smoking was related to the magnitude of the awareness of (or participation in) smoking control activities. This relationship was led by a subconstruct of the NVS index, belief in the harmfulness of smoking, indicating that the community change on this subconstruct was related to the level of receipt of smoking control activities.

5.4.5 Relationship Between Attitude Change and Changes in Smoking Prevalence

The relationships between change scores (1989-1993) on the main and subconstructs and changes in smoking prevalence were also examined using correlation analyses. Changes in community attitudes as measured by the SPHP and NVS indices were not correlated with smoking prevalence change. Correlations were .23 (P1 = .16) and .20 (P1 = .19) for SPHP and NVS, respectively. There were, however, significant positive correlations for the social actions concerning smoking subconstruct (Pearson correlation coefficient = .61, P1 <.01) and the smoking control in public places subconstruct (Pearson correlation coefficient = .38, P1=.04). The items measuring these subconstructs relate to personal and public control of the social environment (e.g., car, home, restaurants and work sites) and it is not surprising that the magnitude of change on these measures was associated with the magnitude of smoking prevalence change These results provide limited evidence to support an underlying assumption of the COMMIT study that attitudes and beliefs about smoking are associated with community-wide changes in smoking behaviour. No conclusion can be drawn about the directionality of the relationship between attitude change and behaviour change from the community level data, however, the issue of the directionality of the attitude-behaviour relationship in the smoking context is addressed at length using individual level data in Chapter Six.

5.4.6 Cohort Analysis of Attitude Change

Although, for the reasons stated earlier, the cross-sectional data from the 1989 and 1993 surveys provide the stronger basis for assessing community level attitude change

attributable to COMMIT, corresponding analyses were conducted using the cohort data. The cohort data set consisted of 5450 respondents (2755 in the intervention communities and 2695 in the comparison communities) for whom attitude data were obtained in the 1989 and 1993 cohort surveys. There were no significant differences between intervention and comparison communities in attrition rates overall or by smoking and nonsmoking groups; nor were there significant differences overall in the age and sex composition of the cohorts.

For all subjects, change scores on both indices showed positive attitude change (i.e., favouring nonsmoking) in intervention and comparison communities with the result that there was no significant COMMIT effect (SPHP difference = 0.23, P1 = 0.13; NVS difference = 0.04, P1 = 0.41) There was a significant intervention effect for light-to-moderate smokers on the SPHP index (difference = 1.19, P1 = .03, 90% CI: 0.18, 2.24). This is the same group for which a significant intervention effect in quit rates was observed in the end-point cohort as reported in a previous paper (COMMIT Research Group, 1995a). The mean difference in attitude change on SPHP between intervention and comparison communities for heavy and light-to-moderate smokers combined was not significant level (difference = 0.75, P1 = .06, 90% CI: -0.02, 1.51).

The subconstruct analyses showed an effect for all subjects in beliefs about the risks of secondhand smoke (difference = 0.19, P1 = .01, 90% CI: 0.07, 0.30). This effect was attributable to attitude change among never smokers (difference = 0.25, P1 = .02, 90% CI: 0.05, 0.46). The subconstruct analyses also showed that the intervention effect for light-to-moderate smokers on SPHP was largely attributable to differences in attitudes towards

smoking control in public places (difference = 0.27, P1 <.01, 90 % CI: 0.12, 0.41) and towards social actions concerning smoking (difference = 0.20, P1 = .05, 90% CI: 0.00, 0.40).

5.5 Discussion

An important assumption of the COMMIT study was that attitudes and beliefs about smoking held by community members are determinants of community-wide changes in smoking behaviour. This chapter reported the effects of the COMMIT intervention on changes in beliefs about smoking as a public health problem and in norms and values about smoking. The analysis of attitude change was based on data derived pre- and post-intervention from cross-sectional surveys carried out in the 22 COMMIT communities. In addition, analyses of cohort data were also reported, although more confidence is placed in the results of the cross-sectional data analyses because of substantial attrition in the cohort

The cross-sectional results showed that over the period of the trial there were substantial changes in favour of stronger anti-smoking attitudes in both the intervention and comparison communities. The incremental effect of COMMIT was modest and limited primarily to changes in heavy smokers' beliefs about smoking as a public health problem. The intervention effect for heavy smokers was attributable to changes in attitudes towards favouring legislative control of smoking. The cohort data also showed a significant intervention effect for changes in beliefs about smoking as a public health problem, but for light-to-moderate rather than heavy smokers. In this case, the intervention effect was due largely to changes in attitudes towards smoking control in public places and, to a lesser extent, social actions concerning smoking. In both the cross-sectional and cohort analyses,

COMMIT was shown to be influential in changing smokers' opinions about the seriousness of smoking as a public health problem but unsuccessful in furthering the same opinions in nonsmokers.

Attitude change attributable to COMMIT was not sufficient to support the main hypotheses that the intervention increased the priority of smoking as a public health problem or norms and values supporting nonsmoking for the general population in the intervention communities. Consistent with North American trends, positive change was observed for all attitude measures for both intervention and comparison communities with the result that the incremental effect of COMMIT was not significant. That COMMIT's effects on attitudes and norms were undetectable in the face of such a strong secular trend is a possible interpretation of the weak trial outcome. This sentiment is reflected in a comment made by an editorial accompanying the main outcome papers that secular "changes of this order could either nullify the effort to produce [changes] by controlled intervention or render true effects of intervention undetectable." (Susser, 1995, p.157) Recognizing, however, that the COMMIT trial was designed with the knowledge that a strong secular trend was occurring, another interpretation is that the weak trial effect resulted from the inability of the intervention activities to bring about the intended additional changes in attitudes and norms. The significant positive relationship between receipt (or awareness) of smoking control activities and changes in norms and values towards smoking provides some evidence to counter this claim.

The secular trend in attitude change in the cross-sectional analysis was weakest for heavy smokers, the group for which a significant intervention effect was shown in terms of

increased priority of smoking as a public health problem. That the heavy smokers were the group least affected by secular trends in attitude change is not surprising. The significant intervention effect for this group has important public health implications in showing that COMMIT produced an incremental effect in the group most resistant to attitude change. It remains an open question as to whether this effect might translate into future change in smoking behaviour among heavy smokers in the intervention communities.

The significant intervention effect for the light-to-moderate smokers in the cohort analysis is consistent with the quit rate difference previously reported (COMMIT Research Group, 1995a) and with the difference observed within this cohort (32.4% for intervention, 28.1% for comparison). An implication of the quit rate difference is that a smaller proportion of the group remained as smokers in 1993 in the intervention communities compared with the comparison communities which would lead us to expect a corresponding intervention effect on attitude change for light-to-moderate smokers.

This last point raises the more general question of the relationship between the results reported here for attitude change with those previously reported for changes in smoking behaviour, both quit rates and prevalence (COMMIT Research Group 1995a,b). The main observation is the overall correspondence of the two sets of results in terms of the modest effect of COMMIT on both behaviour change and attitude change at the community level. Some support for this general correspondence was provided by the positive correlations between community change scores on social actions concerning smoking and smoking control in public places subconstructs and community changes in smoking prevalence.

Finally, the results of these analyses lead to a reconsideration of the underlying assumption of COMMIT that attitudes and beliefs about smoking are important determinants of community-wide changes in smoking behaviour, an assumption grounded in current theories of health promotion (McKinlay, 1993; Fincham, 1992; Brown, 1991). On the one hand the modest effects of COMMIT on both attitude change and behaviour change lead to an indeterminate conclusion about the validity of the assumption. Similarly, the significant intervention effect for heavy smokers in the cross-sectional analysis is inconclusive because there remains the possibility of future behaviour change in this group. On the other hand, the consistency of the significant intervention effects for attitude change and quit rates among light-to-moderate smokers in the cohort analyses provides limited evidence in support of the assumption, although the directionality of the attitude-behaviour relationship is uncertain. In this regard, detailed analyses at the individual level that appear in the next chapter provide additional evidence.

Table 5.1 Item Analyses - Summary Statistics

INDEX	YEAR	n of CASES	MEAN (min, max) INTER-ITEM CORRELATIONS	COEFFICIENT ALPHA	MEAN (min, max) CORRECTED ITEM-TOTAL CORRELATIONS
SPHP	1989	4395	0.29 (0.11, 0.74)	0.87	0.50 (0.35, 0.64)
	1993	4651	0.32 (0.14, 0.79)	0.88	0.53 (0.35, 0.66)
NVS	1989	3700	0.25 (0.02, 0.65)	0 77	0.44 (0.20, 0.64)
	1993	3758	0.29 (0.05, 0.71)	0.81	0.49 (0.22, 0.67)

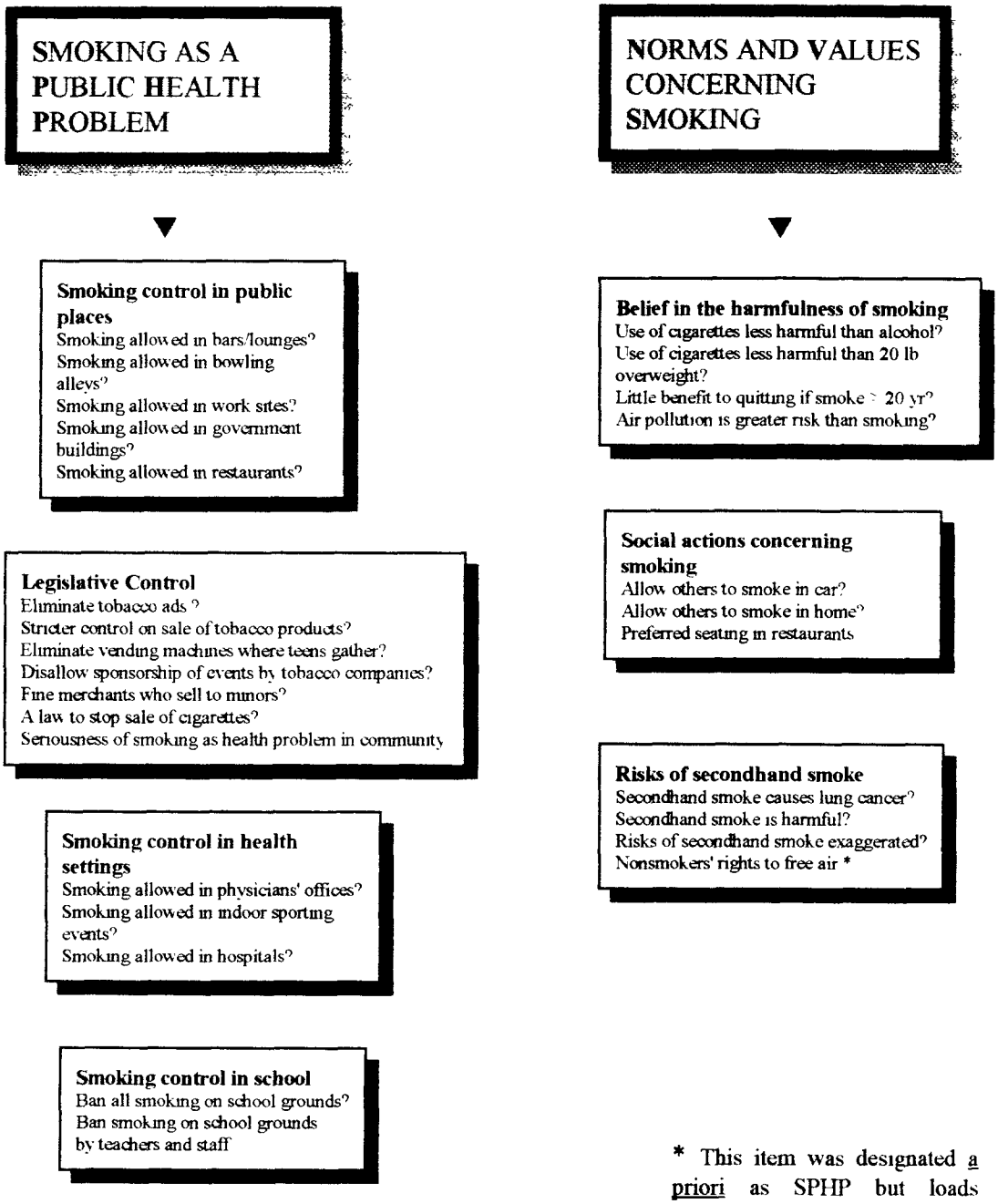


Figure 5.1 Index ➜ Subconstruct ➜ Item Summary (based on 1989 and 1993 factor loadings)

Table 5.2 Number of Respondents on the SPHP Index (n) and Index Response rates (r)

Pair	1989 Attitude Survey					1993 Final Prevalence Survey				
	Intervention		Comparison		Response Rate Difference	Intervention		Comparison		Response Rate Difference
	n	r	n	r		n	r	n	r	
1	276	60.4	264	58.0	2.4	446	72.5	498	75.9	-3 4
2	333	70.6	322	70.8	-0 2	527	80.7	579	86.0	-5.3
3	310	68.3	324	72.3	-0.4	597	82.7	594	81.1	1.5
4	308	70.2	313	67.9	2.3	502	80.2	471	77.7	2.5
5	236	54.5	267	59.1	-4.6	482	73.5	459	77.4	-3.9
6	280	62.4	285	62.8	-0.4	456	75.7	547	80.6	-4 8
7	279	64.3	288	64.6	-0.3	459	76.5	441	74.6	1.9
8	277	61.7	292	67.1	-5.4	508	79.6	505	83.7	-4.1
9	298	65.4	293	65.0	0.4	548	81.5	524	83.7	-2.2
10	298	67.3	287	63.9	3.3	507	78.5	525	79.7	-1.2
11	286	64.4	272	62.0	2.5	502	79.8	496	77.5	2.3
Community Means	289	64.5	292	64.9	-0.4	503	78 3	513	79.8	-1 5

Table 5.3 Number of Respondents on the NVS Index (n) and Index Response rates (r)

Pair	1989 Attitude Survey					1993 Final Prevalence Survey				
	Intervention		Comparison		Response Rate Difference	Intervention		Comparison		Response Rate Difference
	n	r	n	r		n	r	n	r	
1	222	48.6	226	49.7	-1.1	351	57.1	375	57.2	-0.1
2	279	59.1	261	57.4	1 7	437	66.9	455	67.6	-0.7
3	275	60.6	293	65.4	-4.8	495	68.6	483	66.0	2.6
4	248	56.5	258	56.0	0.5	422	67.4	397	65.5	1 9
5	194	44.8	222	49.1	-4 3	380	57.9	345	58.2	-0.3
6	235	52.3	230	50.7	1.7	367	61.0	442	65.1	-4.1
7	241	55.5	232	52.0	3.5	375	62.5	362	61.3	1.2
8	249	55.5	247	56.8	-1.3	425	66.6	403	66.8	-0.2
9	240	52.6	253	56.1	-3.5	439	65.3	415	66.3	-1.0
10	246	55.5	240	53.5	2.1	415	64.2	427	64.8	-0.6
11	229	51.6	231	52.6	-1.0	405	64.4	402	62.8	1.6
Community Means	242	53.9	245	54.5	-0.6	410	63.8	410	63.8	0.0

Table 5.4 Change in Attitudes Toward Cigarette Smoking, by Intervention Condition, SPHP Index

Year	Community Means		Difference[a]	P[b]	90% Confidence Interval
	Intervention	Comparison			
All Subjects					
1989	36.22	36.57	0.36	.26	-0.18, 0.89
1993	33.89	34.46	0.57	.05	0.01, 1.13
Change (1989-1993)	2 33	2.12	0.21	.28	-0.43, 0.86
Heavy Smokers					
1989	43.44	43 61	0.17	.81	-1 14, 1.49
1993	40.97	42.37	1.40	<.01	0.78, 1.95
Change (1989-1993)	2.47	1.24	1.23	.03	0.18, 2.26
Light-to-Moderate Smokers					
1989	40.32	41.24	0.92	.20	-0.21, 2 07
1993	37.74	38.85	1.11	<.01	0.39, 1.83
Change (1989-1993)	2.58	2.39	0.19	.33	-0.61, 0.99
Recent Quitters					
1989	35.91	37.57	1.66	.04	0.38, 2.92
1993	35.18	35.73	0.54	.11	-0.21, 1.31
Change (1989-1993)	0.72	1.84	-1.12	.86	-2.94, 0.70
Never Smokers					
1989	33.84	33.75	-0.09	.80	-0.69, 0.49
1993	31.72	32.14	0.41	.17	-0.32, 1.14
Change (1989-1993)	2.11	1.61	0.50	.21	-0.63, 1 62

[a] Comparison - Intervention for 1989 and 1993 differences as low scores indicate stronger anti-smoking attitudes. Intervention - Comparison for change differences as higher change in intervention communities is expected.

[b] Two-sided for 1989 comparisons and one-sided for 1993 and change (1989-1993) comparisons.

Table 5.5 Results by Community for Attitude Scores on SPHP Index for Heavy Smokers

Pair	Intervention		Comparison		Difference in Attitude Change
	Final 1993	Change (1989-1993)	Final 1993	Change (1989-1993)	
1	41.50	3.85	39.89	1.91	1.94
2	41.65	1.00	42.39	0.21	0.79
3	42.33	4.20	43.66	1.43	2.77
4	39.68	2.02	41.06	-2.04	4.06
5	39.32	-0.25	41.17	-0.13	-0.12
6	40.67	1 52	43.49	-0.04	1.56
7	40.26	1.72	42.06	1.69	0.03
8	40 60	4 73	42.07	0.84	3.89
9	43.52	1.56	45.25	3.81	-2.25
10	40.20	4.60	42.46	3.45	1 15
11	40.92	2.21	42.57	2.53	-0.31
Community Means	40.97	2.47	42.37	1.24	1.23

Table 5.6 Change in Attitudes Toward Cigarette Smoking, by Intervention Condition, NVS Index

Year	Community Means		Difference[a]	P[b]	90% Confidence Interval
	Intervention	Comparison			
All Subjects					
1989	19.85	20.26	0.41	.05	0.07, 0.74
1993	18.88	19.16	.0.28	.16	-0.21, 0.74
Change (1989-1993)	0.97	1.10	-0.14	.64	-0.76, 0 46
Heavy Smokers					
1989	25.00	25.58	0.58	.02	0.19, 1.00
1993	24.68	25.16	0.48	.09	-0.14, 1.10
Change (1989-1993)	0.32	0.42	-0.10	.61	-0.79, 0.62
Light-to-Moderate Smokers					
1989	23.78	24.28	0.50	.10	0.01, 0.99
1993	22.89	23.14	0.24	.22	-0.29, 0.79
Change (1989-1993)	0.89	1.14	-0.25	.76	-0.91, 0.41
Recent Quitters					
1989	19.65	20.15	0.50	.22	-0.21, 1.22
1993	18.93	19.06	0.13	.35	-0.48, 0.75
Change (1989-1993)	0.72	1.09	-0.37	.85	-1.00, 0.26
Never Smokers					
1989	17.88	18.17	0.29	.40	-0.29, 0.86
1993	17.19	17.40	0.21	.19	-0.21, 0.62
Change (1989-1993)	0.69	0.77	-0.08	.57	-0.90, 0.74

[a] Comparison - Intervention for 1989 and 1993 differences as low scores indicate stronger anti-smoking attitudes Intervention - Comparison for change differences as higher change in intervention communities is expected.

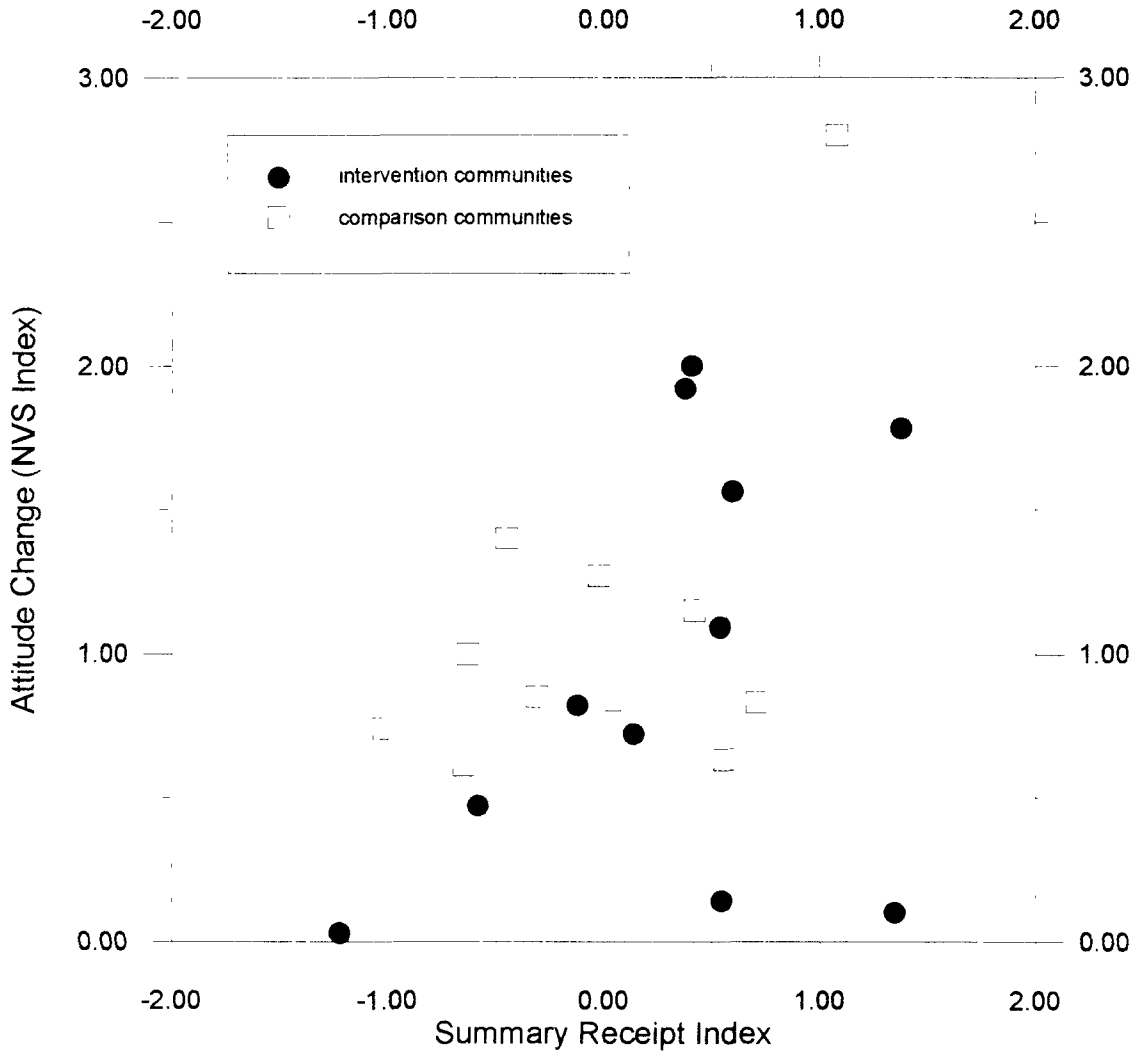
[b] Two-sided for 1989 comparisons and one-sided for 1993 and change (1989-1993) comparisons.

Table 5.7 Changes in Attitudes Toward Cigarette Smoking, by Intervention Condition, Subconstructs

Year	Community Means		Difference[a]	P[b]	90% Confidence Interval
	Intervention	Comparison			
Legislative Control - Heavy Smokers					
1989	17.75	17.76	0.01	96	-0 45, 0.45
1993	16.68	17 49	0.81	<.01	0.58, 1.03
Change (1989-1993)	1.07	0.27	0.80	<.01	0.36, 1.23
Smoking Control in Public Places - Heavy Smokers					
1989	10 95	10.99	0.04	.76	-0.18, 0.27
1993	10.46	10.62	0.16	.05	0.00, 0.31
Change (1989-1993)	0.49	0.36	0.12	.20	-0.12, 0.36
Social Actions Concerning Smoking - Heavy Smokers					
1989	6.50	6.58	0.08	.09	0.00, 0.16
1993	6.45	6.58	0.13	.01	0.03, 0.24
Change (1989-1993)	0 05	0.00	0.05	0.22	-0 05, 0 15
Legislative Control - Recent Quitters					
1989	14.93	15.59	0.66	.13	-0.05, 1.37
1993	14 71	15 09	0.38	.03	0.04, 0.72
Change (1989-1993)	0.22	0.50	-0.28	.72	-1.18, 0.61
Legislative Control - All Subjects					
1989	15.03	15.28	0.25	.09	0.01, 0.50
1993	14.26	14.59	0.33	<.01	0.09, 0.57
Change (1989-1993)	0.76	0.69	0.08	.31	-0.21, 0 37

[a] Comparison - Intervention for 1989 and 1993 as low scores indicate stronger anti-smoking attitudes. Intervention - Comparison for change differences as higher change in intervention communities is expected.

[b] Two-sided for 1989 comparisons and one-sided for 1993 and change (1989-1993) comparisons.



Pearson Correlation Coefficient =.39 (P1 = .04)

Figure 5.2 Relationship Between Attitude Change (NVS Index) and Standardized Summary Intervention Receipt Index for All Subjects

CHAPTER SIX

ATTITUDE CHANGE COVARIATES AND THE RELATIONSHIP BETWEEN SMOKING ATTITUDES AND SMOKING BEHAVIOUR: Evidence from the evaluation cohort

6.1 Introduction

This chapter moves from the analysis of attitude change at the community level to the individual level, in keeping with the socioecological understanding of health which necessitates analyses on multiple levels (McLeroy, 1993). The two key issues addressed are: 1) the covariates of attitude change; and 2) the relationship between attitude change and behaviour change, which correspond to objectives three and four of the thesis. Regarding the first issue, Chapter Five considered attitude change by smoking group but did not consider differences in attitude change attributable to demographic and socio-economic characteristics of respondents. Therefore this chapter seeks to identify differences in attitude change in various social groups.

The cohort data from COMMIT further provide the basis for calculating within-subject measures of attitude change over the course of the trial which can be compared with behaviour change measures for the same individuals. These data are especially powerful for exploring the directionality of the attitude-behaviour relationship. This chapter takes up these

two unexplored issues of the covariates of attitude change and the directionality of the attitude behaviour relationship with the intention of further enhancing our understanding of smoking attitude change.

6.2 The Attitude-Behaviour Relationship in Health Research

Bettinghaus (1986) tells us that most health promotion campaigns operate under the twin beliefs that: 1) if people are given the facts about certain health-related behaviours they will behave according to those facts (i.e., once informed that smoking causes lung cancer they will quit smoking); and 2) if people can be convinced to hold favourable or unfavourable attitudes towards a particular behaviour, they will change their behaviour to fit their attitudes.

The nature of the relationship between attitudes and behaviour (A-B), however, continues to be a source of controversy in the social and behavioural sciences. It is obvious that behaviours influence health but what exactly is the relationship between attitudes and behaviour? Five possibilites relating attitudes and behaviour have been identified: (1) attitudes precede behaviours; (2) behaviours precede attitudes; (3) the relationship is concurrent; (4) the two are unrelated, or; (5) both are produced by other phenomena (McBroom and Reed, 1992). The Community Intervention Trial for Smoking Cessation (COMMIT), like most other health interventions before it, focused on the first of these: that attitudes and beliefs about smoking are important determinants of community-wide changes in smoking behaviour.

One group of theorists led by Festinger (1957) suggested that the observed relationships between attitudes and behaviour could be explained by the concept of cognitive dissonance. When beliefs or attitudes do not agree, as in the case of an individual with strong

antismoking attitudes who continues to smoke, the situation is thought to be uncomfortable or unpleasant. This unpleasant state arising from the inconsistency between attitudes and behaviour is then thought to motivate the individual to change either their attitude or behaviour to eliminate the cognitive dissonance.

Ajzen and Fishbein (1980) contend that consistency theories have done little to explain observed inconsistencies between attitudes and behaviour. They claim that "while studies of this kind [research designed to test consistency theories] showed that people tend to bring their beliefs and attitudes into line with their actions, they provided no information about the extent to which attitudes influenced behaviour " (p. 22) As discussed in Chapter Five, Ajzen and Fishbein argue that an individual's intention to perform (or to not perform) a behaviour is the single best predictor of that behaviour. Accordingly, any behaviour can be successfully predicted from attitude provided that the measure of attitude corresponds directly to the intention to perform the behaviour. Intention, in turn, is a function of both an individual's attitude toward the behaviour and the anticipation that others s/he regards as important will approve or disapprove of the behaviour in question.

In the specific case of health attitudes and behaviour, Stacy and colleagues (1994) report that "comprehensive evaluations of the predictive impact of attitudes on health behaviour have been rare, and the case for attitude as a strong natural precursor to behaviour may not be as strong as some of the basic research would suggest." (P. 73). They studied five different health behaviours (smoking, drinking, binge eating, illegal drug use and drunk driving) prospectively in five different subject groups and found that attitudes could predict

behaviour in only two instances: alcohol and marijuana use. While past behaviour was an effective predictor of smoking, attitudes could not predict smoking.

In a recent paper presenting the results of a meta-analysis of 138 studies of attitude and behaviour correlations, Kim and Hunter (1993) concluded that attitudes (especially those that are shown to be relevant to the behaviour in question) are strongly related to behaviour (the average population correlation between attitudes and behaviour was .79). These authors clearly rejected the notion that attitudes and behaviour are unrelated and they further rejected the "third phenomenon hypothesis" arguing that relevant attitudes outweigh any effect of intervening variables. Their analysis considered several different kinds of attitude and behaviour studies ranging from consumer behaviour to deviance, environmental behaviours, race relations, health care utilization, drug use (alcohol and marijuana) and migration. To be considered for their meta-analysis, A-B studies had to involve behaviours that were completely under volitional control (i.e., a person would be able to start or stop the behaviour at will). None of the 138 studies considered for their analysis considered the link between attitudes toward smoking and smoking behaviour, although they did not state that smoking studies were excluded because of their volitional control criterion.

The question of whether or not the behaviour of quitting smoking is under volitional control is critical to any study examining the links between smoking attitudes and smoking behaviour. In April of 1994, seven chief executives of tobacco companies testified before a U.S. Congressional subcommittee that nicotine was not addictive (Hilts, 1994). Neither the World Health Association nor the American Psychiatric Association agrees with them (Goodin, 1989). Even though cigarettes do not offer as intense pleasurable effects as drugs

like heroin and cocaine, they rank higher on other criteria of addiction. For example, nicotine ranks first among drugs such as heroin, cocaine, alcohol, caffeine and marijuana in terms of dependence (a measure combining difficulty in quitting, relapse rates, percentage of users who eventually become addicted) (Hilts, 1994). The balance of evidence mounted through the 1970s and 1980s led the U.S. Surgeon General to declare in his 1988 report that: cigarettes and other forms of tobacco are addicting; nicotine is the drug in tobacco that causes addiction; and the pharmacologic and behavioural processes that determine tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine (USDHHS, 1988, p 9). This same conclusion was reached by a committee of the Royal Society of Canada (Royal Society of Canada, 1989).

In sum, there are several different ways of theorizing the attitude-behaviour relationship in health research. A consistency theory approach suggests that attitudes and behaviours will come into line due to the unpleasant state of cognitive dissonance. Consistency theory therefore supports empirical findings that show attitude change preceding behaviour change, or attitude change concurrent with behaviour change, or attitude change following behaviour change. Ajzen and Fishbein's theory of reasoned action claims that attitudes, properly measured, will always predict behaviours and that inconsistent findings in the literature are a result of improperly measured attitude or behaviour variables. This thinking has informed most health education research. Stacy et al. (1994), however, recently reported that attitudes towards smoking were not effective predictors of smoking behaviour. It is amidst this controversy that this chapter examines both the covariates of attitude change and the directionality of the A-B relationship.

6.3 Approaches to the Analysis of Smoking Attitudes and Smoking Behaviours

Two approaches to the study of the relationship between smoking attitudes and behaviours in COMMIT were adopted. The first approach was to determine the degree to which attitude change differs by smoking behaviour, education level, sex, and geographic location (i.e., COMMIT site). An analysis of variance (ANOVA) approach was used to examine this question. Two ANOVAs were specified with change scores on each attitude index as dependent variables.

The implicit assumption in the ANOVA approach is that factors such as changes in smoking behaviour are important determinants of attitude change (i.e., the direction of the relationship is hypothesized to be B → A). The hierarchical method for decomposing sums of squares was used in each of the ANOVAs with the result that factors thought to be associated with smoking and smoking attitudes such as education level and sex were adjusted for before the main effects of behaviour change, intervention condition and site were assessed.

Educational attainment appears to be the best single sociodemographic predictor of smoking or smoking cessation (USDHHS, 1989) and thus it was anticipated to be an important independent variable in these attitude change analyses. The prevalence of smoking among women has declined much more slowly than among men since the 1960s in North America (USDHHS, 1989; Health and Welfare Canada, 1993) and there are indications that women smokers could outnumber men by the year 2000 in the U.S. (Pierce et al., 1989b). Grunberg et al. (1991) note that overall, men are more likely to smoke than women but that this difference is dramatic in some cultures (e.g., Japan, China, Indonesia) and minimal in others (e.g., Canada and the United States). This 'gendered' nature of smoking behaviour led

to the inclusion of sex as an independent variable in the attitude change ANOVAs. 'Site' was introduced last with the intention of examining the effects of geographic context after adjusting for the effects of education, sex and behaviour change. The site variable represents the n = 11 COMMIT sites in the study (e.g., Brantford and Peterborough comprise the Canadian site; Raleigh and Greensboro comprise the North Carolina site). Age was introduced as a covariate following the main effects to examine whether attitude change in COMMIT was related to age, adjusting for the preceding factors. Multiple classification analyses (MCA) were run for each ANOVA to determine the magnitude of effects for the categories within each significant factor (at the .05 level).

The second approach was to compare the 'attitude profiles' of different subgroups, defined by their changes in smoking behaviour during the trial, with subgroups whose smoking behaviour did not change. The profile approach is an explicit attempt to decompose the direction of the attitude - behaviour relationship. For each attitude index, attitude profiles were 'mapped' for quitters versus those who smoked throughout the trial and for starters versus those who remained nonsmokers throughout the trial. Smoking status of the evaluation cohort members was determined at each contact in 1989, 1991 and 1993. Quitters were defined as heavy or light-to-moderate smokers at baseline (1988) who indicated that they currently did not smoke and that they quit smoking at least six months ago. Because quit dates were recorded, it was also possible to derive subgroups of smokers who quit during the noncontact years (i.e., 1990 and 1992) which meant for these groups that attitudes and behaviour changes were not measured concurrently, aiding the understanding of the directionality of the A-B relationship. Starters were defined as recent quitters or nonsmokers

at baseline who answered yes to the question "Do you smoke now?" Start dates were not recorded so it was not possible to profile those who started smoking in 1990 or 1992.

To assess whether the attitude changes either preceding or following behaviour changes differed from the attitude change of those whose smoking status remained constant, mean attitude change scores between 1989 and 1991 and between 1991 and 1993 were compared using Student's *t* tests for independent samples. These tests were one- or two-tailed depending upon whether a direction of difference between the two groups could be specified a priori. Recall that the premise of the COMMIT trial was that attitude change precedes behaviour change. It followed that in this analysis, attitude changes preceding behaviour changes were hypothesized to be larger (i.e., one-tailed) than attitude changes not associated with behaviour changes. No direction of difference was hypothesized for attitude changes concurrent with or following behaviour changes (i.e, two-tailed).

Surprisingly little is known about the relationship between changes in attitudes toward smoking and changes in smoking behaviour mainly due to the fact that attitudes and behaviours have rarely been measured prospectively over time (Stacy et al., 1994). The profile approach described above exploits the longitudinal nature of the COMMIT evaluation cohort data on attitudes and behaviours regarding cigarette smoking. The intention of the profile analysis is to reveal predictive precedence of one variable (i.e., attitude change or behaviour change) over the other.

6.4 ANOVA Results

The ANOVA and MCA results appear in Tables 6.1 through 6.4.[9] The significant explanatory factors for change on the SPHP index were education level (2P = .04), behaviour change (2P < .01) and site (2P < .01) (Table 6.1). There was no evidence of a difference between men and women in terms of attitude change on SPHP and there was no evidence of difference in attitude change between individuals from intervention and comparison communities. The similarities in attitude change between intervention and comparison communities is not surprising given the results from Chapter Five. A significant two-way interaction effect between education level and the intervention was, however, noted. These findings show that the mean attitude change for SPHP was significantly different from the overall mean attitude change for groupings by education level, by behaviour change and by site

The MCA table (Table 6.2) presents the category means as deviations from the grand mean allowing for the interpretation of the direction and magnitude of influence of each category within a factor (SPSS Inc., 1988) The adjusted values show the effect of a certain category within a given factor after variation due to the other factors and covariates has been taken into account. For education level, the adjusted deviation for those with less than high school education of -0.48 indicated that this group had relatively less attitude change as measured by the SPHP index. The largest deviations occurred in the behaviour change

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9 The power of the ANOVA tests here are assumed to be very high. Recall that the power of a test is the probability of rejecting H_o when H_a is in fact true (Moore and McCabe, 1993). Normally when ANOVA is used for analyses, it is important to perform power calculations to check that sample sizes are adequate to detect differences among means. In the cases presented here, sample sizes are deemed large enough to provide ample power to detect differences.

categories, as foreshadowed by the large F-value for this factor. Quitters showed very high relative attitude change (adjusted deviation of 1.61) while those who started smoking during the trial showed very low relative attitude change (adjusted deviation of -1.52). The large relative deviations notable for the site factor were Oregon (adjusted deviation of 1.25) and New Jersey (adjusted deviation of -1.15), indicating that these sites experienced very different attitude change.

A clearer interpretation of the significant two-way interaction effect noted for education level and the intervention is best achieved graphically. Figure 6.1 shows the mean SPHP change scores for each level of education by intervention condition. The difference in mean attitude change between the intervention and comparison conditions is greatest for those with less than high school education and least for those with some college education. The intervention, then, had the greatest effect on the attitudes towards smoking of individuals with less than high school education. In Chapter Three it was noted that there was a significant association between the intervention condition and education level for missing cases on the SPHP index in 1993. It is important to add here that this association does not hold for the missing values on the SPHP *change* index ($2P = .07$) so more confidence can be placed in the result presented here.

The ANOVA results with change on NVS as the dependent variable appear in Table 6.3. The only significant main effect was for the behaviour change factor ($2P < .01$); no differences in attitude change between education levels, men and women, intervention or comparison conditions or sites were noted for the NVS index. There were, however,

significant two-way interaction effects between education and site (2P = .01) and behaviour change and site (2P = .04).

The MCA table (Table 6.4) showed that, like the SPHP change ANOVA, the largest relative deviations from the grand mean occurred for the groups either quitting or starting smoking. The quitters had an adjusted deviation of 2.41 indicating higher mean change on NVS while those who started smoking during the trial had an adjusted deviation of -2.38. Thus the magnitude of difference in mean change in smoking norms and values was similar but in opposite directions for those who quit smoking compared with those who started to smoke.

The two-way interaction effects involving the 'site' variable are difficult to interpret graphically because of the large number of groupings. The difference in mean NVS change between the 11 sites was different for those with less than high school education but similar for those with some college education. For some sites (e.g., New York City, Iowa, Oregon) those with less education showed more changes in their norms and values regarding smoking than did those with more education. For other sites (e.g., New Jersey, California, New York State and New Mexico) it was those with less than high school education which showed greater shifts in their norms regarding smoking than did those with at least some college education.

As for the two-way interaction between behaviour change and site, the most noteworthy finding was that the attitude change experience across the 11 sites was remarkably similar for quitters and for those smokers and nonsmokers whose status did not change during the trial. This finding is not surprising given the importance of the behaviour

change factor as a main effect and the concomitant non-importance of site as a main effect. Those who started smoking during the trial, however, had comparatively more variation in their shift in norms and values about smoking depending on their COMMIT site The difficulty in the interpretation of this finding is the small numbers in the cells of starters by site. The numbers in these cells varied from a low of 8 starters in the California site to a high of 14 starters in the New York State site.

Two additional ANOVA models were run which included 'race' as a factor given that smoking rates are higher in certain racial and ethnic minority groups. The limited data that have been available in the U.S. have shown smoking rates to be higher among black men and Hispanic men than among white men (USDHHS, 1989). For the purposes of this study, it was thought that these differences in smoking prevalence might also affect attitudes and attitude change even though COMMIT messages were not directly tailored to specific racial groups The race variable grouped individuals into the following racial categories: white, black, Asian and Hispanic. Given that some racial groups were concentrated in some COMMIT sites (e.g., there were relatively large black communities in New Jersey and North Carolina and relatively large Hispanic communities in New Mexico, in particular, and to a lesser degree in California and New Jersey), cell counts were very low with both 'race' and 'site' in the same model After adjusting for education level and sex, race was not a significant factor in either the model with change on SPHP as dependent variable ($2P = .40$) nor the model with change on NVS as dependent variable ($2P = .64$).

The ANOVA analyses revealed an important relationship between attitudes and behaviour with behaviour change as the strongest main effect for change on both the SPHP

and NVS indices. The direction of the relationship, however, remains transparent from the above approach It is the purpose of the profile analyses that follow to investigate the directionality of that relationship by comparing the attitude change profiles of various smoking behaviour groups.

6.5 Attitude Profile Results

The attitude profile analyses were designed to reveal the explanatory precedence of attitude change or behaviour change in the A-B relationship. The ANOVA analysis (section 6.4) assumed an explanatory role for behaviour change which was supported theoretically by consistency theories in the literature and well supported empirically in the results. Traditionally, however, public health has tended to view attitude change as a precursor to behaviour change (cf Bettinghaus, 1986). This analysis of attitude profiles for various behaviour change groups examines the traditional public health hypothesis that attitude change precedes behaviour change.

Basic socio-demographics (education levels and sex ratios) of the various 'quitter' and 'starter' profiles appear in Tables 6.5 through 6.8. In general, quitters (SPHP and NVS) had higher proportions of those with at least high school education than those who remained smokers throughout the trial, but lower proportions than all respondents. Starters, on the other hand, had lower proportions of high school graduates than did nonsmokers and all respondents. Those who started smoking during the trial also tended to be female as indicated by the sex ratios in Tables 6.7 and 6.8. These profile descriptions indicate that groups whose

smoking behaviour changed during the trial had differing socio-demographic characteristics than those whose behaviour remained constant.

The attitude profiles for SPHP of quitters versus those who remained smokers from baseline through to the end of the trial appear in Figure 6.2. In general, those whose behaviour did not change (the smokers) had more gradual attitude shifts than the quitters, although this was more obvious for the NVS index (Figure 6.3). Smokers throughout the trial had higher scores on the SPHP index (recall that high scores on both SPHP and NVS indicate attitudes more favourable toward smoking) at each year of contact than did any of the groups who were smokers at baseline but who quit smoking during the trial. The most unfavourable attitudes towards smoking were reported by those who quit smoking by 1989 (i.e., those who quit smoking relatively early in the trial) with those who quit in subsequent years reporting attitudes slightly more favourable to smoking. When differences between the incremental changes in attitudes are considered (Table 6.9) we can see that those who quit in 1989 showed significantly more positive change in their beliefs about smoking as a public health problem (3.15) between 1989 and 1991 when compared with those who remained smokers throughout (1.34) ($2P < .01$). This finding suggests that substantial attitude change occurs *following* quitting smoking, although any attitude change that occurred before 1989 is unknown.

The group quitting in 1990 also showed significantly more positive attitude change than smokers well after quitting smoking. The 1990 quitters had a similar attitude change score to the smokers between 1989 and 1991 but showed significantly more positive change (2.59 versus 1.52) between 1991 and 1993 ($2P = .03$). Evidence offered by the attitude profile

of the 1990 quitters, suggesting that behaviour change precedes attitude change, is strengthened by the fact that attitudes and behaviours in this case are not measured at the same point in time.

The group quitting by 1991 showed no significantly different attitude change between 1989 and 1991 (2.38 versus 1.34, 1P = .10). This group, however, did display a significantly stronger shift in attitudes favouring nonsmoking than smokers following quitting between 1991 and 1993 (2.61 versus 1.52, 2P < .01). SPHP scores for the 1991 quitters were lower in 1989 (i.e., more antismoking) than the constant smokers but the attitude change experience for these two groups between 1989 and 1991 was similar. Quitting smoking, however, seemed to trigger an accelerated attitude shift for this group. As for the 1992 quitters, they displayed a similar attitude change profile to those who remained smoking, indicating no attitude-behaviour effects.

Smokers who quit by 1993 showed significantly more positive attitude change between 1989 and 1991 (2.35 versus 1.34, P1 < .01) and between 1991 and 1993 (2.49 versus 1.52, 2P < .01) than those who remained smoking. Given that this group could have quit any time between 1991 and 1993, the finding suggests both that attitude change precedes behaviour change and that attitudes and behaviours change concurrently.

The norms and values profiles for quitters versus those who remained smokers during the trial appear in Figure 6.3. Like the result for SPHP, smokers throughout the trial had the highest (i.e., most favourable to smoking) NVS scores while those who quit earliest (1989) displayed norms and values most unfavourable to smoking in all three contact years. These

early quitters, however, did not have a significantly different attitude change experience from the constant smokers.

Those who quit in 1990 (3.03 versus .48, $2P < .01$) and those who quit by 1991(3.14 versus .48, $2P < .01$) showed significantly more change between 1989 and 1991 than continued smokers, suggesting concurrent shifts in attitudes and behaviours (Table 6.10). Quitters in 1992 showed attitude change similar to smokers between 1989 and 1991 but showed significantly more change in attitudes than those who continued smoking between 1991 and 1993 ($2P < .01$). This finding is further suggestive of a concurrent shift in attitudes and behaviours. Those who quit by 1993 displayed a much stronger attitude shift than smokers both between 1989 and 1991 (2.61 versus 0.48, $P1 < .01$) and between 1991 and 1993 (1.31 versus 0.35, $2P < .01$), suggesting in the first instance that attitude change is a precursor to behaviour change and in the second instance that attitudes and behaviours change in tandem.

The attitude profiles for those who started smoking during the trial versus those who remained nonsmokers throughout appear in Figures 6.4 (SPHP) and 6.5 (NVS). As was the case for the comparisons between quitters and smokers, those whose behaviour did not change (the nonsmokers) had more gradual attitudes shifts than did those who started smoking during the trial. Nonsmokers scored lower on both indices at all points in time indicating, as one might expect, that those who began to smoke during the trial held attitudes more supportive of smoking than nonsmokers. Those who began smoking by 1993 (i.e., the most recent starters) scored highest (i.e., more pro-smoking) on both indices at the final contact.

An examination of the attitude change scores on SPHP for the starters versus nonsmokers throughout (Table 6.11) revealed that those who started smoking by 1989 had a significantly different attitude change experience between 1989 and 1991 than did those who remained nonsmokers. Starters in 1989 had a mean attitude change score of -0.53 between 1989 and 1991 indicating that they came to believe smoking to be a *less serious* public health problem during those years. This change was significantly different than for the nonsmokers who came to believe smoking to be a more serious public health problem ($2P < .01$). The result suggests that starting smoking accelerates attitude change. Those who started smoking by 1991 and the group starting by 1993 showed attitude change similar to the nonsmokers over both time intervals. These two starter profiles reveal no evidence of accelerated attitude changes due to their behaviour changes.

The complementary attitude change analysis on NVS for starters versus nonsmokers appears in Table 6.12. Those who started smoking by 1989 showed a similar attitude change on NVS throughout the trial with change scores of 0.78 (89-91) and 0.52 (91-93) not significantly different from the corresponding nonsmoker change scores of 0.82 and 0.50. The group who had started smoking by 1991, however, demonstrated a shift in norms and values more supportive of smoking between 1989 and 1991. The 1991 starters had a 1989-1991 attitude change score -0.70 which was significantly different ($2P < .01$) and in the opposite direction from the nonsmoker change score. Between 1991 and 1993, this group scored a relatively high positive attitude change (1.19). Although this change score was not statistically different from the 91-93 change score for nonsmokers (0.50), it represents a fairly dramatic shift in terms of magnitude and direction for this group.

The attitude profile for the group who began smoking by 1993 resembled that for the 1991 starters between 1989 and 1991. During this time their norms and values became more supportive of smoking (change score of -0.67). Such a shift would suggest that an attitude change favouring smoking preceded their initiation of smoking. Between 1991 and 1993, however, this group's attitude change (-0.18) did not differ significantly (1P = .10) from that for nonsmokers (0.50).

6.6 Discussion and Conclusions

Both the ANOVA and the profile analysis results suggest a strong relationship between attitudes toward smoking and smoking behaviour. The ANOVA findings show that behaviour change (i.e., either quitting or starting smoking) is the strongest factor associated with change in beliefs about the seriousness of smoking as a public health problem and norms and values regarding smoking. For SPHP, main effects on attitude change were behaviour change, education level and site. Sex, intervention condition, race, and age, however, were not important factors accounting for change in beliefs about the seriousness of smoking as a public health finding. From a pubic health perspective, the most consequential finding was the significant interaction between education level and intervention condition. This result indicated that the intervention was able to accelerate the attitude change of individuals least likely to have been affected by broader North American secular changes. The reinforcement of nonsmoking messages provided by COMMIT appeared to have an important attitudinal impact on a traditionally hard-to-reach group.

Change in smoking behaviour was the sole main effect accounting for variation in shifts in norms and values regarding smoking. Other indicators like education level, sex, intervention, site, age and race were not significant factors in NVS change. Shifts in beliefs about smoking as a pubic health problem, then, had more connections to personal characteristics (education level and geographic location) than did changes in norms and values. The implications of this difference are that norms and values regarding smoking are strong associated with smoking behaviour and can change only when behaviour is affected.

The profile analyses examined the controversial issue of the directionality of the attitude-behaviour relationship. As stated above, most public health initiatives operate under the assumption that attitude change necessarily precedes health behaviour change This assumption leads to efforts to change attitudes and, in turn, to evaluate attitude change, and consequent behaviour changes at the individual and community levels. One of the most important observations from the profiles was that those who quit smoking during the trial had SPHP and NVS scores that were less supportive of smoking than the smokers at all contact times. There was also a 'predisposition gradient' in that those who quit by 1989 had stronger antitobacco scores than those quitting later in the trial. Similarly, those who started to smoke during the trial had attitudes and norms more supportive of smoking at each contact point than those who remained nonsmokers. A predisposition gradient was also noted for the NVS index where those who started to smoke earliest (i.e., by 1989) had the weakest antismoking norms at the trial's outset. These findings suggest that predisposing attitudes toward smoking are strongly related to smoking behaviour.

These differences, however, do not test whether attitude *change* precedes or follows behaviour change. The approach here was to examine the attitude change of groups whose behaviour changed during the trial and compare that attitude change with those whose behaviour remained constant throughout. There were 32 hypothesis tests involved in this analysis. Of those tests, the majority 18 (56%) showed no evidence of an A-B effect while 7 (22%) indicated that the relationship was concurrent. Behaviour change preceded attitude change in 4 (13%) of the tests while attitude change preceded behaviour change in 3 (9%) of the tests.

We must be careful, however, to note the extent to which outcomes were methodological artifacts. That is, the directionality of the A-B relationship could be determined only by a subset of those 32 tests while the remainder are able only to test whether the A-B relationship is concurrent. Directionality was revealed in those cases where attitude and behaviour measurements were clearly separated in time. Attitude change following behaviour change could be tested from those who quit or started by 1989 (89-91 and 91-93 change scores), those who quit in 1990 (91-93 change scores) and those who quit or started by 1991 (91-93 change scores). Of the 14 such tests, 6 (43%) indicated an accelerated attitude change following a change in behaviour. Attitude change prior to behaviour change could be tested in those who quit in 1992 (89-91 change scores) and those who quit or started by 1993 (89-91 change scores). Of the 6 such tests, 3 (50%) indicated an accelerated attitude change prior to a behaviour change. The remainder of the tests were equivocal in terms of directionality, given the temporal overlap of attitude and behaviour measurements.

At this point it is prudent to ask two questions: 1) Is there a difference in outcomes between measures? and, 2) Is there a difference in outcomes between behaviours? Regarding the first question, we learned in Chapter Four that SPHP and NVS are correlated, however, the first part of this chapter demonstrated that NVS change was more strongly associated with behaviour change and less so with any other factors than SPHP. This might suggest a difference in the nature of the relationship between attitude change and behaviour change. Regarding the second question, one might suspect that the relationship between attitude change and behaviour change would differ for different types of behaviour changes The two behaviour changes considered here were quitting smoking and starting smoking. A large attitude change might not be necessary to quit smoking in this social climate that is generally supportive of nonsmoking. On the other hand, a large attitude shift might be required before or after starting smoking in the current social climate to reinforce the decision. The bottom line is that these behaviours are very different and have potentially very different implications for attitude change because of the social context in which they occur.

Consider the group who quit by 1993. The pattern for SPHP and NVS is very similar. Both show evidence of attitude change preceding behaviour change (89-91) and there is also evidence for attitudes and behaviours changing together (91-93). One noteworthy difference is the magnitude of the 89-91 NVS change score for the quitters versus the smokers throughout. This might suggest a clearer divide between quitters and continued smokers on NVS items like choice of seating in restaurants and allowing others to smoke in one's home and car.

There is evidence from both measures of concurrent shifts in attitudes and behaviours but more evidence to suggest that beliefs about smoking as a public health problem are apt to shift *following* quitting smoking. Questions on the SPHP index are largely linked to control of smoking in public places. A plausible explanation is that quitting smoking prompts stronger feelings about public control of smoking given a desire of recent quitters to avoid exposure to tobacco smoke after their quit decision.

Beliefs about smoking as a public health problem changed in a prosmoking direction for that group who started smoking in 1989. No other differences were detected for the starters on SPHP. This would suggest that changes in starters' beliefs about smoking as a public health problem between 1989 and 1993 were similar except for the accelerated shift evident for those who started in 1989. As was the case for quitters on NVS, the magnitude of difference between starters and nonsmokers is generally greater than for SPHP, suggesting that norms and values shift more strongly as a result of, or in advance of, a behaviour change. A strong shift towards more prosmoking norms occurred between 1989 and 1993 for the group who began smoking by 1993 Thus the results here support the assertion that beliefs shift following starting smoking while norms appear to shift in advance of starting smoking.

The findings here suggest that attitude change both precedes and follows behaviour change. It is worth noting that some of the difference tests, particularly for the quitters versus the smokers throughout, might not have been significant due to: 1) the general trend towards attitudes favouring nonsmoking even in smokers; 2) the addictive nature of tobacco which could allow smokers to hold strong antismoking attitudes while continuing to smoke. This

second point raises again the issue of the volitional control of behaviour in A-B research that was discussed earlier in the chapter.

The profile results provide empirical support for both Ajzen and Fishbein's theory of reasoned action and consistency theories; smoking attitudes are important antecedents to smoking behaviour and attitudes and behaviour appear to harmonize, thereby reducing cognitive dissonance. It could be the case then that the attitude-behaviour relationship continues to be under theorized or that our measurements of attitudes and behaviours are so problematic (see Pestello and Pestello, 1991; Nickerson, 1990) that even the best research designs cannot account for all the necessary contingencies. An important conclusion of this chapter is that the relationship between attitude change and behaviour change appears to be associated with both the type of attitude measure and the type of behaviour being measured. Systematic differences between SPHP and NVS in terms of the relationship between attitudes and behaviours were noted and it was also stressed that quitting smoking and starting smoking are very different types of behaviour given the social environment in which they occur.

One important critique of attitude-behaviour research has been offered by Zukier (1982). Zukier argues that behaviour is nonsensical without reference to context and that inconsistencies between attitudes and behaviour might be reduced by means of a context-sensitive analysis of attitudes. Socio-cultural context, he suggests, "is not the background but the matrix of behaviour." (p. 1076). The notion of the importance of context for the development of smoking attitudes and behaviour is addressed in Chapter Seven. That chapter

examines links between attitudes towards cigarette smoking and the social environments of the COMMIT communities.

Table 6.1 Hierarchical ANOVA Model with Dependent Variable: Change on Smoking as a Public Health Problem Index

Factor	F Value	Sig. of F
Main Effects		
Education Level	3.33	.04
Sex	2.50	.11
Behaviour Change	11.43	<.01
Intervention	0.77	38
Site	3.73	<.01
Covariate		
Age	0 02	90
2-Way Interaction Effects		
education * sex	0.18	.83
education*behaviour change	1.26	.27
education * intervention	3.35	.04
education * site	0.99	.47
sex * behaviour change	0.06	.98
sex * intervention	0.00	.95
sex * site	1.54	.12
behaviour change * intervention	1.45	.23
behaviour change * site	0.98	.50
intervention * site	0.73	.69

Table 6.2 Multiple Classification Analysis Results for Significant Main Effects (SPHP)

Grand Mean = 3.26

Variable & Category	n	Mean	Unadjusted Deviation	Deviation Adjusted for Independents and Covariates
Education				
less than high school	434	2.53	-0.73	-0.48
high school graduate	840	3.56	0.30	0.38
some college or more	2624	3.29	0.03	-0.04
Behaviour Change				
quitter	455	4.86	1 60	1.61
smoker	1319	2.91	-0.50	-0 36
starter	121	1 79	-1.47	-1.52
recent quitter/nonsmoker unchanged	2003	3.23	-0.03	-0.04
Site				
New York State	361	3.39	0.13	0.14
California	306	3.45	0.19	0.20
New York City	317	2 65	-0.63	-0.68
Ontario	444	2.32	-0.94	-0.99
New Jersey	247	2.09	-1.17	-1.15
Iowa	438	3.72	0.46	0.39
Washington	348	2.76	-0.50	-0.45
Massachusetts	389	3 83	0.57	0.51
North Carolina	359	3.68	0.42	0.47
New Mexico	323	3.11	-0.15	-0.03
Oregon	366	4.51	1.25	1.25

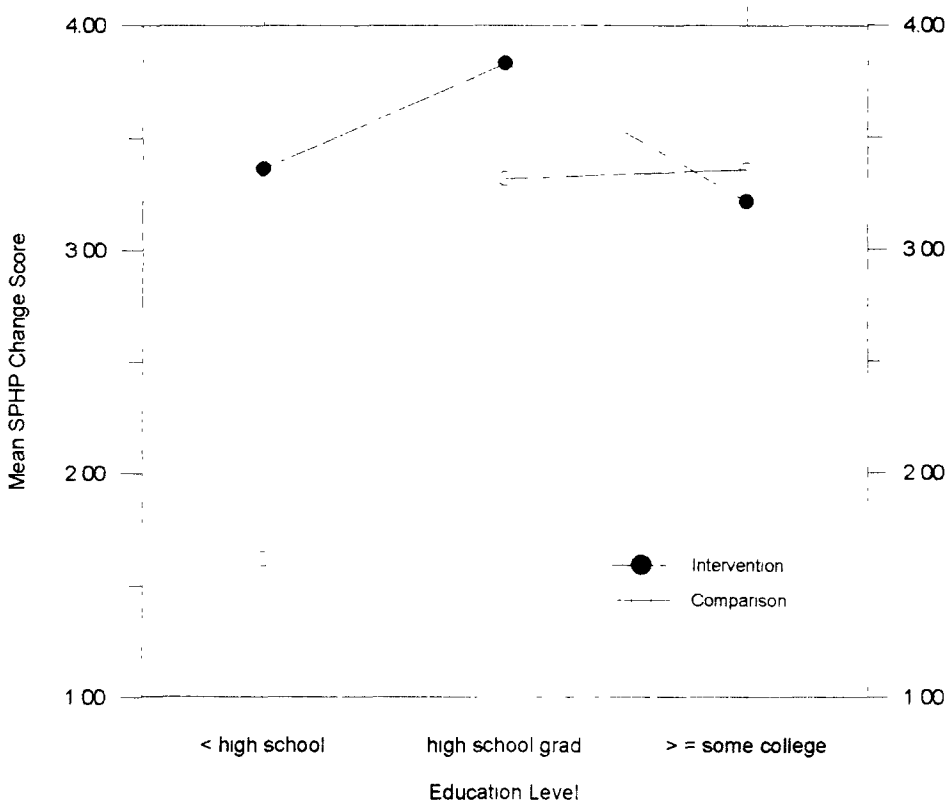

Figure 6.1 Mean Change on SPHP Based on Education Level for the Intervention Conditions

Table 6.3 Hierarchical ANOVA Model with Dependent Variable: Change on Norms and Values Index

Factor	F Value	Sig. of F
Main Effects		
Education Level	0.12	.89
Sex	2.29	.13
Behaviour Change	51.22	<.01
Intervention	0.04	.38
Site	0.78	.65
Covariate		
Age	.19	.67
2-Way Interaction Effects		
education * sex	0.28	.76
education*behaviour change	1.46	.19
education * intervention	0.45	.64
education * site	1.86	.01
sex * behaviour change	0.28	.84
sex * intervention	0.04	.84
sex * site	0.87	.56
behaviour change * intervention	0.10	.96
behaviour change * site	1.52	.04
intervention * site	0.78	.65

Table 6.4 Multiple Classification Analysis Results for Significant Main Effects (NVS)

Grand Mean = 1.36

Variable & Category	n	Mean	Unadjusted Deviation	Deviation Adjusted for Independents and Covariates
Behaviour Change				
quitter	322	3.76	2.40	2.41
smoker	997	0.82	-0.54	-0.54
starter	85	-1.03	-2.39	-2.38
recent quitter/nonsmoker unchanged	1463	1.33	-0.03	-0.02

Table 6.5 Profile Characteristics - Quitters vs. Smoked Throughout - SPHP Index

Profile	**n**	**Education** (% with at least high school education)	**Sex** (% female)
Quit by 1989	54	88.9	57.4
Quit in 1990	171	88.9	42.1
Quit by 1991	257	87.2	45.5
Quit in 1992	209	85.6	47.4
Quit by 1993	371	85.1	49.3
Smoked Throughout	1042	86.8	52.0
All (with valid scores on SPHP in 89, 91, & 93)	3303	89.7	51.3

Table 6.6 Profile Characteristics - Quitters vs. Smoked Throughout - NVS Index

Profile	**n**	**Education** (% with at least high school education)	**Sex** (% female)
Quit by 1989	42	88.3	59.5
Quit in 1990	120	90.0	50.0
Quit by 1991	183	88.5	49.7
Quit in 1992	120	88.3	48.3
Quit by 1993	226	86.8	52.3
Smoked Throughout	686	86.9	53 9
All (with valid scores on NVS in 89, 91, & 93)	2198	90.4	52.0

Table 6.7 Profile Characteristics - Starters vs. Nonsmokers Throughout - SPHP Index

Profile	**n**	**Education** (% with at least high school education)	**Sex** (% female)
Started by 1989	85	83.5	50.6
Started by 1991	112	84.8	53.6
Started by 1993	100	85.0	56.0
Nonsmoker Throughout	1656	93.3	51.3
All (with valid scores on SPHP in 89, 91, & 93)	3303	89.7	51.3

Table 6.8 Profile Characteristics - Starters vs. Nonsmokers Throughout - NVS Index

Profile	**n**	**Education** (% with at least high school education)	**Sex** (% female)
Started by 1989	65	84.6	52.3
Started by 1991	82	89.0	59.8
Started by 1993	66	89 1	60.6
Nonsmoker Throughout	1097	94.0	50.1
All (with valid scores on NVS in 89, 91, & 93)	2198	90.4	52.0

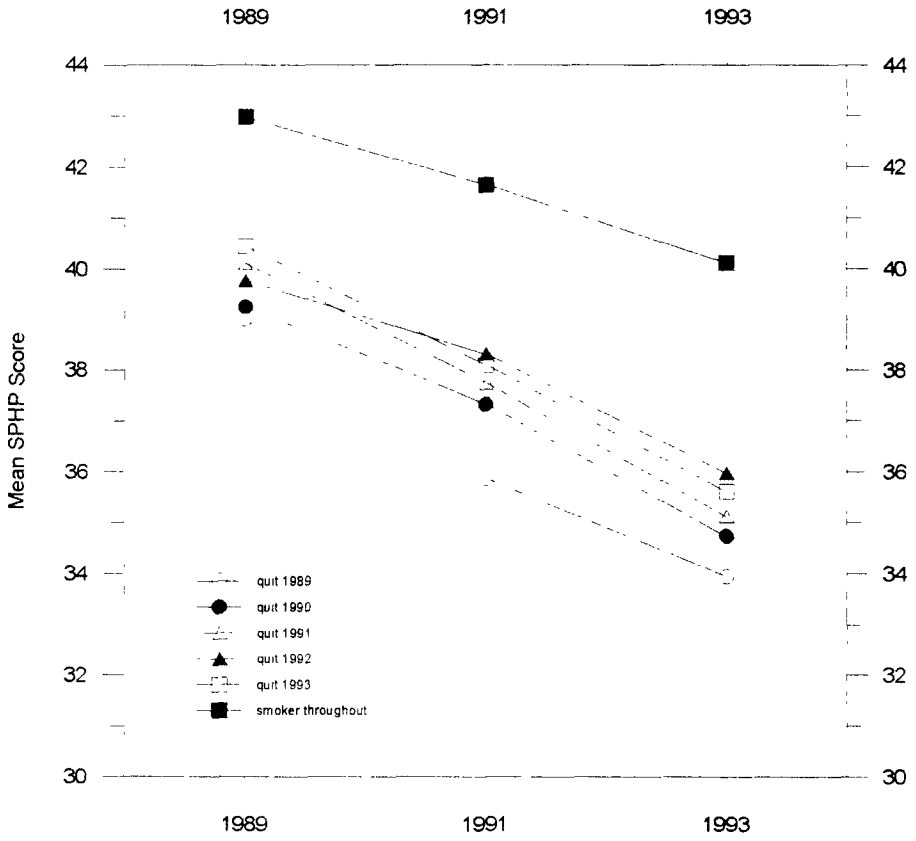

Figure 6.2 Attitude Profiles Quitters versus Smokers Throughout - SPHP Index

Table 6.9 Attitude Profiles (Quitters versus Smokers) - SPHP Index Mean Scores (with standard deviations shown)

Profile	**Change 89-91**	**t Score**	**Change 91-93**	**t Score**	**Evidence Suggests***
Quit 1989	3.15 (5.36)	2.40 P2= 01	1.91 (5.21)	0.53 P2=.30	B → A No Effect
Quit 1990	1.92 (8.50)	0.87 P2=.25	2.59 (6.07)	2.15 P2=.03	No Effect B → A
Quit 1991	2.38 (8.16)	1.91 P2=.05	2.61 (6.23)	2.55 P2<.01	A ↔B B → A
Quit 1992	1.46 (7.00)	0.62 P1=.30	2.33 (7.24)	1.49 P2=.10	No Effect No Effect
Quit 1993	2.35 (7.41)	2.35 P1<.01	2.49 (6 66)	2.49 P2<.01	A → B A ↔B
Smoker Throughout	**1.34** (6.22)		**1.52** (5 76)		

*

A → B: Evidence suggests that attitude change occurs before behaviour change.

B → A: Evidence suggests that behaviour change occurs before attitude change

A ↔B: Evidence suggests that attitudes and behaviour change concurrently.

No Effect: Evidence suggests no attitude - behaviour effects.

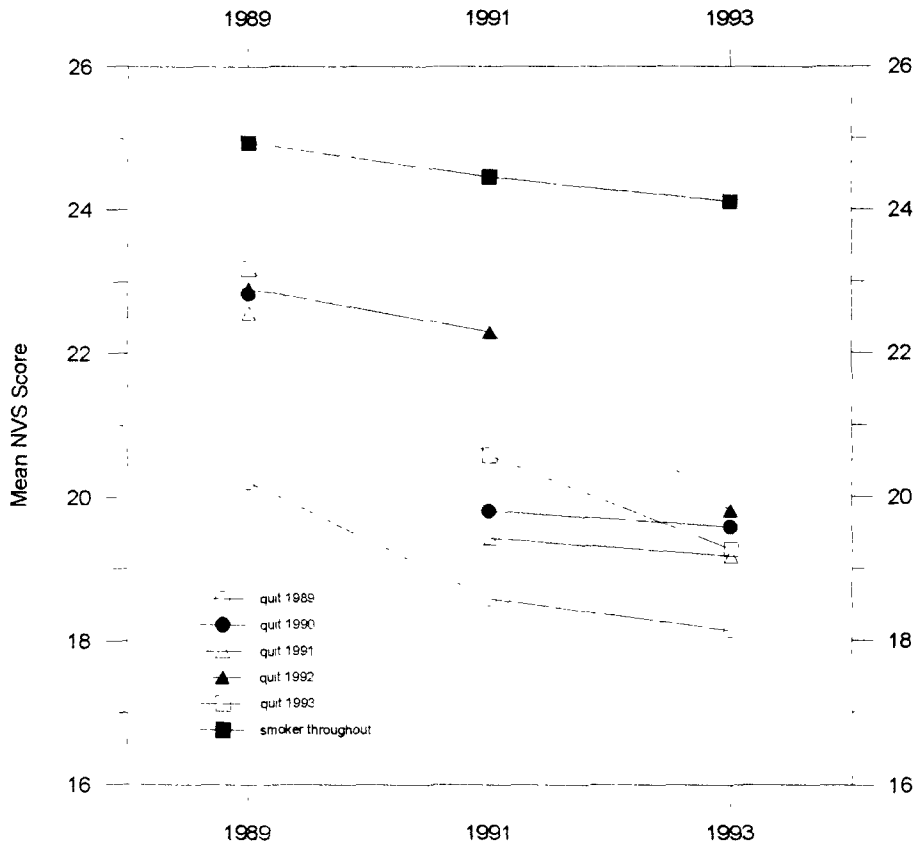

Figure 6.3 Attitude Profiles Quitters versus Smokers Throughout - NVS Index

Table 6.10 Attitude Profiles (Quitters versus Smokers) - NVS Index Mean Scores (with standard deviations shown)

Profile	**Change 89-91**	**t score**	**Change 91-93**	**t score**	**Evidence Suggests**
Quit 1989	1.64 (4.05)	1.80 P2=.10	0.43 (4.05)	0.12 P2=.30	No Effect No Effect
Quit 1990	3.03 (4.65)	5.63 P2<.01	0.22 (3.88)	-0.34 P2=.30	A↔B No Effect
Quit 1991	3.14 (4.48)	7.25 P2<.01	0.25 (4.13)	-0.29 P2=.30	A↔B No Effect
Quit 1992	0.61 (4.11)	0.32 P1=.30	2.48 (5.02)	4.40 P2<.01	No Effect A↔B
Quit 1993	2 61 (4.79)	5.99 P1<.01	1.31 (4.67)	2.77 P2<.01	A →B A↔B
Smoker Throughout	**0.48** (4.14)		**0.35** (4.06)		

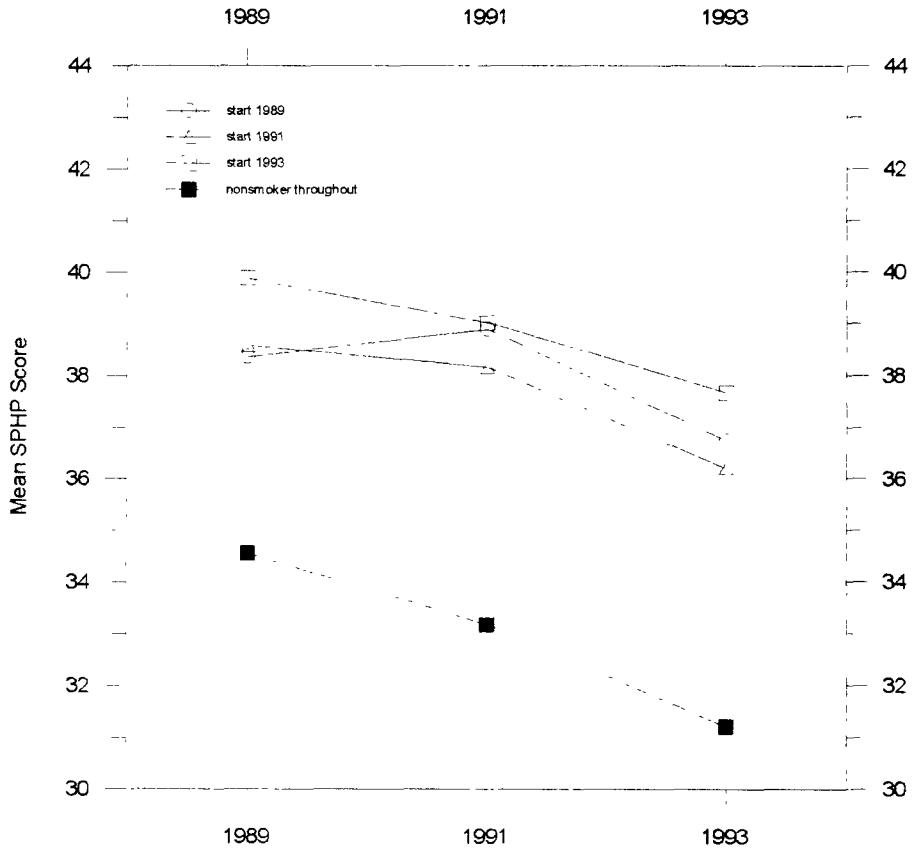

Figure 6.4 Attitude Profiles Starters versus Nonsmokers Throughout - SPHP Index

Table 6.11 Attitude Profiles (Starters versus Nonsmokers) - SPHP Index Mean Scores (with standard deviations shown)

Profile	**Change 89-91**	**t score**	**Change 91-93**	**t score**	**Evidence Suggests**
Start 1989	-0.53 (6.04)	-2.86 P2<.01	2.14 (5.46)	0.30 P2=.30	B →A No Effect
Start 1991	0.42 (7.26)	-1.39 P2=.10	1.96 (7.17)	0.00 P2=.99	No Effect No Effect
Start 1993	0.87 (5.83)	-0.87 1P=.30	1.34 (6.29)	-0.96 P2=.30	No Effect No Effect
Nonsmoker Throughout	**1.39** (5.93)		**1.96** (5 63)		

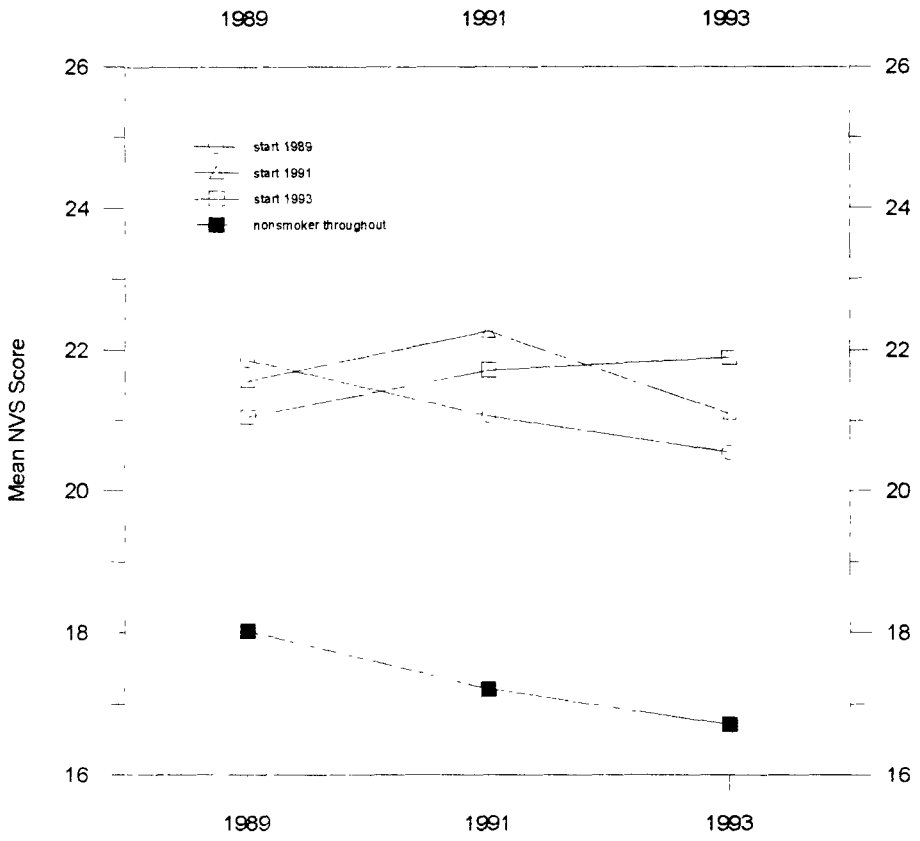

Figure 6.5 Attitude Profiles Starters versus Nonsmokers Throughout - NVS Index

Table 6.12 Attitude Profiles (Starters versus Nonsmokers) - NVS Index Mean Scores (with standard deviations shown)

Profile	**Change 89-91**	**t score**	**Change 91-93**	**t score**	**Evidence Suggests**
Start 1989	0.78 (3.62)	0 09 2P>.30	0.52 (3.82)	0.41 2P>.30	No Effect No Effect
Start 1991	-0.70 (4.06)	-3.30 2P<.01	1.16 (4.21)	1.39 2P=.10	A↔B No Effect
Start 1993	-0.67 (3.28)	-3.69 1P<.01	-0.18 (3.92)	-1.37 2P=.10	A→B No Effect
Nonsmoker Throughout	**0.82** 3.42		**0.50** (3.23)		

CHAPTER SEVEN

TOWARDS AN UNDERSTANDING OF COMMUNITY VARIATION IN SMOKING ATTITUDES

7.1 Introduction

The decline in smoking prevalence over the past three decades has been one of the most obvious social changes of recent times in North America. This decline, however, has been more pronounced in certain regions than in others. For example, while Canada's overall smoking rate was approximately 29% in 1990, within Canada provinces such as Quebec (34%) and Newfoundland (32%) had rates well above the national average while British Columbia (26%) and Ontario (27%) had rates below the national average (Pederson, 1993). Recall that smoking prevalence at baseline in the 22 COMMIT communities varied from a low of 22.6 % in Las Cruces, New Mexico to a high of 35.2% in Brantford, Ontario (Table 3.1). It may be argued that attitudes toward cigarette smoking also vary across space and not just over time (i.e., the social acceptability of cigarette smoking has declined since the mid-1960's (USDHHS, 1989)).

7.2 Questions Posed in this Chapter

If the notion that health behaviours are just the outcomes of personal choices is rejected in favour of the viewpoint that behaviour is more closely connected to the broader social world, then an investigation into the contextual variation of attitudes becomes an important pursuit. Community-based approaches to health promotion presuppose that shared attitudes about the appropriateness of behaviours have significant and enduring effects upon individual attitudes and, in turn, individual behaviours (Brown, 1991; Bract, 1990). The policy environments of communities and states or provinces are thought to be concrete expressions of those shared beliefs (Barnett, 1993; Meisenhelder, 1981) and thus potentially powerful tools for furthering social change (USDHHS, 1989). Evidence also suggests that after controlling for other factors that affect cigarette consumption, such as socio-economic status and taxation level, restrictions on smoking in public places have significant effects on cigarette smoking (Wasserman et al., 1991). Empirical support for community-level influences on attitudes, however, is not well established (Curry et al., 1993; Gotestam and Gotestam, 1992) largely due to the scarcity of reliable data.

A potentially powerful community-level influence on smoking attitudes and behaviour is legislation (McKinlay, 1993). Antismoking legislation has existed in North American since the turn of the century (Wagner, 1971; Taylor, 1984; Grossman and Price, 1992). An underlying assumption of this chapter is that legislation is a concrete reflection of a group's (i.e., community, state/province, nation) collective opinions about unacceptable actions. The work here is thus supportive of Barnett's (1992) thesis that the links between societal conditions and law are strong and pervasive. Put more formally, Kenneth Burke's sociology

of law would suggest that the law is a "set of shared meanings, that categorize and interpret the elements of social life in such a way that results in a sense of the presence of a "just" social order." (Meisenhelder, 1981, p. 48) This sense of presence of a "just" social order may influence attitudes without first changing behaviour - this is the intention of planned socio-political change; that the passage of laws to restrict behaviours like smoking will lead to attitudes and behaviours aligning with the legislation. The goals of the laws that restrict smoking in public places (Clean Air Acts in the U.S.) have grown out of an interest in protecting individuals from environmental tobacco smoke (Goodin, 1989) but the U.S. Surgeon General's Report adds that these laws "may also contribute to reductions in smoking prevalence by changing the attitudes and behaviour of current and potential smokers." (USDHHS, 1989, p. 28)

The extent of the effects of smoking legislation on the attitudes of individuals has not been well established (USDHHS, 1989). A Norwegian study reported that legislative changes and attitude campaigns in that country during the 1980s produced positive attitudes toward the regulations yet smoking prevalence increased during the same time period! (Gotestam and Gotestam, 1992) The authors lament that "positive attitudes may be a good ground for later behaviour change, but probably it is more effective to change the behaviour first, and the attitudes will follow." (p. 534)

The intervention had a moderate effect on both behaviour (COMMIT Research Group 1995a,b) and attitudes (Chapter Five). No intervention-induced change was detected for the targeted heavy smokers but statistically significant differences in quit rates were noted for light-to-moderate smokers. While all communities showed attitude change favouring

nonsmoking between 1989 and 1993, the incremental effect of COMMIT was modest and limited primarily to changes in heavy smokers' beliefs about smoking as a public health problem. There were no community-wide effects of the trial on smoking attitudes with the result that across the 11 pairs of communities, between-site variation in 1993 was approximately equivalent to the between-site variation at the outset of the trial. The COMMIT data provide a unique opportunity to examine the attitudes toward smoking of a geographically diverse group of communities in 1989, before the start of intervention activities. The choice of 1989 is fortuitous in that The Association of State and Territorial Health Officials (ASTHO) conducted an extensive survey of state policies and public health activities regarding tobacco control that same year (CDC, 1991b). These data provide an important benchmark for the comparison of state legislative and economic environments at the baseline of the COMMIT trial. Thus the salient questions for the geographical perspective on COMMIT become, "What is the extent of between-community variation at the outset of the trial? How can we account for this variation?" These questions are linked to the fifth and final thesis objective of describing the role of community context in shaping attitudes and to begin to account for the geographic variability in attitudes in the COMMIT communities.

7.3 General Approach

The purpose of this chapter is to explore and offer possible explanations for spatial variations in smoking attitudes. The points of departure for examining these variations are analyses at the individual level. These examinations, employing ANOVA techniques, test the assumptions that 'site' (e.g., state or province) and community-level attitudes are important

factors accounting for variation in individual attitudes toward smoking (controlling for individual smoking behaviour and socio-demographics.) In the ANOVA analyses of Chapter Six, the outcome variables were *changes* in attitudes towards smoking. In this chapter, the outcome variables are attitude scores at the outset of the trial in 1989. It was suggested in the conceptual model of Chapter Three that individual and community attributes contribute to individual attitude scores at baseline which in turn affect attitude and behaviour changes. Community-based approaches to health promotion presuppose that shared attitudes about the appropriateness of behaviours have significant and enduring effects upon individual attitudes and, in turn, individual behaviours (Bract, 1990). Empirical support for community-level influences on individual attitudes is, however, not well established (Curry et al., 1993). Thus the individual-level analyses are performed in an effort to test the empirical validity of the community-based health promotion assumption.

The second step involved a detailed consideration of COMMIT communities displaying comparatively large variation in attitudes in 1989 as informed by the ANOVA results and the community attitude estimates. The source of the community information is a series of community profiles prepared by research centres overseeing activities in local community pairs. Social and demographic particulars are provided in the profiles along with details of local and state/provincial level tobacco control efforts and more anecdotal comments aimed at conveying the overall socio-political character of the communities. The profiles, completed in the autumn of 1987, provide a portrait of the COMMIT sites and communities before the trial began and are thereby appropriate for investigating community links to pre-trial attitudes toward smoking.

In addition to the community profiles, legislative data were collected annually between 1988 and 1992 in each COMMIT community. Issues that have dominated recent smoking policy debates in both the U.S. and Canada include taxation, restriction of advertising and promotion of tobacco products (including packaging and labeling restrictions and sponsorship restrictions), control of smoking in public places and control of youth access to tobacco (USDHHS, 1989; National Clearinghouse on Tobacco and Health, 1995). The legislative documentation provides an additional source of information on the socio-political environment of the COMMIT communities and is used to further describe the community contexts. These legislative records and profiles provided detailed accounts for the communities before the trial began, allowing for inferences about the nature of community differences that lead to variation in attitudes toward smoking. The COMMIT records are further supplemented with published data from the ASTHO Survey.

7.4 Results

7.4.1 Between-Site variation - ANOVA Analyses of the Evaluation Cohort Data

Analyses of differences between groups in their attitudes towards cigarette smoking in 1989 are presented in this section. The data come from the 1989 Evaluation Cohort survey (n = 5450). The hierarchical ordering of factors in the ANOVA models that follow reflect the principal purpose of these individual-level analyses: to assess the importance of 'place' in accounting for individual variation in attitude scores while adjusting for the effects of personal characteristics such as smoking status, education and sex. We know from Chapters Four and Five that there is a clear relationship between smoking status and scores on both the

SPHP and NVS indices. Educational status is the most important socio-demographic predictor of smoking status (Escobeda et al., 1990; Fiore et al., 1989). Indeed Winkleby et al. (1992) have concluded that education level is the most reliable proxy for socio-economic status in health studies. It has been suggested that education may be linked to attitudes and values that predispose a person to accept or reject warnings about tobacco use and might further reflect exposure to antismoking messages (CDC, 1990). Overall, men smokers still outnumber women smokers in both the U.S. (Pierce, 1989) and Canada (Pederson, 1993) but the rate of decline has been greater for men (Fiore et al., 1989). Sorensen and Pechacek (1987) noted some differences between men and women in their attitudes toward smoking cessation. In their study of Minnesota worksites, they found that women were less likely to perceive the health benefits of quitting and expressed more concern about weight gain and job pressures related to quitting. Given the gendered nature of both smoking and smoking cessation, it is prudent to include sex as a factor in the ANOVAs.

7.4.2 ANOVA - SPHP 1989

The ANOVA results and the corresponding multiple classification analysis (MCA) for SPHP appear in Tables 7.1 and 7.2, respectively. Beliefs about smoking as a public health problem clearly differed in 1989 for smoking groups, groups defined by education level, men and women and geographic location ($P < .01$). Intervention groups also had different beliefs about smoking as a public health problem at the start of the trial ($P < .01$) which corroborates the finding from Chapter Four that the intervention communities began the trial with attitudes

more favourable to nonsmoking than did comparison communities. Age of respondents in the evaluation cohort (entered as a covariate) did not have any effect on SPHP scores.

The directions and magnitudes of these main factor differences were assessed in the MCA analysis (Table 7.2) The largest deviations occurred for the baseline smoking status factor with the categories of heavy smokers and nonsmokers displaying the largest adjusted departures from the grand mean (5.11 and -4.88, respectively). The directions of these differences suggested that, as expected and shown in previous chapters, smokers (heavy and light-to-moderate) considered smoking to be a less serious public health problem in 1989 than did recent quitters and nonsmokers in the COMMIT communities. Groups showing negative deviations from the grand mean (i.e., relatively stronger antismoking attitudes) were those with less than high school education, women and respondents from Washington State and New Jersey. Respondents from North Carolina and Iowa had the strongest relative prosmoking attitudes in 1989 (deviations of 3.22 and 1.55, respectively).

Also noteworthy were the significant interaction effects between baseline smoking status and sex, education level and sex, and site and intervention (Table 7.1). Men and women smokers (heavy and light-to-moderate) appeared to share similar beliefs about smoking as a public health problem in 1989 while women nonsmokers (recent quitters and nonsmokers) held stronger antismoking attitudes than men as measured by SPHP in 1989. Women who did not graduate from high school had stronger prosmoking attitudes than their male counterparts but female high school graduates and those with some college education had stronger antismoking attitudes than men with equivalent education levels. Note that the significant

interaction effects involving the education variable make it difficult to interpret the main effects for education.

The interaction effect between site and intervention confirms the relatively advantageous starting position that many of the intervention communities enjoyed at the outset of the trial Nine out of the 11 sites had intervention communities held attitudes relatively unfavourable to smoking in 1989 (the two exceptions were the New York State site and the Massachusetts site). Large starting differences in favour of the intervention communities were seen in New Jersey, Washington, North Carolina and New Mexico

7.4.3 ANOVA - NVS 1989

The corresponding ANOVA results for NVS appear in Tables 7.3 and 7.4. Again, baseline smoking status, education level, site and the intervention are significant main effects Sex, however, is not an important factor but the covariate age is significant in the NVS model. The MCA analysis (Table 7.4) revealed that the direction of differences between categories within factors is similar to the SPHP ANOVA for baseline smoking status and the intervention. One key difference is the deviations from the grand mean for the education level factor. For NVS, the negative deviation occurred for the highest education category, indicating that those with the most education share norms and values that are relatively more favourable to nonsmoking than those with less education. Recall that the finding was reversed for SPHP. Again, the presence of interaction effects for the education variable complicates the interpretation of main effects. Sites which displayed the strongest prosmoking norms were

again North Carolina and Iowa while those with norms most supportive of nonsmoking were Washington State and Oregon

The significant interaction effects for the NVS ANOVA were between baseline smoking status and sex and between education level and intervention condition. Women smokers had norms and values more supportive of smoking than did male smokers while female nonsmokers had stronger antismoking norms and values than male nonsmokers. The interaction effect between the intervention and education level shows that individuals from the comparison communities had norms and values more supportive of smoking at each education level but that this discrepancy was most pronounced for those with less than high school education.

Similar to the attitude change analysis of Chapter Six, the above results demonstrated that attitude scores differ significantly by social grouping and by geographic location. The most obvious differences occurred by smoking group with heavy and light-to-moderate smokers displaying attitudes less favourable to nonsmoking and recent quitters and nonsmokers attitudes more favourable to nonsmoking. The principal purpose of the ANOVA modeling using 1989 data from the evaluation cohort, however, was to determine the extent to which geographical variation in attitudes remains after accounting for individual socio-demographics. Indeed "site" was an important factor in both the SPHP and NVS analyses suggesting that attitudes toward smoking differed significantly between COMMIT sites at the outset of the trial. Individuals from North Carolina and from Iowa clearly had different attitudes towards cigarette smoking than did individuals from Washington State. Differences between individuals from various geographic regions in attitudes towards a risky behaviour

like cigarette smoking suggest that individual differences in risk interpretation are to some degree "place-specific". The ANOVA approach allowed for the identification of the relative importance of place as a factor in an individual's attitude score while adjusting for the effects of smoking status, education level and sex.

7.4.4 Within-Site Variation - Evaluation Cohort

The ANOVA analyses were repeated using a variable for each community (n = 22) to reveal any within-site variations in smoking attitudes. Community main effects were significant for both SPHP and NVS ($P2 < .01$) after again controlling for smoking status, education, and sex. The multiple classification analyses for SPHP and NVS using the community variable are shown in Tables 7.5 and 7.6, respectively.

For SPHP, the communities with large adjusted deviations in the antismoking direction were Paterson, New Jersey, (-2.99), Bellingham, Washington, (-2.79), Vallejo, California (-1.26), and Santa Fe, New Mexico (-1.21). The communities with the least concern about smoking as a public health problem were Greensboro (4.31) and Raleigh (2.15), North Carolina and Davenport (1.61) and Cedar Rapids (1.48), Iowa. The communities with the largest adjusted deviations in the antismoking direction on the NVS index were Bellingham, Washington (-1.44), Medford/Ashland, Oregon (-0.90), Santa Fe, New Mexico (-0.64), and Longview/Kelso, Washington (-0.57). The weakest antismoking norms were measured in Greensboro (1.88) and Raleigh (1.07), North Carolina, Cedar Rapids, Iowa (1.02) and Trenton, New Jersey (0.46).

These deviations suggest identifiable differences between individual communities (i.e., beyond the 'site' level) in their beliefs about smoking as a public health problem and norms and values regarding smoking. Differences between selected community pairs will be examined as part of the analysis of the community profiles and legislative data.

7.5 Between and Within-Site Variations in Attitudes Toward Smoking - Evidence From the Community Profiles and Legislative Records

The mean community (i.e., prevalence estimates) attitude scores in 1989 and 1993 SPHP and NVS are displayed in Figures 7.1 and 7.2. There are several important observations that can be made from these figures. First of all, the patterns of variation for both 1989 and 1993 were approximately equal for both indices, reinforcing the point made above that it is useful to consider the 1989 geographical variations because their relative patterns are maintained in 1993. All communities had lower attitude scores in 1993 on both measures which indicated a shift in all communities towards attitudes favouring nonsmoking. In 1989, the community with the least concern about smoking as a public health issue was Greensboro, North Carolina (mean = 40.23) with its paired community Raleigh scoring the next to least amount of concern (mean = 39.04). Paterson, New Jersey (mean = 33.82) was the community with the strongest sentiments about smoking as a public health problem, with Bellingham, Washington (mean = 33.95) scoring a similar mark on the SPHP index. Communities with norms and values least supportive of nonsmoking in 1989 were Greensboro (mean = 21.52), Lowell, Massachusetts (mean = 21.22), Peterborough, Ontario (mean = 21.09) and, Raleigh

(mean = 21.00). Communities with norms most supportive of nonsmoking were Santa Fe, New Mexico (mean = 18.92) and Bellingham (mean = 18.59).

From these observations and the ANOVA results it appears that some of the more interesting sites to consider for more indepth examinations are North Carolina, Iowa, Washington State, New Jersey, and New Mexico. These were chosen based on their variations from the overall SPHP and NVS scores (between site variation), the variations exhibited between the community pairs within the sites, and the geographic diversity covered by these selections.

North Carolina

The most obvious variation in the 1989 COMMIT attitude data (both from the evaluation cohort and from the attitude prevalence data) is the higher prosmoking attitudes of the two communities in North Carolina. The COMMIT findings reported here correspond well to the studies by Green and Gerken (1989) and Dixon et al. (1991) which compared statewide attitudes toward tobacco use from a mid-west state (Illinois) and the leading U.S. tobacco producing state (North Carolina). In their studies, Illinois residents were more inclined to favour restrictions of smoking in public places and decreased federal support to tobacco farmers than the "tobacco state". Indeed, profiting from tobacco was the strongest predictor of smoking attitudes in their studies.

The geographic and economic factors that led to the tobacco empire in North Carolina leave a legacy of strong present-day corporate influence by tobacco producers. Grossman and Price (1992) recount the historical development of tobacco production in North Carolina.

They explain that the sandy soils around Durham were found to be especially well-suited for growing the popular light-yellow tobacco know as Bright. At the end of the American Civil War, so the story goes, Washington Duke returned home to his farm near Durham and began growing the Bright tobacco. His son James Buchanan Duke initiated the large-scale production of cigarettes, first by employing many skilled cigarette rollers and later by means of a newly-invented cigarette making machine. By 1884 the machine was able to produce 120,000 cigarettes per day (Wagner, 1971). Other cigarette makers could not match Duke's economies of scale and instead of fighting him, the five leading companies joined together in 1890 to become the American Tobacco Company (ATC) under Duke's leadership. Not long afterward ATC's interest in the British market led to a defensive amalgamation of the thirteen leading British companies under the umbrella company of Imperial Tobacco. Rather than starting a trade war, the American Tobacco Company and Imperial Tobacco merged to form the British-American Tobacco Company led again by Duke. American anti-trust legislation (the Sherman Antitrust Act) eventually forced the break-up of the tobacco conglomerate in 1911. The product of the break-up was four competing companies: American Tobacco, R.J. Reynolds, Lorillard, and Liggett & Myers which accounted for ninety-two percent of the U.S. cigarette market (Wagner, 1971; Doron, 1979).

This brief history of the rise of cigarette manufacturing in the United States and the central role played by North Carolina provides an important context for the understanding of attitudes towards cigarette smoking in that state. The community profiles report that, "in 1983, tobacco was directly and indirectly responsible for an estimated 147,000 jobs with a payroll of $1.6 billion." (Research Triangle Institute, 1987, p. 1) The tobacco industry further

supports many state cultural, sports and educational activities. The authors of the community profile give the example that North Carolina State University in Raleigh receives millions of dollars annually from the industry in support of tobacco research.

In terms of its legislative environment, North Carolina has the lowest state excise tax on cigarettes in the U.S. (Table 7.7). A state bill specifying raising the state excise tax from 2 cents (unchanged since its inception in 1969) to 6 cents was defeated in the state legislature in 1989. At this time a "clincher motion" was adopted which required a two-third majority in the Senate to ever bring the matter up again in the future. There are no state laws restricting smoking in public places in North Carolina excepting a statute prohibiting the sale of tobacco products to minors under 17 years of age. State law did not preempt local legislation in 1989 but neither Raleigh nor Greensboro had local smoking restrictions in place at that time.

In 1989 Greensboro proposed an ordinance that would require all restaurants seating more than 50 to maintain a nonsmoking section (25 percent of dining area) and to prohibit smoking in retail and grocery stores. The city ordinance was approved by referendum in 1989 and became effective in 1990. As soon as the law took effect, however, a citizen's group in Greensboro began collecting signatures to instigate a repeal referendum. While the group gathered enough signatures to force another referendum, a majority of Greensboro residents again voted in favour of the mandatory city ordinance.

Resistance to citywide restrictions against smoking in public places in Raleigh came not from the residents but from the Restaurant Owners' Association and the Chamber of Commerce (Carrell et al., 1995). The citywide restrictions in Raleigh were not passed until

1991 but they were some of the strongest in the country at the time. The smoking ban included enclosed entertainment venues, sports arenas, schools, shopping malls, elevators, health care facilities, pharmacies, public washrooms and public transportation. The tobacco industry did not launch an attack on the stringent local legislation as all State government buildings were strategically excluded from the provisions of the ordinance. Carrell et al. (1995) explain that had the Raleigh ordinance included State buildings, "the tobacco industry would have had an opportunity to redefine the issue as a State issue and unleash its lobbying machinery . . ." (p. 108-9)

The different experiences the cities of Greensboro and Raleigh had passing similar local smoking control ordinances highlights the existence of within-state variation in attitudes towards tobacco control. The COMMIT communities in North Carolina clearly had weaker antitobacco sentiments than communities within other sites in the trial. Within the North Carolina site, however, Greensboro scored higher on both SPHP and NVS than did Raleigh and smoking prevalence at baseline in Greensboro was 29 percent compared to Raleigh's 25 percent. Community-specific characteristics from the community profiles are investigated next with these differences between the two communities in attitude scores and legislative experience in mind.

The COMMIT communities of North Carolina generally reflect a lower socio-economic status and more multi-racial composition than do many of the other COMMIT sites. The population of Raleigh in the 1980s was 70 % white, 27 % black and 9 % Hispanic origin with the comparable figures for Greensboro at 66 % white, 33 % black and 7 % Hispanic Still, Raleigh and Greensboro, while located only 120 km apart along North Carolina's "urban

crescent", differ in their employment and economic profiles. Raleigh is the capital of North Carolina and is a centre for educational excellence with North Carolina State University and Shaw University located within Raleigh. Duke University in Durham, North Carolina and UNC Chapel Hill are both within commuting distance of the capital. One-third of the population of Raleigh has 16 or more years of education and while traditionally dependent on tobacco, furniture and textiles, "research-minded, high technology companies have been actively recruited" (Research Triangle Institute, 1987, p. 7) to replace the traditional employers. One unmistakable feature of the Raleigh economy is the presence of the Research Triangle Park, a research and development campus, which employs approximately 27,000 persons in 47 governmental and industrial firms. Research Triangle Park had the highest concentration of Ph.D.'s in the workplace in the U.S. at the time the community profiles were completed in 1987.

As of the late 1980s, however, Greensboro's economy continued to be rooted in textiles and agriculture. The two largest employers in the city were Cone Mills textiles and Lorillard tobacco, each employing 3,500 workers. There are two universities in Greensboro, UNC at Greensboro and NC A&T State University, but these are much smaller in terms of employment and enrollment than are the universities in and around Raleigh. It followed that the population of Greensboro was less well-educated than Raleigh's with less than 25 % of Greensboro's population having more than 16 years of education.

There were comments in the community profiles suggesting that employees of Lorillard would oppose any worksite smoking cessation program in their plant and that it would be impractical to attempt any intervention strategies there. Additionally in Greensboro,

there was concern about an executive level "corporate buddy" barrier to smoking cessation programs at textile and other large manufacturing firms. The authors write: "Many CEOs, especially textile and other large manufacturers, do not want to offend their tobacco friends. While allowing cessation to be offered to employees, many CEOs are reluctant to establish a smoking policy or to receive public recognition for efforts in the area." (Research Triangle Institute, 1987, p. 18) As an example of how strong this pressure can be, in 1986 one of the city's largest textile manufacturers publicly announced a smoke-free workplace policy but pressure from tobacco interests resulted in a swift change of this policy.

There is no evidence in the North Carolina community profiles that COMMIT researchers were concerned about the "corporate buddy" barrier in Raleigh. The authors noted, however, that the Great American Smokeout (GASO) is not promoted by the city of Raleigh because of political considerations (in contrast, the GASO model in Greensboro serves as the model for all other state health units and receives community-wide publicity!) The state of North Carolina is Raleigh's largest employer yet "the city manager does not allow promotion of the Great American Smokeout, nor will he allow the City Wellness Coordinator to offer smoking cessation as part of the program." (p. 22) The city of Raleigh, in its role as capital of the "tobacco state", is described as "cautious" towards the promotion of cessation or smoke-free areas.

The salient socio-economic and political features of the two North Carolina COMMIT communities have been extracted and condensed from the community profile. At the outset of the trial, Raleigh, the intervention community, was in a relatively advantageous position. It had both a lower smoking prevalence and attitudes more favourable to nonsmoking than

did its matched comparison community, Greensboro. Trying to piece together some of the possible reasons for these within-site differences present at the outset of the trial, the discussion emphasized the economic contrasts between Raleigh and Greensboro. Raleigh's economy had diversified from tobacco and textiles during the 1980s with the result that fewer people employed in Raleigh were directly affected by the tobacco industry. The argument put forth by Dixon et al. (1991) can be extended in this examination of within-state variations in attitudes toward smoking. In their comparison between Illinois and North Carolina, they concluded that, "clearly, those respondents who personally profit from the manufacture or sale of tobacco products have the highest economic stakes in tobacco policy and are more likely to view most smoking issues from a pro-tobacco perspective." (p. 251)

Iowa

COMMIT's Iowa communities of Cedar Rapids (intervention) and Davenport (comparison) were chosen for further investigation because of their relatively favourable attitudes toward smoking, supported by findings from both the ANOVA models and the community-level attitude scores. Iowa's economy is not supported by tobacco revenue so the self-interest explanation invoked to account for North Carolina's strong pro-tobacco stance is not applicable here. Smoking prevalences at baseline in Cedar Rapids (27 percent) and Davenport (29 percent) were not substantially different from the mean for the COMMIT communities of 29 per cent. The community profiles for the Iowa communities begin with the comment that, "Historically, the social climate in Iowa hasn't encouraged cigarette smoking. Iowa once prohibited the sale of cigarettes and was the first state to have a cigarette excise

tax." (Ferguson et al., 1987, p. 2) These remarks are somewhat perplexing in light of findings from the Iowa COMMIT attitude surveys. So what is it about Iowa that might account for the prosmoking sentiments?

The legislative environment of Iowa is relatively strict by U.S. standards (Table 7.7). Iowa's Clean Indoor Air Act, which came into effect in 1987, restricts smoking in all public places unless specifically permitted. In 1989 an amendment to the Clean Indoor Air Act was proposed which would include restaurants in the definition of public places and increase the penalty to $50.00 (up from $10.00) per violation. An amendment passed in 1990 saw the fine increased to $25.00 and smoking only permitted in designated areas of restaurants and public areas (greater than 250 square feet). By 1991, the Adolescent Smoking Prevention Act was passed and implemented statewide in Iowa. This very restrictive Act prohibits adolescent smoking and purchase of tobacco products. In the same year, the Iowa legislature raised the state cigarette tax from 31 cents to 36 cents per package - well above the U.S. average of 23 cents per package. It would appear as though the legislative environment in Iowa would be supportive of stronger antismoking sentiments than seen in the COMMIT attitude data.

While extensive smoking control laws existed at the state level, Iowa smoking control legislation allows state law to preempt (i.e., take precedence over) stricter local ordinances. This limits the possibility for any grass-roots movements to propose and enforce additional tobacco control measures. Comments in the community profiles also suggest that smoking legislation in Iowa is largely symbolic; enforcement is minimal and voluntary compliance is expected. Columbotos (1969), in a review of the conditions for effectiveness of law, notes that for legislation to have an impact on attitudes and behaviour, it must meet three

conditions. First, the legislation must be compatible with existing values. Second, it must be enforceable and third, the authorities responsible must be fully committed to enforcing the law. Iowa does not appear to meet the third of these conditions which could account for some of the attitude leniency toward tobacco.

There is an element of attitudes towards smoking not linked to personal behaviour and self-interest highlighted by the Iowa example. The two Iowa communities had the highest prosmoking scores on the smoking control in public places subconstruct and the third highest scores on the legislative control subconstruct in 1989. The mean score of the two Iowa communities was below the COMMIT mean (an antismoking position) on the belief in the harmfulness of smoking and risks of secondhand smoke subconstructs. Thus the favourable-to-smoking sentiments of Iowans are not linked to ignorance of the dangers of tobacco but rather to an aversion to regulation restricting individual behaviour.

It could be inferred that underlying these sentiments is a libertarian or "free to be foolish" (Leichter, 1991) political orientation. Such an orientation resists the use of regulation to cajole individuals into changing even risky behaviours on the grounds that they infringe on personal rights and freedoms. Jacobson et al. (1993) suggest that beginning in the mid- to late 1980s in the U.S. there appeared to be a secular shift in the nature of the tobacco debate away from the scientific evidence about the health effects of smoking toward debates over individual liberties. These authors further point out that "the personal freedoms arguments appeal to an unusual coalition of nontraditional allies including civil liberties advocates, who are usually devoted to individual liberties; libertarian, who believe in minimal government

interference with personal decisions; and conservatives, who generally support business interests." (p. 802)

The political landscape of Iowa which includes strong libertarian and conservative elements (Ferguson, 1995) suggests that the personal freedoms arguments would resonate well with Iowa residents. Historically, Iowa has favoured preemption of local legislation which would further point to a reluctance on the part of Davenport and Cedar Rapids residents to advocate increasingly restrictive antitobacco measures in their communities. In the case of the Iowa COMMIT communities, relatively favourable attitudes towards smoking coexisted alongside strong state-wide legislation and high tobacco taxation at trial baseline. Two general lines of reasoning have been suggested for this apparent contradiction. The first is that the preemptive nature of the state law and the general lack of enthusiasm to enforce it locally allow for the law to have very little impact on attitudes and behaviours at the community level. The second is that the political environment of the state of Iowa is especially responsive to the repackaging of the tobacco debate around the issue of individual rights and freedoms. Together these suggest that prosmoking attitudes need not be linked to self-interest as in the case of the North Carolina communities, but rather to the nature of the legislative and political environments.

Washington State

The Washington State communities of Bellingham and Longview/Kelso had relatively strong antismoking attitudes which were shared by the communities from other west-coast COMMIT sites. California, for example, had some of the strictest smoking regulations in the

U.S. at the time of the community profile preparation (Wallack et al., 1987). California state law allows local communities to pass ordinances which reflect their unique local sentiments regarding smoking. By 1989 there were 171 local ordinances in California accounting for 35 percent of the U.S. total (Table 7.7). Taylor (1984) recounts the modest beginnings of the California legislative fervor. In the mid-1970s a small group of professionals, exposed to radical politics on California campuses less than a decade earlier, were concerned enough about environmental tobacco smoke to get a local law passed in the Berkeley City Council. The group grew in size and political power and eventually fought for state-wide legislation.

Similarly, nearby Oregon has "a national reputation for supporting and encouraging the adoption and maintenance of healthy lifestyles." (Nettekoven et al., 1987, p. 3) Henderson (1987) characterized the Washington COMMIT communities as reflecting "the state's generally high level of citizen activism in environmental and health affairs." (p. 2) The west coast states represent a clear departure from southeast state and mid-west state characteristics already examined. In general there appears to be a stronger commitment to health and environmental issues on the west coast than in other U.S. areas.

What makes the Washington State site the most interesting of the three west coast COMMIT sites is its within-site variation in smoking prevalence and attitudes at baseline. Bellingham (the intervention community) had a baseline smoking prevalence of 24 percent and consistently scored lower than Longview/Kelso (baseline smoking prevalence of 29 percent) on both the SPHP and NVS indices in 1989 and 1993. In terms of its legislative environment, Washington State had a Clean Indoor Air Act in place since 1985 which prohibits smoking in public places such as banks, grocery stores, governmental buildings,

libraries, restrooms, foyers and public transportation and includes a mandate specifying non-smoking areas in restaurants of a certain size. State cigarette taxes in 1989 were relatively high at 34 cents per package (Table 7.7). Policies at the state level were being drafted in 1988 to establish worksite regulations, health care and day care regulations, prohibit tobacco sales to minors and prohibit the distribution of free tobacco products. In 1987, neither Bellingham nor Longview/Kelso offered additional local policies or ordinances aimed at smoking control but by 1989 the legislative records indicated that both Bellingham and Longview/Kelso began to implement additional local ordinances. Bellingham's county smoking policy became effective in 1989. It banned smoking in all county-owned buildings, removed cigarette vending machines from county-owned facilities and began to emphasize hiring of nonsmoking employees. By 1989, Longview/Kelso was only beginning to draft similar, albeit less comprehensive, legislation aimed at controlling the smoking environment in public sector workplaces. Differences between these communities in smoking prevalence and attitudes towards cigarette smoking in the late 1980s, then, appear to be reflected somewhat in the local legislative environments.

There are, however, other differences between the two communities that might further reconcile some of the empirical findings. Longview/Kelso had a slightly higher median family income at US$21,338 versus Bellingham at US$19,572 while Bellingham edged out Longview/Kelso in median years of education completed at 12.8 versus 12.5. The occupational structure of the two communities was very different in the 1980s. Bellingham's white collar workforce (54 percent) was a significantly larger proportion of its total workforce than Longview/Kelso's (46 percent). These numbers are reversed when the

proportion of blue collar employment is examined. Blue collar employment is Bellingham was 46 percent while it was a much larger 54 percent in Longview/Kelso. Both communities were largely dependent upon the timber industry but Bellingham's economy was comparatively more diverse. The two largest employers in Bellingham were an aluminum company (Intalco Aluminum) and Western Washington University, while timber and paper products industries were the largest two employers in Longview/Kelso. In Henderson's (1987) words, "Longview/Kelso is inordinately dependent upon the economic well-being of its large industries, particularly timber, pulp and fiber, for its livelihood." (p. 17)

The community profile also pointed to differences in social environments between the cities of Longview and Kelso - merged for the purposes of the trial into one 'community'. Henderson (1987) notes that in the centre of Longview "is a beautifully landscaped park built around a small lake. In addition, boulevards and streets are wide, and radiate from an attractive and busy downtown shopping area." (p. 8) The description for Kelso, however, is not as inviting. Henderson writes:

> Kelso is very different [from Longview] in history and appearance. Named for an early Scottish settler, it began and grew as a typical Pacific Northwest logging town, . . . and retains its blue collar mill town quality. With a population of about 10,000, Kelso now presents a somewhat worn and threadbare appearance. The downtown area is small and appears to lack vitality, with some of its stores vacant and boarded . . . (p. 8)

In the U.S., the prevalence of smoking has been consistently higher among blue collar workers than among white collar workers. In 1985, 40 percent of blue collar workers smoked compared with 28 percent of white collar workers (USDHHS, 1989). While it would be inappropriate to conclude with complete certainty that the differing occupational structure

and economic diversity between Bellingham and Longview/Kelso are responsible for the differences in smoking prevalences and attitudes towards smoking, they are the most obvious socio-demographic differences between the two communities. The discrepancies between these communities within Washington state highlight the possibilities for local variations in smoking prevalences and attitudes despite state-level legislation and impressions that "west-coast" states share consistently strong antismoking opinions.

New Jersey

Hymowitz et al. (1987) admit in the community profiles that Paterson (intervention) and Trenton (comparison) posed some serious challenges to a successful antismoking campaign. The New Jersey pair had the lowest combined education levels and highest proportions reporting low incomes of the 22 COMMIT communities. Inner city poverty, competing health priorities such as drug abuse, AIDS among intravenous drug users and teenage pregnancy and ethnic polarization were some of the barriers identified at the outset of the trial. Smoking rates at baseline were also above the COMMIT average of 29 percent with Paterson at 31 percent and Trenton at 35 percent and scores for the norms and values index for these communities were relatively high (Figure 7.2). At the same time, Paterson and Trenton held the strongest and third strongest, respectively, pre-intervention beliefs about the seriousness of smoking as a public health problem (Figure 7.1). Thus the New Jersey community pair presented a paradoxical mix of relatively high smoking prevalence, norms and values supportive of smoking and strong beliefs regarding the serious nature of smoking as threat to public health.

The profiles (Hymowitz et al., 1987) revealed that New Jersey was a leader among states in taking a "progressive approach" to tobacco control both in areas of taxation and legislation. State taxation of cigarettes in 1989 at 40 cents per package was the highest for any U.S. COMMIT site (Table 7.7) and second only to Texas at 41 cents per package (CDC, 1991b). In 1987, New Jersey had nine state laws prohibiting smoking. The legislative tracking data indicated that New Jersey generated the greatest legislative activity of any COMMIT site during the trial. At the state level in 1989 there were acts that would eliminate smoking in schools (Ogden-Colburn Act), establish a clean air restaurant program (Foy Act) and there was a motion put forth by the very active New Jersey Commission on Smoking and Health to recommend legislation that would ban smoking in most public places. During 1989, State Senator Graves also proposed an aggressive bill that would outlaw billboard advertisement throughout New Jersey. This volume of legislative activity appeared to be supported by the residents of both Paterson and Trenton whose average scores on the legislative subconstruct were the lowest (i.e., most supportive of legislative restrictions) of any COMMIT site.

There were several more indications from the community profiles that New Jersey was a state that had a high level of commitment to tobacco control. New Jersey's governor in the 1980s created the Governor's Commission on Smoking or Health which was designed to consider issues involving tobacco abuse and make recommendations concerning smoking policy and legislation. Additionally, the New Jersey government through its "Professional Athletes Against Substance Abuse" program engaged professional athletes in the promotion of health messages. New Jersey senator Bill Bradley further formed the "Athletes Against Tobacco" program which took advantage of New Jersey's proximity to professional

basketball, football and hockey teams in the nearby Philadelphia, New York and Meadowlands areas. Other indications of the state's commitment to control tobacco were the presence of the Smoking and Tobacco Use and Control Program in the New Jersey State Department of Health and the estimated $275,000 of the state budget devoted to tobacco control activities (Table 7.7).

Within the New Jersey pair, Paterson, the intervention community, had the stronger antismoking attitudes (as measured by the SPHP index) with a corresponding lower smoking prevalence. The profiles indicated that both communities have large White, Black and Hispanic communities although Paterson's Hispanic population was substantially larger than Trenton's (29 percent versus 9 percent). Hymowitz et al. (1987) summarized the employment structure in both communities as dominated by technical, service and labouring occupations. They did note, however, that a greater number of Trenton residents were employed in managerial positions, a difference they attributed to its role as state capital.

One important feature of the public health climate in Paterson in the late 1980s was the priority given to drug abuse, especially in the inner city. The Paterson profile reports that the existence of a serious crack cocaine problem came to light in 1987 which "mobilized the entire community" around the issue of drug abuse. Led by the mayor, this issue received heightened local media attention and it was thought that tobacco control efforts could be opportunistically "piggybacked" onto the drug control activities.

The New Jersey communities were unique among the COMMIT group in that they had low scores on the SPHP index along with high smoking prevalences and acknowledged serious competing public health priorities. A possible interpretation is that the combination

of comprehensive state legislation and public education and the local efforts linked to the drug abuse problems in these communities (especially Paterson) have affected public opinion about the dangers of tobacco use and has brought them on side in terms of the importance of legislative control. Either it is the case that 1989 was too soon to measure the effects on behaviours and the normative environment of the previous state-wide campaigns, or it is the case that such efforts can only ever hope to shift opinion about the seriousness of smoking as a public health problem but not affect norms and behaviour. Then again, it may be that education and legislation are unable to affect norms and behaviours in localities where other more immediate public health problems such as hunger, AIDS and illegal drug abuse seem to overwhelm the tobacco problem.

New Mexico

New Mexico was an interesting choice for further exploration due to its consistently strong antismoking sentiments and low smoking prevalence compared with the other COMMIT sites. Las Cruces had the lowest baseline smoking prevalence of all the communities at 22.6 percent with Oregon's Albany/Corvallis at 23.1 percent edging out Santa Fe at 23.2 percent. The relatively low (antismoking) NVS scores in 1989 for the New Mexico site reflect the low baseline smoking prevalence in these communities. The NVS scores are slightly lower in the communities from Washington State and Oregon even though smoking prevalences were marginally higher in these west coast communities. The two New Mexico communities also scored the fifth and sixth lowest scores on the SPHP index in 1989. Santa Fe and Las Cruces are remarkably similar in terms of their smoking attitude-behaviour profiles

which implies that there is little scope for examining any within-site differences. The differences worthy of investigation then are between-site differences, that is, considering the salient socio-politico-economic features of these New Mexico communities to highlight any features that set them apart from other COMMIT communities.

New Mexico has a lenient tobacco control environment. A Clean Indoor Air Act has existed since 1985, although Piland et al. (1987) note that enforcement has been virtually non-existent. Two tobacco control bills, one aimed at banning the sale of tobacco to minors and one at banning tobacco use in school, were defeated during the 1987 legislative session. The state taxation level in 1990 was very low at 15 cents per pack (Table 7.7) and neither COMMIT community in New Mexico had any additional legislation restricting smoking in public places in 1989. In fact, Las Cruces defeated a bill to create smoking-designated areas in restaurants in 1987 and the following year Santa Fe followed-suit by dismissing a city ordinance to ban smoking in public places and restaurants. Thus the New Mexico sites present another paradox: strong antismoking sentiments and low smoking prevalences exist in legislative environments that are generally supportive of smoking.

There are two demographic features of the New Mexico communities that might begin to account for their smoking behaviour and attitudes. The first is the dominance of white collar employment in both Santa Fe and Las Cruces. Large employers in Santa Fe include tourism, the State of New Mexico and the U.S. Government. In Las Cruces, White Sands Missile Range employs over 8,000 workers while other large employers include New Mexico State University and the public schools. Given the consistently higher incidence of smoking among blue-collar workers compared with white-collar workers (USDHHS, 1989), it is

reasonable to suggest that the abundance of white-collar employees in the New Mexico communities contributes to the lower smoking prevalences and relatively unfavourable attitudes towards smoking.

The second key demographic feature of New Mexico is its large Hispanic population. Just over half of the population of New Mexico is non-Hispanic white while 36 percent are Hispanic, 8 percent are Indian and 2 percent are black (Piland et al., 1987). Of the 712 Hispanic respondents to the 1989 attitude cohort survey, 333 (46.7 percent) lived in the New Mexico communities. An examination of the smoking attitudes of the Hispanic respondents versus those of the others (Table 7.8) revealed that Hispanic respondents had markedly stronger beliefs about smoking as a health problem ($P2 < .01$) but shared with other respondents similar norms and values regarding smoking ($P2 = .07$).

There has been a limited number of studies suggesting that the smoking attitudes and behaviours of Hispanics in the U.S. differ from other groups (Vander et al., 1990; Marin et al., 1990a; Marin et al., 1990b). It has been shown, for instance, that Hispanic smokers are generally less likely to smoke heavily but more likely to smoke in social situations (Marin et al., 1990a). Vander et al. (1990) also noted that Hispanic smokers were more likely than other groups to want to prevent their children from smoking. Marin et al. (1990b) provide a cultural explanation for the differences in Hispanic smoking attitudes by pointing to the "collectivist" nature of Hispanic culture. According to these authors, individuals belonging to a collectivist culture are highly concerned about the needs of others which are then expressed in a strong orientation toward the family and high values placed on social relationships. Extrapolating this interpretation to the current case, a strong desire to prevent children from smoking would

likely translate into antismoking scores on the SPHP index. An emphasis on social relationships could, however, contribute to norms and values more supportive of smoking, especially in cases of exposure to environmental tobacco smoke.

It was anticipated that the low smoking prevalences and antismoking attitudes measured in the New Mexico communities at the outset of the trial would be matched with stringent legislative environments both at the local and state levels. This expectation was not borne out. New Mexico's Clean Indoor Air Act was relatively lenient by U.S. standards in 1989 and attempts to strengthen it in the late 1980s were unsuccessful. At the local levels, city ordinances to control tobacco in both Santa Fe and Las Cruces were defeated. We suggested that the occupational and ethnic composition of these communities may account for some of the smoking attitudes and behaviours of these New Mexican residents. Specifically, the high proportion of white collar workers in both cities and the large Hispanic populations were suggested as possible explanations for the relatively low smoking prevalences and strong antismoking attitudes. The cultural explanation, however, is a complex one, but is raised as an area for further research.

7.6 Discussion and Conclusions

The research in this chapter has attempted to piece together the complex connections between smoking attitudes, smoking behaviour and the social environment. It was discovered that "place" was an important main effect on individual attitudes towards cigarette smoking, independent of smoking behaviour and personal characteristics. These findings informed a "case study" approach into an examination of the sources of variation in community attitudes

and norms regarding cigarette smoking. Five COMMIT sites (i.e., ten paired communities) from North Carolina, Iowa, Washington, New Jersey and New Mexico were selected for detailed analyses. Diversity in smoking attitudes, behaviours and social environments were represented in these choices.

The communities from North Carolina held the strongest prosmoking attitudes in the COMMIT study. It was suggested, not surprisingly, that these strong prosmoking attitudes were linked to the state's dependence on the tobacco industry. Greensboro was shown to have a higher smoking prevalence and stronger prosmoking attitudes than Raleigh and we extended the self-interest argument by pointing to the concentration of tobacco employment in Greensboro and the relatively more diversified economy of the state capital Raleigh. The Iowa communities held strong prosmoking attitudes as well but these existed in a relatively stringent state legislative environment. The preemptive nature of the state legislation, lack of enforcement at local levels and political support for the rights and freedoms arguments in the tobacco debate were offered as reasons for the apparent contradiction. On the west coast, the Washington State communities of Bellingham and Longview/Kelso displayed prominent within-site differences in smoking prevalence and attitudes and these were largely attributed to socio-economic differences between the two communities. The New Jersey communities held the strongest beliefs about the seriousness of smoking as a public health problem and these were credited to a high volume of state activity in the area of tobacco control. It was further suggested that high smoking prevalences and other drug problems in these communities contributed to the awareness of the smoking problem. Finally, the New Mexico communities exhibited the lowest smoking prevalences of all the COMMIT communities and

relatively strong antismoking sentiments. These existed, however, within a lenient legislative environment at both the state and local levels. The most obvious socio-demographic features of these communities were the concentrations of white collar employment and large Hispanic populations. A link between Hispanic culture and the smoking attitude-behaviour profile of the New Mexico communities was suggested.

Attitudes toward smoking have undergone dramatic changes over the past three decades in North America. This shift has been reflected in an overall decline in cigarette smoking and adoption in nearly every state and province of tobacco control legislation. Even in the short period between 1989 and 1993, all communities in the COMMIT trial saw an attitude shift towards favouring nonsmoking. Despite this overall trend, we see that some regions and communities are very active in tobacco control while others lag behind (CDC, 1991; Jacobson et al., 1993). What has been shown here is that the mix of social, legislative and cultural forces in different places affects attitudes towards smoking and likely readiness for public health activities in the form of policy or education. This implies that knowledge of the social milieux is an important antecedent of public health action.

As a final comment, it is noteworthy that the Canadian communities of Brantford and Peterborough are absent from the case studies. *A priori* one might have expected the cultural differences between the United States and Canada to lead to strong differences in smoking attitudes between the Canadian pair and the U.S. pairs. In fact, anticipation of between-country differences was an impetus for inclusion of a Canadian site in the American study. The findings, however, revealed that these particular Canadian communities were very similar to the American communities. It turned out that there was more variation in attitudes among

the U.S. communities than between the U.S. and Canadian communities in the COMMIT trial. In terms of rank order, Brantford scored 8th and 11th (i.e., close to the centre of the distribution) in 1989 on the SPHP and NVS indicies, respectively. Peterborough scored 11th on the SPHP index in 1989 but 20th on the NVS index in that year. In terms of norms and values at the outset of the trial, Peterborough was more like the communities from North Carolina than its matched Canadian community. It should be noted, however, that Peterborough scored the greatest change on the NVS index between 1989 and 1993 (Figure 7.2) making it more similar in terms of NVS profile to the communities from California and Washington State by the end of the trial.

The COMMIT data provided a unique opportunity to explore links between the social environment and attitudes towards cigarette smoking. Smoking continues as the leading preventable cause of death and disability in North America (Shopland et al., 1995). If the best promise for smoking control lies in continuing the process of changing opinions and norms as Fielding (1992) suggests, then it is important to consider how economic, political and social processes operate in distinct places to create environments supportive of nonsmoking.

Table 7.1 Hierarchical ANOVA Model - Dependent Variable: 1989 SPHP Score

Factor	F Value	Sig. of F
Main Effects		
Baseline Smoking Status	319.47	<.01
Education Level	16.87	<.01
Sex	20.63	<.01
Site	11.53	<.01
Intervention	9.45	<.01
Covariate		
Age	0.08	.78
2-Way Interaction Effects		
baseline smoking status * education	1.43	20
baseline smoking status * sex	4.94	<.01
baseline smoking status * site	1.33	.11
baseline smoking status * intervention	0.53	.66
education * sex	3.02	.05
education * site	1.31	.16
education * intervention	0.09	.92
sex * site	0.77	.66
sex * intervention	2.67	.10
site * intervention	1.91	.04

Table 7.2 Multiple Classification Analysis - SPHP 1989

Grand Mean = 38.54

Variable & Category	n	mean	Unadjusted Deviation	Deviation Adjusted for Independents and Covariates
Baseline Smoking Status				
heavy smoker	1025	43.70	5.16	5.11
light-to-moderate smoker	1008	41.18	2.64	2.77
recent quitter	1035	36 97	-1.57	-1.56
never smoker	1314	33.73	-4.81	-4.88
Education				
less than high school	520	37.74	-0.80	-1.64
high school graduate	952	39.16	0.62	0.11
some college or more	2910	38.48	-0.06	0.26
Sex				
male	2108	39.29	0.75	0.58
female	2274	37.85	-0.69	-0.54
Site				
New York State	401	38.46	-0.08	-0.25
California	345	37.79	-0.75	-0.73
New York City	362	37.58	-0.96	-0.78
Ontario	496	37.78	-0.76	-0.62
New Jersey	285	36.82	-1.72	-1.49
Iowa	485	40.27	1.73	1.55
Washington	385	36.87	-1.67	-1.69
Massachusetts	428	37.92	-0.62	-0 61
North Carolina	410	42.05	3.51	3.22
New Mexico	372	38.05	-0.49	-0.30
Oregon	366	39.32	0.78	0.78

Table 7.3 Hierarchical ANOVA Model - Dependent Variable: 1989 NVS Score

Factor	F Value	Sig. of F
Main Effects		
Baseline Smoking Status	544.55	<.01
Education Level	15.11	<.01
Sex	0.63	.43
Site	7.04	<.01
Intervention	7.09	<.01
Covariate		
Age	72.76	<.01
2-Way Interaction Effects		
baseline smoking status * education	0.69	66
baseline smoking status * sex	6.74	<.01
baseline smoking status * site	0.75	.83
baseline smoking status * intervention	0.08	.97
education * sex	0.36	.70
education * site	0.98	.49
education * intervention	3.13	.04
sex * site	0.61	.80
sex * intervention	0.96	.33
site * intervention	0.90	.54

Table 7.4 Multiple Classification Analysis - NVS 1989

Grand Mean = 21.49

Variable & Category	n	mean	Unadjusted Deviation	Deviation Adjusted for Independents and Covariates
Baseline Smoking Status				
heavy smoker	856	25.40	3.91	3.82
light-to-moderate smoker	862	23.88	2.39	2.44
recent quitter	927	19.78	-1.71	-1.76
never smoker	1049	17.84	-3.65	-3.57
Education				
less than high school	436	23.13	1.64	0.50
high school graduate	811	22.59	1.10	0.46
some college or more	2447	20.84	-0.65	-0.24
Site				
New York State	351	21 43	-0.06	-0.10
California	284	20.94	-0.55	-0.47
New York City	304	21.53	0.04	0.20
Ontario	407	21.71	0.22	-0.02
New Jersey	239	21.74	0.25	0.10
Iowa	433	22.16	0.67	0.61
Washington	327	20.30	-1.19	-1.06
Massachusetts	358	21 36	-0.13	-0.14
North Carolina	342	22.91	1.42	1.51
New Mexico	311	20.96	-0.53	-0.32
Oregon	338	21.00	-0.49	-0.57

Table 7.5 Multiple Classification Results for Within-site Differences - SPHP

Grand Mean = 38.54

Community	n	Mean	Unadjusted Deviation	Deviation Adjusted for Independents
Utica	193	38.35	-0.19	-0.21
Binghamton	208	38.61	0.02	-0.25
Vallejo	174	37 43	-1.15	-1.26
Hayward	171	38.19	-0.35	-0.22
Yonkers	176	38.20	-0.33	-0.33
New Rochelle	186	36.96	-1.55	-1.19
Brantford	257	37.78	-0.78	-0.66
Peterborough	239	37.81	-0.74	-0.56
Paterson	129	35.14	-3.40	-2.99
Trenton	156	38.51	-0.33	-0.16
Cedar Rapids	244	40.20	1.64	1.48
Davenport	241	40.35	1.81	1.61
Bellingham	201	35.87	-2.67	-2.79
Longview/Kelso	184	38.00	-0.59	-0.54
Fitchburg/Leominster	220	38.13	-0.41	-0.33
Lowell	208	37.69	-0.85	-0.92
Raleigh	210	40.95	2.41	2.15
Greensboro	200	43.21	4.66	4.31
Santa Fe	195	37.18	-1.36	-1.21
Las Cruces	177	39.11	0.46	0.65
Medford/Ashland	203	38.97	0.43	0.43
Albany/Corvallis	210	39.66	1.12	1.13

Table 7.6 Multiple Classification Results for Within-site Differences - NVS

Grand Mean = 21.49

Community	n	Mean	Unadjusted Deviation	Deviation Adjusted for Independents
Utica	172	21.45	-0.04	-0.14
Binghamton	179	21.41	-0.08	0.00
Vallejo	137	20.74	-0.74	-0.51
Hayward	147	21.12	-0.37	-0.26
Yonkers	156	21.52	-0.01	0.15
New Rochelle	148	21.60	0.11	0.25
Brantford	217	21.55	0.08	-0.44
Peterborough	190	21.87	0.38	0.08
Paterson	108	21.13	-0.36	-0.32
Trenton	131	22.24	0.75	0.46
Cedar Rapids	216	22.48	0.99	1.02
Davenport	217	21.85	0.36	0.27
Bellingham	165	19.85	-1.64	-1.44
Longview/Kelso	162	20.77	-0.72	-0.57
Fitchburg/Leominster	185	21.14	-0.35	-0.45
Lowell	173	21.60	0.11	0.11
Raleigh	168	22.36	0.88	1.07
Greensboro	174	23.44	1.95	1.88
Santa Fe	167	20.60	-0.89	-0.64
Las Cruces	144	21.45	-0.11	0.13
Medford/Ashland	169	20.61	-0.88	-0.90
Albany/Corvallis	169	21.40	-0.09	-0 15

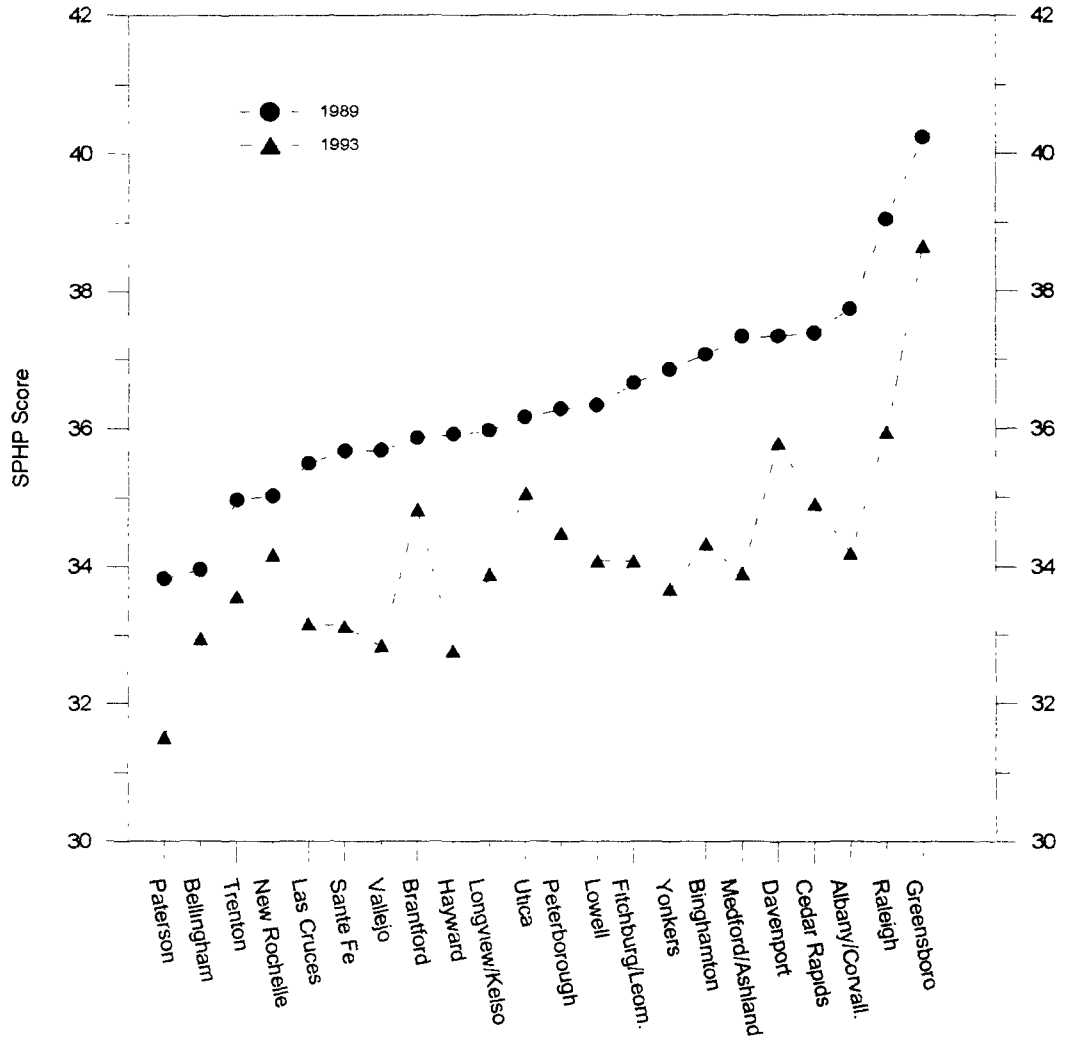

Figure 7.1 Community Attitude Scores in 1989 and 1993 for the SPHP Index (sorted by 1989 scores)

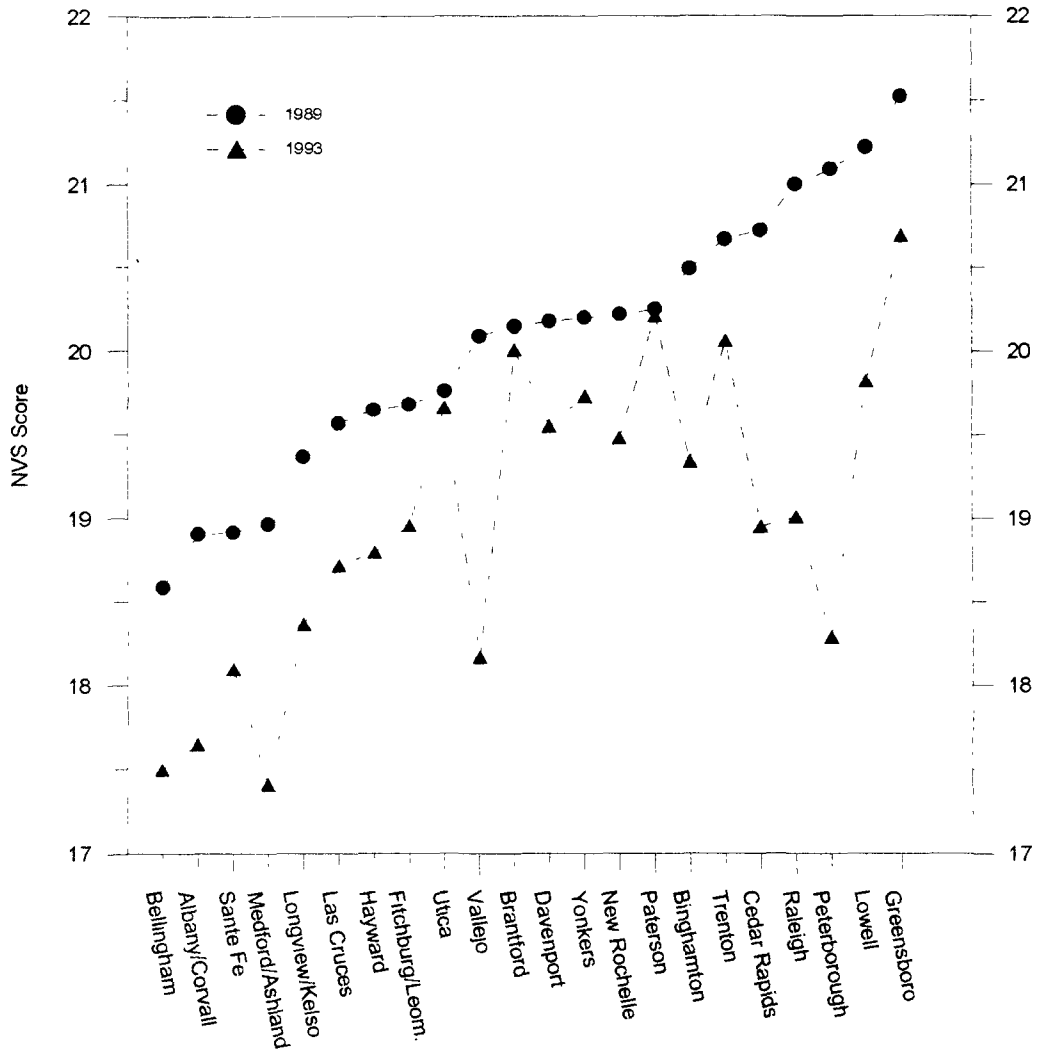

Figure 7.2 Community Attitude Scores in 1989 and 1993 for the NVS Index (sorted by 1989 scores)

Table 7.7 State Economic and Legislative Activities Related to Tobacco Control

COMMIT Sites	state tax rate (cents per pack) (1990)	state law restricting smoking in public places (1990)	state law restricting smoking in public sector workplaces (1990)	state law restricting smoking in private workplaces (1990)	state law restricting smoking in schools (1990)	number of cities/counties with local smoking ordinances (1989)	total budget devoted to tobacco-related public health activities ($) (1989-90)
California	35.0	yes	yes	no	yes	171	155,000,000
Iowa	31.0	yes	yes	yes	yes	0	25,000
Massachusetts	26.0	yes	yes	no	yes	59	0
New Jersey	40.0	yes	yes	yes	yes	1	275,000
New Mexico	15.0	yes	yes	no	no	1	78,300
New York	39.0	yes	yes	yes	no	9	290,000
North Carolina	2.0	no	no	no	no	12	0
Oregon	28.0	yes	yes	no	yes	2	0
Washington	34.0	yes	yes	no	yes	3	0
U.S. Comparisons	23.2 (U.S. average)	45 (yes totals of 50 states)	38 (yes totals of 50 states)	17 (yes totals of 50 states)	39 (yes totals of 50 states)	490 total in U.S.	120,645 (excluding California)

Source: 1989-1990 Association of State and territorial Health Officials (ASTHO) Survey in CDC (1991b).

Table 7.8 1989 Smoking Attitude Scores for Respondents of Hispanic Origin versus Other Respondents (standard deviations and sample sizes shown)

Group	SPHP 1989	*t* value	NVS 1989	*t* value
Hispanic	**34.91**		**21.14**	
	(9.67)		(5.30)	
	n = 453	-8.51	n = 390	-1.83
		(2P < .01)		(2P = .07)
non-Hispanic	**38.93**		**21.66**	
	(9.51)		(5.60)	
	n = 5281		n = 4421	

CHAPTER EIGHT

CONCLUSIONS

8.1 Introduction

This thesis presented an analysis of several aspects of attitudes towards smoking using data from the U.S. National Cancer Institute's COMMIT trial. The research was informed by the premise that changes in attitudes and norms are important for longstanding changes in smoking behaviour. A combination of social environmental influences and individual characteristics were understood to be important influences on attitudes toward cigarette smoking. In this context, five objectives were addressed:

1 To develop indices to measure smoking attitudes and attitude change.

2 To document changes in smoking attitudes over the course of the COMMIT trial.

3 To determine covariates of individual attitude change.

4 To examine the nature of the relationship between attitudes toward smoking and smoking behaviour.

5 To describe the role of community context in shaping attitudes and to begin to account for the geographic variability in attitudes in COMMIT communities.

Results of the efforts towards these objectives provided for substantive, methodologic and theoretical contributions. The contributions made under each objective will be discussed in turn in this chapter.

8.2 Objective One: To develop indices to measure smoking attitudes and attitude change

This objective was driven by the paucity of appropriate existing measures for measuring smoking attitudes. Previous studies of smoking attitudes have, for the most part, employed single-item analyses. Because the single-item approach can compromise reliability, the aim here was to develop measures based on broad dimensions of smoking attitudes. The indices were designed to measure two primary attitude constructs: beliefs about smoking as a public health problem (SPHP); and norms and values regarding smoking (NVS). Two general approaches to index construction, the rational method and the factor analytic method, were used. Item analysis suggested good internal consistency for both indices with Cronbach's alpha scores above 0.75 (an appropriate score for health measures (Mahoney et al., 1995)). Validity was assessed primarily by an examination of the relationships between index scores and smoking status. Smokers reported significantly higher scores than nonsmokers on the two measures indicating, as anticipated, that smokers have more favourable attitudes towards smoking than nonsmokers.

The SPHP and NVS constructs were empirically distinguishable components of attitudes towards smoking and the indices developed were reliable and valid measures of the constructs. The development of robust attitude measures was an important step in the research as no conclusions drawn in the subsequent chapters would be credible without the assurance of reliable and valid measures. As DeVellis and Alfieri (1995) point out,

> Too often . . . we regard our findings or insights on a particular health issue as somehow distinct from the means by which they were obtained. That is, we may see inference and measurement as independent of one another. We may

> mistakenly conclude that cogent conclusions can be drawn from questionable measurement procedures. Suspect measures, however, cannot generate defensible conclusions--our data are not insulated from the weaknesses or inappropriateness of their source. Clearly, then, our understanding of phenomena is dependent upon the quality of their assessment and, more specifically, on the correspondence of measures to the phenomena on interest. (p. i)

These measures have potential applications beyond COMMIT and the work presented here. Potential applications for the measures include evaluating readiness for acceptance of tobacco control legislation in populations or the broad-based monitoring of secular trends in smoking attitudes and norms. This is not to say that the scale items are completely transferrable to all times and places. For example, many items on the SPHP index referred to beliefs about legislative control of smoking in different settings. As smoking legislation becomes implemented over time in more locations, these questions have less relevance and take on less importance. A reassessment of the validity of the scales would be necessary over time with changes in the social environment An appropriate methodology for such a reassessment is Mahoney et al.'s (1995) model for scale development integrating qualitative and quantitative methods.

8.3 Objective Two: To document changes in smoking attitudes over the course of the COMMIT trial

One of the chief purposes for the development of scales to measure attitudes and their subsequent testing for suitability was the assessment of COMMIT's ability to change attitudes and norms regarding smoking. The success of COMMIT in changing smoking attitudes was

examined by testing two primary hypotheses: (1) the priority of smoking as a public health problem increased more in the intervention communities than in the comparison communities; and (2) norms and values that support nonsmoking increased more in the intervention than in the comparison communities. The main trial effect was on heavy smokers in the intervention communities who showed significantly more change in their beliefs about smoking as a public health problem. Despite the absence of an intervention-comparison difference, the magnitude of change in community-wide norms and values was related to the level of smoking control activities. In the cohort, light-to-moderate smokers in the intervention communities came to have stronger beliefs about smoking as a serious public health problem, an effect closely related to the quitting behaviour of light-to-moderate smokers in the trial.

Thinking back to Chapter Two and the notion of communities as systems, it is important to be reminded that the communities in COMMIT existed within broader state/ provincial, national and international systems. Communities are not isolated from broader changes in society. Because the systems are inherently interconnected, changes in state or provincial legislation or changes in nation-wide norms naturally affect communities and individuals within communities. Some of these changes noted in Chapter Two were California's Proposition 99, the rise in Canadian cigarette prices and the designation by the U.S. Environmental Protection Agency of environmental tobacco smoke as a Class A carcinogen. These are powerful changes which occurred beyond the community and beyond the control of the COMMIT trial. We saw that every community had a change in their attitudes and norms favouring antismoking (Figures 7.1 and 7.2) between 1989 and 1993.

Expecting the COMMIT activities at the community level to have a measurable effect beyond the broader changes was certainly very ambitious.

Chapter Two also pointed out that the root debate in health promotion is that of the broader debate in social science regarding the roles of human agency and structure in social change. Although the design of COMMIT recognized that smoking is a behaviour that is deeply socially ingrained, policy changes directed at tangibly altering the social environment was not a primary objective of COMMIT (Carrell et al., 1995). Indeed, federal regulations prohibited use of COMMIT resources for lobbying activities. This is not to say that coalition building and information dissemination towards policy goals did not occur in COMMIT communities. Carrell and colleagues (1995) describe several instances where COMMIT education strategies resulted in the adoption of local ordinances. For example in Raleigh, North Carolina a COMMIT-sponsored project designed to reduce illegal sales to youth through merchant education was a major factor in the proposal to allow vending machines only in venues also licensed to sell alcohol. The point to be made in raising the issue of agency versus structure is that it might be that as Weissfeld, Kirsht and Block (1990) suggest, positive health behaviour attitudes and beliefs already exist, it is the structural barriers to good health that need to be addressed.

8.4 Objective Three: To determine covariates of individual attitude change

The first part of Chapter Six adopted an analysis of variance approach to study the covariates of attitude change. Behaviour change (i.e., quitting smoking) during the trial was

the most important factor affecting attitude change for both the SPHP and NVS indices. For SPHP, other main effects were demonstrated for education level and site while for NVS the only factor to be consequential was behaviour change. An important public health finding was the interaction effect between education level and intervention condition for SPHP indicating that less educated individuals in the intervention communities showed stronger antismoking attitude changes during the trial than their counterparts in the comparison communities. Even though the community-wide results of Chapter Five were disappointing, this finding for less educated individuals is promising in that it demonstrates that the 'boost' offered by the COMMIT intervention was effective for a traditionally hard-to-reach group.

In some ways the results of objective three parallel the results of objective two. For objective two, heavy smokers were identified as being receptive to the intervention activities. So it would appear that groups less likely to adopt broader secular beliefs about smoking were brought closer to 'mainstream' thinking about tobacco as a result of the COMMIT intervention. The problem with these results is that COMMIT sought to change the entire community, from nonsmokers to smokers alike, in the hopes that the community's capacity to foster nonsmoking initiatives and attitudes would be strengthened. That COMMIT's effects were concentrated in groups most directly affected by tobacco tells us that this type of intervention did little to bring the entire community on board. For nonsmokers and those less affected by tobacco exposure (i.e., the more highly educated), the trial's activities and messages were largely lost amidst the broader societal shifts towards nonsmoking sentiments. The COMMIT strategy did not involve entire communities leaving open the question of the

potential effect, or even possibility, of an approach genuinely able to mobilize a whole community.

For an entire community to rally around the issue of tobacco was perhaps a lofty goal of COMMIT given that the health issue was defined by COMMIT investigators and not the community. One of the overall lessons learned from the COMMIT experience, however, was that communities could indeed respond to a research agenda that was externally imposed and not necessarily seen as the main problem (health or otherwise) facing a community (Thompson et al., 1995). Part of the community enthusiasm for the externally imposed initiative, it should be noted, was attributed to the financial resources injected into the localities by the funding agency.

8.5 Objective Four: To examine the nature of the relationship between attitudes toward smoking and smoking behaviour

This objective was addressed in the latter part of Chapter Six. Once the importance of the behaviour change variable for attitude change was established in the covariate analysis, the next step was to examine the directionality of the relationship. The COMMIT cohort data were particularly well-suited to posing the question of the causal precedence of attitude change or behaviour change in the case of smoking. Wading into the attitude-behaviour debate remains difficult in light of the amount of controversy that continues to surround A-B studies in social psychology. The level of controversy is also a compelling reason to continue to investigate A-B relationships.

The profile analysis clearly revealed that some level of predisposing attitude was necessary for particular behaviours. In every case smokers had weaker antismoking attitudes than nonsmokers. Furthermore, those who remained smokers during the trial had weaker antismoking attitudes than those who eventually quit and those who started smoking during the trial had weaker antismoking sentiments than nonsmokers. This type of evidence from the profiles revealed the importance of a match or consistency between attitudes toward smoking and smoking behaviour.

The profile analysis also allowed for an examination of the relationship between attitude change and behaviour change. In the case of smoking, do attitudes change and then behaviours follow suit or is it that a behaviour change like starting or quitting smoking prompts an attitude shift? Perhaps both processes are involved or perhaps the process is a concurrent one where attitudes and behaviours are changed in tandem.

Evidence from the profile analysis supported several positions in the A-B debate. There was support for the traditional health education position that attitude change precedes behaviour change and support for the position that behaviour changes prompt attitude shifts. An important conclusion of this chapter was that the relationship between attitude change and behaviour change appears to be associated with both the type of attitude measure and the type of behaviour being measured. Systematic differences between SPHP and NVS in terms of the relationship between attitudes and behaviours were noted and it was also stressed that quitting smoking and starting smoking are very different types of behaviour given the social environment in which they occur. The search in A-B research for generic attitudes and behaviours that consistently precede or follow one another is perhaps a pointless pursuit.

Rather, attention needs to continue in the quest for understanding conditions or contexts in which attitudes and behaviours are consistent.

There are serious methodologic concerns for any A-B analysis. Attention must be paid to how attitudes and behaviours are measured, and whether temporal order of these measures is clearly established. In this case the attitude measures were soundly constructed from accepted techniques (Chapter Four). The behaviour variable in this case was, however, problematic for two reasons: 1) nicotine is an addictive substance , and 2) smoking behaviour was self-reported. The addictive nature of nicotine calls the volitional nature of smoking behaviour into serious question. If a smoker cannot change his or her behaviour despite a strong attitude shift, this would suggest inconsistencies between smoking attitudes and behaviour, however measured. Regarding the self-reported nature of the behaviour variable, McBroom and Reed (1992) note there is a considerable distrust regarding self-reported behaviour.

The longitudinal design assured that for at least some of the hypothesis tests there was a clear temporal ordering of attitude and behaviour measures. While the profile analysis appeared methodologically unsophisticated, McBroom and Reed (1992) stress that "intensive application of statistical techniques has added little to our understanding of the core issues of attitude-behaviour consistency." (p. 206) The comparison of attitude change for groups whose behaviours changed versus those remaining constant proved useful for laying bare the process of attitude change through time for various groups.

8.6 Objective Five: To describe the role of community context in shaping attitudes and to begin to account for the geographic variability in attitudes in COMMIT communities

This objective was perhaps the most expressly geographic of the five in the thesis. By addressing this objective, the role of place in influencing attitudes towards smoking was explored. The conceptual model of Chapter Three suggested the importance of community attributes in the construction of individual attitudes towards smoking. After controlling for other variables thought to influence smoking attitudes (i.e., smoking status, education level and sex), individual attitude scores were demonstrated to vary by the 11 COMMIT sites and the 22 COMMIT communities. Thus the analyses in the first part of Chapter Seven clearly identified the significance of the role of place in smoking attitudes.

The ANOVA's, however, could not reveal the specific attributes of different places that contribute to variations in attitudes and norms. To reveal some of those attributes, the community profiles and legislative records of some of COMMIT sites with especially strong or weak antismoking attitudes were examined. Case studies of COMMIT sites in North Carolina, Iowa, Washington, New Jersey and New Mexico were conducted to reveal features of the local milieux which could account for variations in smoking attitudes. Some of the place characteristics suggested to be linked to local attitudes include economic reliance on the tobacco industry, libertarian political orientations, socio-economic conditions, legislative context and ethnic composition.

This work has a number of important public health implications. First, knowledge about community social and legislative environments is key to understanding the context in

which the intervention takes place. This conclusion was also reached by COMMIT investigators who saw that gathering information to provide a comprehensive look at each community was a basic first step. In the words of Thompson et al. (1995):

> For lasting change to occur, attention must be paid to the underlying factors that influence behaviour, including the factors that might facilitate or inhibit a proposed change within a community as well as the factors that are likely to make a given approach a "good fit" with its host environment. (p. 57)

The work towards objective five attempted to take the existing information about the communities one step further by making connections to community attitudes and smoking prevalence. By doing so, the analyses demonstrated that explanations for variations between communities in their attitudes and behaviours could be linked to the differences between the communities in their social environments. Knowledge that particular social structures are associated with particular smoking attitude and behaviour profiles could prove useful for future smoking prevention efforts or other health interventions.

Methodologically, the analyses combined a quantitative approach and a more qualitative interpretive approach to understanding community context. A purely quantitative approach is inadequate for revealing the subtleties of community personalities. The qualitative interpretive case study method added an important richness and context to the quantitative attitude and behaviour data. Epistemological questions about how much we can know about communities and how best to learn about communities underlie the work presented in Chapter Seven and are worthy of future consideration.

8.7 A Final Thought

The irony of the decline of the social acceptability of smoking in North America and the concomitant loss of revenue for American tobacco producers has meant an increase in aggressive marketing of cigarettes to other countries, particularly those in Asia and Latin and South America (Stebbins, 1994; Warner and Connolly, 1991). While it was noted at the outset of Chapter One that tobacco is recognized to be the leading cause of preventable death in North America, the World Health Organization has declared cigarette smoking to be the most unnecessary of modern epidemics *worldwide*. Despite the promising changes in norms regarding tobacco use in North American reported here, global cigarette production and consumption continues to increase (Taylor, 1989). Tobacco advertising goes unchecked in many less industrialized countries and is not counterbalanced with warnings about the health risks of smoking tobacco. As we work in North America to put limits on tobacco producers and help to speed up the processes of changing social norms and attitudes regarding tobacco use, we should be conscious of the effects that these efforts have on others around the world. Just as the community is a system within a system, nations and multinational corporations operate within the same system of interconnected systems where perturbations to one part, directly or indirectly, affect the whole.

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