COGNITIVE AND BEHAVIORAL EFFECTS OF OSTEOPOROSIS HEALTH EDUCATION

By

BARBARA ELEANOR BEATTY

B.Sc. (Phys. Ther.) McGill University 1973

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF

THE REQUIRMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

(Department of Administrative, Adult and Higher Education)

We accept this thesis as conforming

to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

December 1986

In presenting this thesis in partial fulfilment of the requirements for an advanced degree at the University of British Columbia, I agree that the Library shall make it freely available for reference and study. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by the head of my department or by his or her representatives. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Department of Administrative, Adult and Higher Education

The University of British Columbia
1956 Main Mall
Vancouver, Canada
V6T 1Y3

Date August 10, 1987

ABSTRACT

The purpose of this study was to describe and evaluate a health education program provided primarily for older women who have or suspect they have osteoporosis. The health education program evaluated is provided by the Ostop Society of British Columbia (Ostop). One of the goals of the study was to provide Ostop with descriptive information about the organization's members, their participation in the organization's education program and their evaluation of the value of the information sources provided by the organization.

A second goal was to evaluate the relationships between variables which may explain how Ostop functions as a provider of osteoporosis health education. Bandura's social learning theory was used to provide a theoretical explanation of the Ostop education program, to identify study variables and to generate the research questions.

The variables that were expected to be related to the members' level of knowledge about osteoporosis were selected personal characteristics, the amount of participation in Ostop, and members' perceptions about the value of the different sources of information provided by Ostop. The same variables plus members' level of knowledge about osteoporosis were expected to be related to the level of participation in health

behaviors believed to help prevent or slow the progression of osteoporosis.

The study sample consisted of 120 women members of Ostop, randomly selected from a membership list which contained the names of 261 women members of Ostop. All of the members included on the list lived close enough to Vancouver, British Columbia to attend the lecture series offered by Ostop. The study group is a random sample of Ostop members but may not accurately represent all women with or at risk of developing osteoporosis. Ostop is a special interest group which tends to attract as members well educated women with at least some prior awareness of and concern about the condition.

The data were collected by means of a mailed questionnaire which was developed for this study. The content of the questionnaire was based on the recent osteoporosis research literature, and the advice of a variety of content experts. Prior to conducting the study, the researcher pilot tested the questionnaire using nine Ostop members.

The descriptive information demonstrated that members are typically post-menopausal women in their sixties and seventies who have osteoporosis and who have an educational attainment of at least graduation from high school. The respondents were well-informed about osteoporosis and were more likely to practice health behaviors related to calcium intake than to perform the recommended amount of exercise. One important finding was that 66% of the respondents reported daily intakes of calcium which exceeded the highest recommended daily intake.

This is of concern in light of research findings that excessive calcium intake is associated with the development of kidney stones in some women.

Regression analysis of the study variables demonstrated that: 1. the number of Ostop-provided information sources identified by respondents as being useful was positively and significantly ($p \leqq .05$) correlated with knowledge level. 2. Both age and menopause status were negatively and significantly ($p \leqq .05$) correlated with knowledge level. 3. The only variable which was correlated significantly ($p \leqq .05$) with the performance of osteoporosis-related health behavior was knowledge level. This was a weak positive correlation of .234.

These results suggest that Ostop's present educational program may be helping women gain knowledge about osteoporosis and that having knowledge about osteoporosis is one factor which is associated with the practice of recommended health behavior. Social learning theory was used to explain the results and to suggest ways in which Ostop may be able to increase the effectiveness of its educational efforts. Suggestions were also made about other ways to provide osteoporosis health education and about directions for further research.

TABLE OF CONTENTS

LIST OF TABLES

ACKNOWLEDGEMENTS

I would like to thank the members of my committee. I greatly appreciate the many hours Dr. William Griffith spent helping with the planning, implementation and reporting of this research project. My thanks are also extended to Dr. Stanley Brown for the advice he gave during the development of the exercise section of the questionnaire and during the final revisions of the thesis.

I would also like to acknowledge the help and support which was given to me by Elizabeth Huntsman. Her continued encouragement and help over many months contributed to the successful completion of this study.

CHAPTER I

INTRODUCTION

Osteoporosis is a very common bone disorder in which bones become weakened to the degree that affected individuals develop fractures, often as a result of little or no trauma. No national statistics are available which accurately describe the incidence of this problem, but experts have estimated that one woman out of every three who is older than sixty-five years of age will suffer from one or more vertebral fractures (Riggs and Melton 1986, p. 1676). Based on the last complete Canadian census, Statistics Canada reports that 178,800 women were sixty-five years of age or older (Canada 1985, p. 40). If the medical estimates of the incidence of vertebral fractures are accurate, then it can be expected that approximately 488,000 Canadian women will suffer from such fractures. Fractures related to osteoporosis are not limited to the vertebrae, but this type of fracture is typical and it illustrates the high incidence of osteoporosis in older women.

Estimates of the incidence of the problem are useful to demonstrate that many people are affected, but these numbers do not reflect the impact of this condition. Fractures may cause pain, disfigurement, physical disability (Notelovitz and Ware

1982, pp. 40 - 41), and death (Riggs and Melton 1986, p. 1676). As a result of these fracture related problems, affected individuals suffer both emotionally and physically. This suffering is the major concern of the individual with osteoporosis. Reducing the incidence of osteoporosis would mean that fewer women would suffer the consequence of fractures as they age.

Recent research has demonstrated that osteoporosis may be preventable in many women. Even once it has developed, effective treatment can help reduce the incidence of the disabling fractures. Success in preventing and managing osteoporosis is partly dependent on women being well informed. This means that women must have easy access to osteoporosis health information. At this time, the only organization in British Columbia that is providing women with comprehensive osteoporosis health education is the Ostop Society of British Columbia (Ostop). The overall purpose of this study is to evaluate Ostop's education programs.

In this first Chapter the medical problem of Osteoporosis is described and related to other common chronic diseases. Health education is proposed as an essential aspect of efforts to reduce the incidence of osteoporosis or to minimize its consequences. The Ostop Society of British Columbia is described, including an outline of its current health education interventions related to osteoporosis. The specific purposes of the study are described next followed by a statement of the

research hypotheses. The final section of the chapter is an outline of the remaining chapters in this thesis.

The Problem

Osteoporosis is a major health problem for older women. It is more common in post-menopausal women than heart disease, cancer of the breast, rheumatoid arthritis or diabetes. Men also develop osteoporosis, but the incidence among men is much lower and it occurs later than in women (Notelovitz and Ware 1982, pp. 15 and 74).

Osteoporosis is a disorder of the bone which is characterized by a reduction of bone mass below the level which is considered normal for an individual of a given age or race. As the bone mass declines, the bones become weakened. Eventually the bones become sufficiently weakened that they are easily fractured (Notelovitz and Ware 1982, pp. 28 - 29; Smith, Sempos and Purvis 1981, p. 59).

Two serious fractures associated with osteoporosis are vertebral and hip fractures. When a vertebra fractures it collapses and the person loses height. As the vertebrae collapses the upper spine becomes rounded. If this process of collapse continues a woman can end up with a severely curved back and may lose up to eight inches of height. This obvious deformity is sometimes referred to a dowager's hump (Notelovitz and Ware 1982, pp. 31 - 32).

Fractures of the hip are life threatening fractures which must be treated by surgery. These fractures often result in

permanent disability (Notelovitz and Ware 1982, p. 37). Up to one-half of people who survive a hip fracture will require permanent nursing home care due to decreased physical ability (Riggs and Melton 1986, p. 1676). Reports on the rate of death following hip fractures vary from 12% to 30% (Notelovitz and Ware 1982, p. 37; Riggs and Melton 1986, p. 1676). These statistics indicate that fractured hips have very serious consequences for the victims.

Osteoporosis is thought to be caused by the interaction of multiple factors. These factors include being genetically predisposed, lifestyle factors such as dietary and exercise habits, and the decline of the hormone estrogen in post-menopausal women. These factors have been identified as being related to osteoporosis development but they have not been proved to be causes. For example, all women eventually become post-menopausal but most do not develop osteoporosis. This condition is not fully understood, but there has been sufficient research to allow experts to make recommendations about how the incidence of osteoporosis can be reduced, and about how women with osteoporosis should be treated (Cameron, Sutton and Prior 1987, pp. 154 - 156; Notelovitz and Ware 1982, pp. 88 - 138; Smith, Sempos and Purvis 1981, pp. 64 - 70).

Despite being both common and serious, until recent years osteoporosis has been a relatively invisible disease. Heaney (Preface to Notelovitz and Ware 1982, pp. 13 - 14), a medical researcher in the field of bone physiology, calls osteoporosis a silent disease for two reasons: 1. There are no external

symptoms that the problem exists until a woman suddenly sustains a fracture as a result of a trivial fall or, sometimes, with vertebral fractures, the fracture is the result of her normal daily activities, and 2. The general public and policy makers have not been interested in this disease. Heaney's observations may be accurate but they do not explain why so little attention has been given this disease.

Lack of symptoms until significant amounts of bone mass have been lost does not explain the lack of attention given to osteoporosis. The development of breast cancer is equally silent until the woman has a tumor sufficiently large to be felt. Despite this silent onset, breast cancer is a disease which has for many years received a great deal of attention from the medical community. Major efforts have been made and continue to be made to make women aware of the value of diagnosing breast cancer in its early stages. The diagnosis and treatment of breast cancer is readily available and has a high priority in the medical community. Reasons other than the lack of obvious symptoms must be found to explain the relative lack of medical attention given to the problem of osteoporosis.

One explanation for this lack of interest in osteoporosis is that it is an age-related problem. The study of normal aging and age-related diseases has not been a priority for the medical community until recent years. As the general interest in gerontology has increased, osteoporosis has become perceived as a more important disease.

Evidence of growing medical interest in osteoporosis is the rapidly expanding body of medical research related to this problem. Sufficient research has been conducted for experts to begin the process of presenting the research results to practicing physicians along with recommendations about appropriate medical practice related to osteoporosis. Examples of such articles can be found in journals such as The B.C. Medical Journal and The Physician and Sports Medicine (Cameron, Sutton and Prior 1987, pp. 153 -156; Erickson 1978, pp. 99 -107; Smith 1982, pp. 72 - 83; Sutton and Cameron 1985, pp. 136 -139). No longer is it assumed that osteoporosis is a condition about which nothing can be done.

Lack of interest on the part of the general public and the policy makers also does not explain the lack of attention paid to osteoporosis. The general public and policy makers depend in part on the medical community to facilitate their interest. Public awareness of a disease is more likely to be present for diseases that the medical community defines as being important. Public awareness related to osteoporosis is changing. Women are becoming more knowledgeable about this disease. This change did not occur until osteoporosis became sufficiently important within the medical community to demand basic science research and the development of the technology required to measure bone mass accurately. As information has become available to the public, women have become more aware of this problem. Osteoporosis has become a disease in which the general public is interested.

Evidence of this increased public awareness about osteoporosis is found in the media. Five years ago women concerned about osteoporosis were unlikely to encounter any useful information about this disease in newspapers or magazines, nor would she have been able to find a book about osteoporosis suitable for a non-medical person. This situation has changed dramatically. Notelovitz and Ware's book, Stand Tall! The Informed Woman's Guide to Preventing Osteoporosis (1982) is available in public libraries and book stores. At least three other books have been published for the purpose of informing women about this problem (Fardon 1985; Fromer 1986; Smith and Cohn 1985).

Popular magazines and newspapers are another source of information about osteoporosis. The article "The Calcium Craze" published in Newsweek (Clark et al 1986, pp. 48 - 52) is a good example of the type of information currently available in news magazines. It provides the general reader with a brief overview of the problem of osteoporosis and current approaches to prevention and treatment. Canadian magazines have also published articles about this condition. For example McLean's Magazine has published an article "New Aid for Bone Victims" (Finlayson and Silburt 1986, pp. 42 - 43) which includes opinions by Canadian medical experts and reports the results of research being conducted in Toronto. Articles about osteoporosis are not limited to news magazines. Canadian Living published an article "Keep Your Bones Healthy" (Edwards 1985, pp. 180, 189, 191 -192, 196 - 197) which describes the development of self help

groups in Canada and provides advice on how women can decrease their risk of developing osteoporosis. Newspapers have also published articles about osteoporosis. Evidence of this interest can be found in both The Vancouver Sun (McQuade April 3, 1985, pp. D5 - D6 and Mullens February 1986, p. 85) and The Vancouver Province (Brody April 2, 1985, p. 26).

Another public information source about osteoporosis is the extensive advertising done by the producers of dairy products and calcium supplements. This source of information often focuses primarily on the role that calcium may play in the prevention and treatment of osteoporosis. Rarely does this source of information discuss that to date the exact role of calcium is unclear (Clark et al 1986, pp. 48 - 50; and Finlayson and Silburt 1986, p. 43). Calcium advertisements have contributed to the increasing awareness of osteoporosis among potential victims but this source of information is often seriously biased.

Increased public awareness and medical interest does not mean that women with osteoporosis will receive accurate early diagnosis and treatment. In the Province of British Columbia, there are no medical specialists who treat osteoporotics exclusively. Correspondence on file with The Ostop Society of B.C., a support group for osteoporotics, demonstrates that many women have been unsuccessful in obtaining medical diagnosis or active treatment intervention (Todd, 1985a). No specialized outpatient or inpatient treatment units exist. Bone density testing facilities are limited to the Vancouver area and current

testing methods are too expensive to be used in routine screening for osteoporosis. Medical experts state that the situation in British Columbia is similar to the rest of North America (Cameron, 1986). The significance of this lack of diagnostic and treatment services becomes clearer if osteoporosis related services are compared to the health care services available for the diagnosis and treatment of breast cancer.

Women in British Columbia can easily obtain diagnostic and treatment services related to breast cancer. Many physicians now routinely refer women near menopause for a diagnostic breast x-ray. A woman with breast cancer will immediately be referred for consultation with medical specialists who routinely treat breast cancer. She can expect to receive the most up to date treatment recommended by the B.C. Cancer Control Agency. Women can expect complete medical care related to cancer of the breast. At the present time no such comprehensive health care is available for women with osteoporosis.

Increased public awareness and medical interest do not ensure that women have access to adequate information to act in a manner which minimizes their risk of developing osteoporosis or which minimizes the rate at which they lose bone mass if they already have osteoporosis. As already mentioned, women do have access to written sources of information. Newspaper and magazine articles alert women to the problem and may provide helpful information but they are not comprehensive sources of information about osteoporosis.

In recent years, as previously mentioned, books about osteoporosis directed at a non-medical audience have been published. These books simplify and report the osteoporosis research literature. They also provide women with information about how they can help themselves and what type of medical intervention they should expect if they suspect they have osteoporosis. The main drawbacks of this source of information are: 1. Women may not have any place to direct questions or to ask for clarification of concepts they do not fully understand, and 2. Not all women will choose to read a book to learn about a health problem.

If British Columbian women turn to the health care system to become well informed about osteoporosis, they will discover that at the present time the sources of health information related to osteoporosis are very limited. The medical profession assumes the responsibility for preventive medicine as well as for the diagnosis and treatment of disease. However, the present system of health care offers many fewer services designed to prevent disease than to treat the sick. The health insurance system reinforces this situation. The B.C. prepaid medical insurance plan permits physicians to bill the plan primarily for problem-oriented interventions. Such a system focuses physicians' attention on patients who already have or suspect they have a medical problem. Patients and physicians share this view of the role of physicians. For example, it is most unlikely that a forty year old healthy woman will make an appointment to see her physician because she wants a

comprehensive plan to help her avoid a fractured hip at age seventy.

Women may not turn to their physicians for preventive health education but they are likely to depend on their physicians for information related to disease. That is, once a woman suspects she has osteoporosis or is told she has osteoporosis, her first source of information is likely to be her physician. Physicians have been and will continue to be providers of education about disease. As mentioned above, some women have not found their physicians to be interested in osteoporosis. Even if the discussion is limited to physicians who are interested in osteoporosis, it is unlikely that women will become fully informed about this disease if they depend solely on their physician as an information source. This is because education is not the primary focus of physicians. The diagnosis and treatment of disease are much higher priorities. The educational component of the physician-patient contact is most often focused on providing patients with the key information they need to understand a diagnosis and to comply with a prescribed treatment.

Providing patients with information related to prescribed treatment is an important part of effective medical treatment. In a selected review of the patient compliance literature, Becker and Maiman (1980, pp. 115 - 116) summarized some of the problems associated with teaching patients about their therapy. A major problem is poor recall by patients of physician's instructions. Patients tend to remember the diagnosis but

forget the content of treatment instruction. Frequently patients also do not understand the instructions. In a study conducted for the Food and Drug Administration to evaluate communication problems which exist between patients and physicians, it was found that only between 2% and 4% of patients asked their doctors questions about drug therapy (Miller 1983, pp. 6 - 7). The physicians reported spending between two and a half, and six and a half minutes talking to their patients about the drugs they were prescribing. This is a very short time to spend teaching patients about drug therapy. These studies indicate that although physicians are potentially good sources of health education, it is unlikely that many women will receive comprehensive osteoporosis information if they depend solely on this source.

This problem is not unique to osteoporosis. The treatment management of most chronic diseases requires informed patients. One solution to this problem is the provision of health education. Hospitals and public health agencies in the Vancouver area offer patients educational opportunities related to many diseases. For instance, women with breast cancer in the Vancouver area have access to a variety of education sources. The Cancer Control Clinic provides the following support services:

1. Each patient is counselled by a social worker. One aspect of this intervention is to help the patient learn about her disease.

2. Every mastectomy patient is visited by a woman who has the same problem.
3. A group called Living with Cancer meets weekly, and once a month the meeting is an information night. Patients are provided with direct access at these meetings to medical specialists who can answer their questions.
4. A breast cancer group meets once a week to support women and help them learn about their disease.
5. A patient library has been organized to facilitate access to information related to cancer.

Women with breast cancer can choose from a variety of resources offered by the Cancer Control Clinic to learn about their problem.

The woman with osteoporosis who turns to hospital or public health patient education services will not find any osteoporosis-related services. None of the teaching hospitals with patient education departments in British Columbia offers osteoporosis-related education. Awareness of osteoporosis may have increased and women may have access to written information if they know how to find it but the majority of women with this problem still do not have easy access to the information they need.

The Ostop Society of British Columbia is a support group that was founded partly in response to this lack of access to easily accessible information about osteoporosis. At the time of this study this organization had 375 members. One of their

main purposes is to establish and maintain educational programs on osteoporosis.

The name Ostop was created by similar organization in Ottawa, Ostop Ontario. The two organizations are in communication but each functions independently. The B.C. organization also operates in association with the Osteoporosis Society of Canada.

The Ostop Society of British Columbia (Ostop) was founded in November 1983 as a voluntary organization. A board of directors (Ostop board) is responsible for developing and administering the society's activities. The Ostop board is composed of both interested community members and health care professionals. This board is advised by a professional advisory counsel composed of selected health care professionals.

One of Ostop's main activities in its three years of operation has been to provide free educational programs for women with osteoporosis and other interested people. The organization is based in Vancouver, and as a result some services are only available to women in that area. Ostop provides its members and the interested general public with up to date information about osteoporosis. Various approaches are used.

1. Each year it arranges nine public lectures on different aspects of osteoporosis. These lectures are free and held in the City of Vancouver.
2. An annual newsletter is sent to members. This newsletter features information about osteoporosis.

3. The Ostop Secretary provides written information about osteoporosis. Women can get this material at meetings or by phoning or writing to Ostop. This material includes articles written for the general public and articles written for health care professionals.
4. The Ostop Board stimulates a variety of other groups and organizations to arrange local radio and television programs about osteoporosis.

These sources of information are believed to provide women with access to accurate osteoporosis information with the expectation that informed women will be more likely to adopt a lifestyle believed to maintain strong bones and that they will actively seek early diagnosis and treatment if they suspect they have osteoporosis.

The Purposes of the Study

The overall purpose of this study is to provide Ostop with information about its members and its education program so that the Ostop Board can assess its present program and make decisions about future programming. The first goal is to provide Ostop with relevant descriptive information about the organization's members, their participation in Ostop's education program and the members' perceived value of the information sources provided by Ostop.

The second goal of the study is to analyze qualitative data which describe the program, and, based on this information, develop a theoretical explanation of how Ostop functions as a

provider of health education. Research questions will then be used to evaluate important relationships within this theoretical explanation.

Research Hypotheses

The research null hypotheses in this study are:

1. There is no statistically significant correlation ($p \leq .05$) between knowledge about osteoporosis and respondents' participation in Ostop, as defined by length of membership and meeting attendance, or their perceived utilization of Ostop models.
2. There is no statistically significant correlation ($p \leq .05$) between knowledge about osteoporosis and respondents' personal characteristics as defined by the presence of a diagnosis, loss of height, presence of a fracture history, age, menopause status and educational level.
3. There is no statistically significant correlation ($p \leq .05$) between reported performance of osteoporosis-related health behaviors and respondents' knowledge about osteoporosis.
4. There is no statistically significant correlation ($p \leq .05$) between reported performance of osteoporosis-related health behaviors and respondents' participation in Ostop as defined by length of membership and meeting attendance, or their perceived utilization of Ostop models.
5. There is no statistically significant correlation ($p \leq .05$) between reported participation in osteoporosis-related

health behaviors and respondents' personal characteristics as defined by presence of diagnosis, loss of height, incidence of fractures, age, menopause status and education level.

Outline of the Study

Chapter II is the literature review relevant to this study. Selected literature is reviewed to explain the nature of osteoporosis and its management. Health education is proposed as a viable method of helping reduce the incidence of osteoporosis and manage the disease once it is present. Social learning theory is then described and related to Ostop's educational program. This discussion provides the foundation which made it possible to generate theory based research hypotheses.

Chapter III is a description of the research design. Included are descriptions of the population and study sample, the research procedures and the plan for the analysis of the data.

Chapter IV describes the process of developing the instruments used to collect the data. It includes a discussion of the factors which influenced the development process, a restatement of the research hypotheses, descriptions of the instruments and the stages of the development process. Next the pilot test of the questionnaire is described and the results of

the test presented. At the end of the chapter, the validity and reliability of the instruments are discussed.

In chapter V, is the last chapter of the thesis, the results of the data analysis are reported and discussed. Finally, in the last section of the chapter implications for health educators, including the Ostop Board, are discussed and suggestions for future research are made.

CHAPTER II

LITERATURE REVIEW

The goal of this study is to investigate the use of a health education intervention aimed at increasing knowledge and health-related behavior of individuals who have, or may be at risk of developing, osteoporosis. Ostop is an organization that has as one of its goals the provision of health education about osteoporosis. This literature review will focus on relevant health education research and educational theory, and relate them to osteoporosis and the Ostop organization. It will be divided into two major sections.

The first section will review the nature of osteoporosis and its management. Factors contributing to osteoporosis will be discussed in the context of an organizational format called the Health Field Concept. Then research literature relevant to the use of health education programs for the prevention and the treatment of disease will be reviewed and related to osteoporosis treatment.

The second section will explore the application of a theoretical framework to understand and investigate

the Ostop group's approach to health education. A review of relevant concepts from Bandura's social learning theory will be given. These concepts will then be related to the stated educational philosophy of Ostop and to the Ostop educational practices observed by the researcher.

The Nature of Osteoporosis and its Management

Osteoporosis is a chronic disease. Like other chronic diseases it develops as a result of multiple factors. Understanding the nature of this disease requires that all of the factors that contribute to its development and progression be identified.

Lalonde (1974, pp. 5 - 6) suggests that one major problem in the effective control of chronic diseases is the lack of a system which can be used to organize the multiple factors which interact to produce a chronic medical problem. This lack results in attention being focused on only some disease factors while other factors are ignored. Attention has been focused on health care, standard of living, public health protection and medical science research. This attention has resulted in major changes in the health care system. Environmental factors and life style factors which also cause disease have received much less attention. As a result, a chronic disease may not receive adequate attention until it has seriously affected the health of individuals. The effective control and treatment of chronic

diseases requires that all of the factors which contribute to a disease be identified and given appropriate attention.

The health field concept was developed to provide a broad conceptual framework which is intended to include all of the factors which contribute to the development of a health problem. The health field concept divides the health field into four categories: human biology, environment, life style and health care organization (Lalonde 1974, p. 31). Each of these categories is described before it is used to organize the literature which describes the factors associated with the development and progression of osteoporosis. This framework is also used to organize the second part of this subsection which demonstrates the value of health education as an important part of the mangement of this problem.

Factors Associated with Osteoporosis

In this section multiple factors which contribute to the development of osteoporosis are identified, and selected research studies are reviewed to demonstrate what is currently known about the different factors.

Human Biology Factors

Both genetic and age-related changes associated with an illness or death are included in this category. These causes are innate problems which originate in the individual's biology (Lalonde 1974, p. 31). Genetic factors and age-related changes are implicated in the development of osteoporosis.

Gender, ethnic origin and physical stature are three important genetically-determined factors which influence a person's predisposition to osteoporosis. Women, as a group, have a much higher incidence of osteoporosis then men (Smith, Sempos, and Purvis 1981, p. 60), but not all women share the same risk level. Women who have northern European or Chinese ancestors are members of ethnic groups which have a greater than average risk of developing this bone disorder. Women who have small bones also have been shown to have an increased risk level (Notelovitz and Ware 1982, pp. 51 - 55; Smith, Sempos, and Purvis 1981, p. 60).

Menopause is an age-related change that is a normal and unavoidable natural process in middle-aged women. During the process of menopause the ovaries stop making estrogen and blood levels of this hormone decline. When this change happens, the rate at which women lose bone mass is accelerated. In some women the rate of bone loss is excessive. These women are very likely to develop osteoporosis unless this accelerated rate of bone loss is diagnosed and slowed (Notelovitz and Ware 1982, pp. 46 - 50, 118 - 119; Smith, Sempos, and Purvis 1981, pp. 61 - 62).

Both genetic predispositions and the age-related change of menopause are human biological factors which contribute to the development of osteoporosis. A woman with osteoporosis is likely to have one or more of these factors. She most probably also is affected by factors assigned to one or more of the other categories.

The identification of human biological causes of disease is an important step in the control of a health problem. Once these factors are known, it is possible to identify the segment of the population which has a high risk of developing a specific disease. These people can then be the main focus of preventive or early diagnostic interventions.

Environmental Factors

Factors which contribute to disease development but are external to the individual are included in the environmental category. These factors are controllable but are not within the control of the individual. Included in this group are factors such as air, water and noise pollution; food or drug contamination and the safety of products such as equipment and drugs. An important characteristic of this category is that to reduce or remove environmental causes of a disease requires interaction with other people to change the environment (Lalonde 1974, p. 32).

With one notable exception, environmental factors are not related to the development of osteoporosis. This one factor is the safety of certain drugs. The long term use of cortisone, heparin, some diuretics, aluminum-containing antacids or high doses of thyroid hormone have been shown to be related to the presence of osteoporosis. The first line of defence against this factor is the selection of alternative drugs. This selection is not always done; neither is it always medically possible. As a result, the use of certain drugs continues to be

a factor in the development of osteoporosis (Notelovitz and Ware 1982, pp. 107 - 108).

Lifestyle Factors

Lifestyle factors are the behavioral choices made by individuals which contribute to an illness (Lalonde 1974, pp. 16 - 17, 32). They include behaviors such as dietary habits, exercise participation, smoking, caffeine and alcohol consumption.

At the present time, insufficient knowledge exists to prove that the adoption of specific lifestyle habits will prevent osteoporosis or retard its progress in affected individuals. Proof would require large, longitudinal, well-controlled studies which used measurements of bone mass as the criteria for judging the effect of lifestyle habits. Such studies have yet to be conducted.

The current state of knowledge is insufficient to prove the influence of health habits on the development of osteoporosis but sufficient knowledge exists to demonstrate the relationship between lifestyle and bone mass. This evidence is sufficiently strong that the National Institutes of Health (1984, pp. 651, 654 - 656) have recommended that further research be conducted and that women be advised to eat a diet which has sufficient calcium and to participate in moderate exercise such as walking.

Notelovitz and Ware (1982, pp. 67 - 71, 102) also draw attention to research which demonstrates a higher incidence of osteoporosis among women who smoke or who consume excessive

amounts of caffeine and alcohol. At the present time, the relationship of these habits to osteoporosis is not well understood. Despite the present lack of scientific explanations, they advise women to stop smoking and to limit their caffeine and alcohol consumption.

Lifestyle habits have been identified as osteoporosis disease factors and based on this identification, osteoporosis experts recommend the adoption of lifestyle habits which are correlated with a lower incidence of osteoporosis. Selected research studies from the dietetic and exercise literature demonstrate the important but incomplete knowledge base which experts use to make lifestyle recommendations.

Evidence to Support Dietary Calcium Recommendations

It is important for the body to maintain a positive calcium balance to prevent the loss of bone mass. A positive calcium balance means that the amount of calcium absorbed from the diet is larger than the amount of calcium excreted from the body. One factor in determining calcium balance is the amount of calcium in the diet.

There is disagreement in the literature about how much dietary calcium is required to maintain or achieve a positive calcium balance. The recommended intake of calcium for adult women fifty years of age and older is 800 mg/day (Canada, Dept. of Nat. Health and Welfare 1983, p. 180). Osteoporosis experts believe that this is too small an amount. They recommend

between 1,000 mg/day and 1,500 mg/day. Notelovitz and Ware (1982, p. 89) recommend 800 - 1,000 mg/day for pre-menopausal women, and 1,200 - 1,400 mg/day for women during and after menopause. The National Institutes of Health (1984, p. 654) recommend 1,000 mg/day for pre-menopausal women and post-menopausal women being treated with estrogen; and 1,500 mg/day for untreated post-menopausal women. Calcium intake in excess of 1,500 mg/day is not recommended, and intakes of over 2,000 mg/day may increase the risk of developing kidney stones (Notelovitz and Ware 1982, p. 89). The precise amount of calcium required to help prevent and treat osteoporosis is yet to be accurately determined. Despite this lack of agreement about the recommended amount of calcium, low calcium intake has been identified as a factor which contributes to osteoporosis.

The amount of calcium a woman includes in her diet is related to her calcium balance. Both pre-menopausal and post-menopausal women who selected diets which contained an average of 661 mg/day of calcium were shown to have a negative calcium balance. The amount of calcium ingested by the study participants was positively correlated with calcium balance. Women who self-selected a diet which was high in calcium had a more positive calcium balance than women who selected a diet low in calcium (Heaney, Recker and Saville 1977, pp. 1605 - 1606). This study demonstrates that calcium balance is clearly affected by daily intake of calcium.

A cross-sectional study conducted in Yugoslavia included two groups of women with different calcium intakes. This study

demonstrated that the difference in calcium intake was related to the incidence of fractures. One group had an average calcium intake of 876 mg/day. The second group had a much lower average intake of 394 mg/day. The high calcium group had a larger bone mass at maturity and a lower incidence of fractures in old age, compared to the low calcium group. Low dietary calcium was associated with negative calcium balance and high fracture rates (Matkovic, et al 1979, pp. 541 - 548).

These studies demonstrate that adequate calcium intake is an important factor in maintaining strong healthy bones. Women with low calcium intakes are more likely to have a negative calcium balance. Calcium intake is an important lifestyle factor which contributes to the development of osteoporosis.

Low calcium intake is an important disease factor for North American women. It is estimated that the average North American woman who is forty-five years of age or older has a intake of calcium of between 450 mg/day and 600 mg/day (Notelovitz and Ware 1982, p. 63; Smith, Sempos and Purvis 1981, p. 63). This means that the average pre-menopausal and post-menopausal woman is eating a diet that does not contain even as much as the more conservative recommended daily intake of 800 mg/day. Low calcium intake is a disease factor which is changeable. By eating a diet which contains adequate calcium, women may be able to reduce their risk of developing osteoporosis or retard the rate of bone loss if they have osteoporosis.

Evidence to Support the Recommendation of Exercise Participation

There is no conclusive proof that regular exercise can either help prevent osteoporosis or help osteoporotics minimize bone loss. The recommendation for moderate exercise is based on exercise studies, most of which do not have cause and effect designs. These studies demonstrate a positive relationship between the amount of bone mass and the type and degree of exercise participation. In recent years, a limited amount of research has been conducted which demonstrates the positive effect of exercise on bone mass in post-menopausal women. These studies are encouraging; however, there has been insufficient research specifically on the relation between exercise and osteoporosis to indisputably conclude that exercise is effective in the prevention and treatment of osteoporosis.

Bone is a dynamic changing body tissue. One theory of bone development states that bone mass is believed to be partly determined by mechanical stress acting directly on the bones. Gravity and muscle contractions are the two mechanical stresses which influence bone mass. When the mechanical stress is reduced, the bone mass atrophies and, conversely, when the mechanical stress is increased the bone mass hypertrophies (Smith 1982, pp. 74 - 75). This evidence of a physiological response by bones to stress is supported by exercise research.

Smith (1981, pp. 182 - 185) reviewed fifteen studies which analyzed the effect of exercise and inactivity on bone mass in people of all ages. These studies demonstrated that bone mass

was lost by physical inactivity and increased by physical activity. Examples of situations which resulted in bone mass loss included astronauts in space, people on bed rest and the immobilization of an extremity in a cast. All of these situations reduced both the weight bearing and the muscle activity forces acting on the bones.

One study reviewed by Smith which demonstrates higher bone mass related to physical activity is especially interesting. In a study conducted by Nilsson and Westlin (1971, pp. 179 -182) nationally-ranked athletes were shown to have had higher bone mass than non-athletes. They also reported that participation in different sports resulted in different amounts of bone mass. In descending order were weight lifters, with the highest bone mass, followed by throwers, runners, soccer players, and lastly swimmers. The controls also demonstrated different bone masses depending on their level of activity. Active control participants had larger bone masses than inactive controls.

Smith concluded that the research evidence supports the theory that bone mass is directly influenced by the amount of exercise included in a person's lifestyle. Low levels of exercise are associated with bone atrophy and high levels are associated with bone hypertrophy.

The one exception to the studies which show positive correlations between exercise and bone mass is excessive exercise combined with poor nutrition in young women. Young women who exercise to the extent that they induce amenorrhea may

lose rather than gain bone mass (Cameron, Sutton and Prior 1987, p. 154; National Institutes of Health 1984, p. 653).

The positive effect of exercise on bone mass has also been demonstrated in post-menopausal women. Post-menopausal women participating in a one hour exercise program three times weekly, for one year, improved their calcium balance and lost no bone mass during the course of the study (Aioia 1978, pp. 356 - 358).

A more recent study using participants ranging in age from fifty to sixty-two years demonstrated that post-menopausal women can gain bone mineral mass. The women in the exercise group participated in a one hour fitness class three times a week for a duration of one year. The control group did not participate in any formal exercise programs. The exercise group gained an average of 6.8% bone mineral mass which was a significant increase. The control group lost 1% bone mineral mass, however this change was not significant (Chow, Harrison and Notaries 1987, pp. 8 - 10).

A study conducted using much older women also demonstrated that activity level is related to bone mass. The study participants ranged in age from sixty-nine years to ninety-five years. For three years the exercise group participated in an activity program three times a week. This program consisted of sitting and standing exercises designed to stress the different parts of the body. At the end of the study the exercise group had increased their bone mineral content by 2.29%. The control group had lost 3.28% of their bone mineral content. The

researchers concluded that even in elderly women it was possible to use exercise to increase bone mass (Smith, Reddan and Smith 1981, pp. 60 - 64).

Caution must be exercised when interpreting these studies on older women. To date, only a small number of studies have been conducted which assess the effect of exercise on the bones of middle-aged and elderly women. These studies have been conducted on small populations and have been relatively short term. This limited research should not be regarded as conclusive evidence that exercise will prevent osteoporosis in all women who exercise. A concern expressed by Sutton (1985) is that women who exercise may believe they have no risk of developing osteoporosis. He stated that despite many years of following an ideal lifestyle, some post-menopausal women will still lose bone at accelerated rates and as a result develop osteoporosis. Sutton's opinion is shared by Notelovitz and Ware (1982, p. 112).

The evidence which would prove that an inactive lifestyle is a factor in osteoporosis may be limited at the present time, but lifestyle is one of the factors over which women have control. Sufficient research has been conducted to demonstrate the association of osteoporosis with an inactive lifestyle. It may be unwarranted for women to hold the belief that exercise is a guarantee against osteoporosis, but it appears to be risky for women to remain inactive while awaiting the results of yet-to-be-conducted longitudinal research studies.

A problem with the recommendation that women adopt a physically active lifestyle is that the research literature does not clearly define the optimal level of exercise required to help prevent the development or progression of osteoporosis. The results of the studies described earlier are useful in developing exercise programs for older women; however, only future research will determine which approaches to exercise are most appropriate. Notelovitz and Ware (1982, pp. 110 - 111) suggest that at least until more data are available, women who do not have osteoporosis should exercise in a manner that increases cardiovascular fitness. The rationale of this approach is that women will meet two health objectives: cardiovascular fitness and the maintenance of bone mass. They recommend twenty-minute exercise sessions stressing weight bearing exercises, such as jogging and bicycling, three times a week. The intensity of the exercise should be at 70% to 85% of the person's exercise capacity, and should be preceded and followed by five or more minutes of warm-up and cool down exercises. Chow, Harrison and Notaries (1987, p. 14) also recommend a cardiovascular fitness program stressing weight bearing exercises. In addition to the fitness exercise they also suggest that a weight training program which increases muscle strength may be beneficial. For women with osteoporosis, Notelovitz and Ware (1982, pp. 128 - 132) recommend gradually increasing a walking program to twenty minutes a day. They also recommend a simple series of back exercises and, where appropriate resources are available, water exercises. The long

term effects of the following recommendations have not yet been established.

Exercise has been shown to be a factor which influences bone mass. At the present time, no claims can be made about the effectiveness of exercise as a prevention or treatment for osteoporosis. Despite this lack of proof, medical experts are strongly recommending that women of all ages become physically active and stay active. This advice includes women with osteoporosis. The optimal levels of exercise to prevent bone loss or maintain bone mass have not yet been determined. At the present time, the advice given to women related to the amount of exercise she should do is based on clinical examination and, when available, measurements of bone mass. Non-osteoporotics are encouraged to strive for cardiovascular fitness. A more limited program is recommended for women with osteoporosis. This advice is good in theory but many post-menopausal women do not usually know their actual bone status. Unless a woman has access to accurate diagnosis, she must make her decisions about exercise with insufficient information on her own bone status.

Summary

Lifestyle factors have been related to the presence of osteoporosis. The current level of knowledge precludes stating that poor lifestyle habits cause osteoporosis or that good lifestyle habits can prevent or minimize osteoporosis. Sufficient knowledge does exist on which to base lifestyle recommendations. These recommendations include: eating a diet

which contains sufficient calcium; participating in physical activity; not smoking; and avoiding excessive consumption of caffeine and alcohol. The research literature has not established the exact amounts of calcium required in the diet nor the optimal amount of exercise that may help maintain strong healthy bones. At present, lifestyle recommendations are based on limited research.

Health Care Organization

The last category of the health field concept is health care organization. This category includes causes of illness and death that result from the lack of effective medical intervention or the unavailability of appropriate treatment (Lalonde, 1974). For many diseases such as heart diseases these factors have been greatly reduced. For example, the health care system provides a wide variety of interventions for ischemic heart disease victims. Attempts are made to prevent this disease and when it develops the affected person can expect accurate diagnosis and treatment intervention. Osteoporotics cannot expect the same amount of diagnosis and treatment intervention.

Both the knowledge and the technology exist to provide better diagnosis and treatment for osteoporotics but these services are not generally available in British Columbia. To date no cost effective screening technique has been developed (Cameron, Sutton and Prior 1987, p. 154). Bone density measurement is available in Vancouver but access is limited and

the test is expensive. Even when a woman has been diagnosed, often as a result of a fracture, she will not necessarily receive treatment for her osteoporosis. Ostop attempts to help women in this situation by responding to letters and phone calls requesting information about osteoporosis. The exact number of requests specifically related to diagnosis and treatment is not known but the society's secretary and volunteers have responded to over one thousand letters and three thousand phone calls since the organization started in November 1983 (Ostop Society of B.C. 1987, p. 3). One of the most common reasons why people contact Ostop is to seek advice or information on how to obtain a diagnosis and treatment for osteoporosis (Todd, 1985a).

Increased availability of accurate, early diagnosis and treatment prescription would not completely eliminate health care organization as a factor in the incidence of osteoporosis. Diagnosis and treatment prescription are only effective if the prescribed treatments are available and the patient complies with the physician's advice. At the present time in British Columbia, no specialized programs exist to provide safe exercise instruction for osteoporotics. Individual patients may receive appropriate instruction from physiotherapists, but one common complaint received by Ostop is that affected women cannot locate appropriate exercise instruction (Todd, 1985a and b; Cameron, 1986). Nutritional consultation is also important but many patients also do not have direct access to nutritional experts (Todd, 1985a and b).

Drug therapy is available. A growing number of osteoporotic women have been prescribed drugs which increase bone mass and arrest or greatly reduce the incidence of fractures. The effectiveness of this treatment is largely dependent on the patient's compliance with the therapy over a long period of time.

Non-compliance with medical treatments is a problem. Davis (1968, pp. 274 - 275) reviewed the non-compliance literature and reported that at least one-third of patients did not follow the instructions of their physicians. Although no comparable data are available for osteoporotics, it is very likely that their non-compliance rate is similar to the findings reported by Davis.

Lack of osteoporotic health care services and patient non-compliance are important factors in the incidence and progression of osteoporosis. The lack of services is being addressed in British Columbia and it is expected that both diagnostic and treatment services will become more readily available in the near future (Cameron, 1986). The increased provision of services will not, however, solve the problem of non-compliance. Other solutions are needed to increase compliance.

Summary

The health field concept is a useful conceptual framework. Using it, the major factors which have been implicated in the development of osteoporosis can be organized. The framework was

not designed to dictate appropriate intervention. Its function is to classify causes or possible causes of illness. Once this step has been completed, solutions to the problems identified can be developed. The type of intervention will vary depending on the professional background of the person providing an intervention. For example, osteoporosis medical specialists are likely to suggest solutions related to their field of practice such as the purchase of diagnostic equipment and the establishment of screening and treatment programs. Osteoporotics who have had difficulty obtaining information about their condition will likely stimulate the development of health education which may provide them with some useful answers. Policy makers, physiotherapists and fitness experts would use the classified disease factors to generate other solutions. The focus of this study is on the role of health education related to osteoporosis. Because of this focus, further discussion will be limited to the field of health education.

Health Education Related to Osteoporosis

Health education is one type of intervention which can be used to help at-risk women reduce the likelihood of developing the disease and women with osteoporosis retard the rate of its progression. The goals and expected outcomes of different educational programs will be determined by the disease factors being addressed, the age of the learner and the state of her bones. In this section, selected health literature is reviewed

to demonstrate that health education is a valuable but imperfect intervention which can contribute to the control of osteoporosis.

The material reviewed is organized into three sections using the health field concept and the disease factor categories described in the previous section: 1. Health education related to human biology factors; 2. Health education related to lifestyle factors; 3. Health education related to environmental and health care organization problems. Health education related to the environmental factor of drug safety is included with the discussion of health education related to health care organization factors because, at the consumer level, the drug safety factor is often closely related to the problems of appropriate medical intervention and patient compliance.

Health Education Related to Human Biology Factors

One major goal of osteoporosis related health education is to inform women about their personal risk of developing osteoporosis and about the consequences which can occur if osteoporosis is not prevented. Women require accurate knowledge about genetic and age-related factors which increase their risk of developing this bone condition. Although they cannot change their genetic risk factors of sex, ancestry, family history, bone size or the normal process of menopause, they can use knowledge to take appropriate action.

Appropriate action will vary depending on the age of the woman and the state of her bones. Premenopausal women who become aware that they have an above average risk of suffering from osteoporosis may be motivated to adopt a lifestyle associated with developing and preserving strong bones. Menopausal and post-menopausal women may also choose to adopt a healthy lifestyle and, in addition, they may use their knowledge of biological risk factors to seek out medical diagnosis and treatment before they become osteoporotics. One possible outcome of increasing women's knowledge about risk factors and the current lack of diagnostic services may be that an increased number of women will demand evaluation. This increased pressure on available services may be an important influence on the development of improved osteoporosis related health care services. This role of health education may be very important and is congruent with the stated educational goals of Ostop. However, because this study does not attempt to evalute this role of osteoporosis health education, no literature related to this role is reviewed in this section. Once diagnostic services are available, health education about risk factors will still be important. It seems reasonable to assume that women who are aware of the consequences of osteoporosis and know they have an increased risk are more likely to participate in screening programs than are women who are uninformed about osteoporosis.

This relationship between health education focused on informing the at-risk population and increased participation in diagnostic and preventive health measures has been demonstrated

with other medical problems. Rosenstock (1974, pp. 360 - 369) reviewed nine studies which evaluated people's beliefs about disease as factors related to participation in preventive health interventions. In eight of the studies, health education was shown to be an important element.

The evaluation of health education was not the central purpose of seven of these studies. However, health education was shown to be an important factor. The focus of these studies was to evaluate the influence of beliefs on the level of participation in preventive health procedures. Two of the beliefs which influenced behavior were: 1. people's belief that they were susceptible to the disease, and 2. people's beliefs about the influence the presence of the disease would have on their lives. In six of the studies, these variables were shown to be related to participation in preventive health care interventions. If people believed they were at risk of developing a disease they were more likely to take advantage of diagnostic tests and to attend medical and dental check-ups.

The influences of the beliefs people held about the consequences of a disease were more complex. People who believed that a disease would have few consequences were unlikely to participate in the recommended interventions. Participation in health care interventions was more likely if people believed that there would be some negative consequences in their lives if they developed a disease. However, if they believed that having a disease would be very disruptive in their lives they were less likely to take advantage of health care

diagnostic interventions. There appeared to be an optimal level of belief about the severity of the consequences that was associated with taking preventive health action.

A common characteristic of these six studies was that they all had organized educational interventions designed to increase people's knowledge about the disease and the recommended health action. Participants were aided in becoming aware of their personal risk and possible consequences.

The one study that did not support the hypothesis that health beliefs influence preventive health participation had no educational intervention associated with it. Participants' health beliefs were evaluated and fifteen months later their health behavior was assessed but no attempts were made to increase their knowledge about either the risk of developing medical problems or the impact the presence of a disease would have on their lives.

Two of the studies reviewed by Rosenstock focus on the evaluation of education as a variable in preventive health behavior. In the first study, non-academic university employees were the subjects. The treatment group was exposed to messages with the intent of influencing their beliefs about disease and the effectiveness of medical interventions. The control group did not receive the educational intervention. Employees exposed to the messages made more preventive health visits to their physicians than employees who did not receive the messages (Haefner and Kirscht 1967, p. 483).

In the second study (Becker et al 1975, pp. 4 - 8, 12 -14), multiple educational interventions on the topic of Tay-Sach Disease were provided for an identified at-risk Jewish population in the Baltimore-Washington area. The purpose of the educational intervention was to increase the population's knowledge about Tay-Sach Disease and to promote a screening program that was being conducted in the area. Tay-Sach Disease is a relatively rare genetic disorder which is always fatal in early childhood. Prior to the study it was assumed that few of the at-risk population had knowledge about the disease, the genetic screening test or the availability of diagnostic techniques to diagnose the disease early in pregnancy.

Following the educational intervention, 7,000 people volunteered for the screening test. All were required to complete a questionnaire which measured their health beliefs. Five hundred of these questionnaires were randomly selected and compared with the questionnaires sent to 500 at-risk Jewish people who had been exposed to the educational interventions but who had chosen not to take the screening test. The return rate for this second group was 80%.

People who believed they were at risk of having a baby with Tay-Sach Disease had a higher participation rate than people who believed they had a low or no risk of having an affected child. Becoming informed about their risk of being Tay-Sach carriers appears to have been one factor which motivated people to take advantage of the diagnostic screening test.

Evaluation of participants' beliefs about the consequences of the disease demonstrates that there is an optimal level of fear associated with participation in the diagnostic screening test. People who scored low on questions related to perceived consequences of being a carrier tended not to participate. The low score was thought to reflect the belief that being a carrier would have little impact on the person's life. As a result of this experience of limited threat, the individual was unlikely to take the test. If a person believed that being a carrier of the Tay-Sach trait would have a very serious impact on his life he was also unlikely to take the test. People took the test if the degree of their fears about the impact of discovering that they were carriers was neither low or high.

The results of the Tay-Sach Disease study are important for health education. This study demonstrated that health education provided to an uninformed at-risk population can influence people's knowledge and beliefs about risk factors and the consequences of not taking preventive action. These changes were associated with participation in a diagnostic screening test.

Rosenstock concluded that the results of the nine studies he had reviewed support the use of educational interventions as an effective method of inducing people to adopt health beliefs that are associated with participation in preventive health programs. These conclusions support the use of health education as an intervention in reducing the incidence of osteoporosis. Uninformed women need to be informed about risk factors which

predispose them to this bone disorder. They also need to know the consequences of not being diagnosed prior to the late stage of severe bone loss. Knowing their risk level may encourage women to seek earlier diagnosis.

Ostop provides women with information about both the risk factors and the consequences of developing osteoporosis. Their rationale for including this information is that until women are informed about osteoporosis, they are unlikely to actively seek diagnosis and treatment. This study does not attempt to measure the relationship of level of knowledge about osteoporosis and an individual's seeking diagnosis or treatment, but it does measure the amount of osteoporosis knowledge members have. Based on the research reviewed by Rosenstock, being well informed about disease risks and consequences is an important factor related to preventive health behavior. This knowledge may also be a factor in helping women to develop a lifestyle which is associated with strong bones.

Health Education Related to Lifestyle Factors

Experts believe that the adoption of appropriate behavior can both reduce the incidence of osteoporosis and retard the rate of its progression in affected women. Women cannot be forced to adopt life habits associated with strong bones. This behavior change must be accomplished by convincing women to eat a high calcium diet, to be physically active and to avoid

caffeine, alcohol and smoking (Notelovitz and Ware 1982, pp. 88 - 110; Smith and Cohn, 1985, pp. 41 - 148, 81 - 83, 106).

The degree to which health education successfully achieves this goal of changing people's health habits is variable. This variability can be demonstrated by presenting the results of selected research studies and reviews of specific areas of the health literature. The success of health education is shown to range from a very low rate of success to a success rate of about thirty percent. These studies are drawn from both cognitive and behavioral approaches to health education. Both of these approaches are common in the health literature. Before discussing the selected studies, a brief discussion of the two different approaches will clarify the differences and similarities between cognitive and behavioral interventions.

Cognitive interventions are designed to increase clients' knowledge about health-related issues. Their goal is to increase the learner's knowledge about health issues and to convince them to adopt recommended beliefs about health and illness (Swanson 1972, p. 363). The major assumption that guides this approach to health education is that if people are informed about health issues and know the consequences of their actions, they will change their behavior.

The second approach to health education is behavioral. These interventions stress the importance of using strategies which increase motivation and reinforce the actual performance of appropriate behavior. This type of intervention is not usually called health education. Names commonly applied to this

approch are behavior medicine, cognitive behavior therapy and cognitive behavior modification (Stainbrook and Green 1982, p. 15). Regardless of the name applied, the goal of these interventions is to change people's behavior by providing information to the learners and by reinforcing the behavioral practice of recommended health habits. The definition of health education used in this study includes behavioral interventions with this goal. The basic assumption that guides behavioral health education is that although knowledge is essential, it is not sufficient to produce behavioral change. In addition to the knowledge which is provided, techniques are used to initiate behavior change and maintain the new behavior. Educators using this approach provide both information and reinforcement such as praise and money, and they may also make behavioral contracts. Learners are taught to provide self-reinforcement by establishing learner-administered rewards and punishments (Ferguson 1978, pp. 231 - 235).

The health education literature does not demonstrate that either the cognitive or the behavioral approach is superior to the other in inducing behavior change. Evidence can be found which supports or negates the value of both approaches. Additionally, the division between the two approaches is not always clear cut. For example, both the American Heart Association and Public Affairs Committee have developed written material to teach people about the factors which increase a person's risk of developing heart disease and how to lower this risk. Booklets such as, Your Heart Has Nine Lives (Blakeslee

and Stamler 1966) and Understanding Your Heart (Irwin 1974) are published primarily to provide factual information about the causes and prevention of heart disease but they also include hints on how to change behavior and maintain new behaviors. That is, they provide information on how learners can use self-reinforcement to help their efforts at changing their behavior.

An example of a behavioral program which emphasizes both cognitive and behavioral techniques is a weight control program reported by Holm, Taussig, and Carlton (1983, pp. 170 - 174). Clients were taught to alter their eating behavior by monitoring their food intake, learning to be more assertive, rearranging their home environment to help avoid overeating and altering their food servicing practices. In addition to this behaviorally-oriented instruction, ten of the twelve sessions included a major emphasis on cognitive components including prescription and explanation of an appropriate diet, instruction on the vitamin, mineral and caloric content of foods and advice on cooking techniques. This program was defined as a behavior modification program and its results were attributed to the behavior techniques despite its reliance on both cognitive and behavioral type interventions.

These examples demonstrate that the apparent division between cognitive and behavioral health education is not clearly defined. The following studies demonstrate that both approaches contribute to health education which is focused on changing people's lifestyle habits. They also demonstrate that the success of health education intervention is variable.

Smoking is a behavior which has been shown to be associated with several chronic diseases (Kasl 1974, p. 443). Smoking has also been associated with osteoporosis (Notelovitz and Ware 1982, pp. 67 and 70). Influencing people to stop smoking has been a goal of many health education interventions and the success of such interventions varies widely. Kasl (1974, p. 443) reported that survey evidence demonstrates that smokers are generally well informed about the dangers of cigarette smoking but that the rate of successful smoking cessation is low. In one survey, one-half of the participants reported having considered stopping smoking but only 7.5% had been successful in stopping for three months (Horn 1968, cited in Kasl 1974, p. 444). Kasl (1974, pp. 445 - 446) also reported that a review of the smoking cessation literature revealed that: 1. the success rate of educational interventions judged by a one year follow-up was very poor; intervention groups and matched control groups demonstrated similar rates of smoking cessation, and 2. program drop out rates were high for all programs. This evidence does not provide any support for the use of educational interventions to help people stop smoking.

Evidence can be found which conflicts with Kasl's conclusion. The Standard Heart Disease Program is a good example of research which demonstrates that health education can affect smoking and other disease-related behaviors. In 1972, three similar communities in northern California were used to demonstrate the value of educational interventions. The first community received an information program about the prevention

of ischemic heart disease. The second community received the information program and was also provided with individual counselling services. The third community was the control and received no intervention. Two years later, evaluation of the risk factors related to ischemic heart disease were used to evaluate the effectiveness of the program. In both of the communities which received the educational interventions, the overall risk of developing heart disease had dropped by approximately 25%. Serum cholesterol and blood pressure were shown to be lower on average in both communities. The community which received the additional intervention of counselling services had the added result of a 35% reduction in smoking among high risk individuals who obtained counselling. In the control community the measures of overall risk of ischemic heart disease increased during the study period (U.S. Dept. of Health, Education and Welfare 1979, pp. 119 - 121).

This study (U.S. Dept. of Health, Education and Welfare 1979, pp. 119 - 121) supports the use of health education to reduce risk factors for heart disease. The method of evaluation is especially interesting. Self-reported behavior change is not used except for smoking. The success of the program was judged on the actual change in measurable risk factors. These factors have been shown to be related to lifestyle factors which cause disease. The conclusion was that educational interventions are an important approach that does affect public health. This study also demonstrated that health education can help people to stop smoking.

Exercise participation has also been identified as a behavior which is important in health improvement and maintenance. Martin and Dubbert (1982, pp. 1005 - 1007) reviewed one hundred and six articles selected from the behavioral medicine literature which studied the use of aerobic exercise as a health intervention. They limited their review to aerobic exercise studies and defined aerobic exercise as "sustained increases in large muscle and cardio-pulmonary activity, which, when performed with sufficient frequence, intensity and duration resulted in improved endurance" (Martin and Dubbert 1982, p. 1002). They concluded that aerobic exercise is an important lifestyle habit. This type of exercise has been demonstrated to: 1. help reduce medical symptoms in people with heart disease, 2. contribute to weight loss in obesity, 3. help in the management of diabetes, and 4. contribute to the reduction of psychological anxiety. The research findings supported the belief that regular moderate aerobic exercise is a useful intervention and that efforts should be made to help people begin to exercise and then continue to exercise indefinitely.

In their review of the exercise adherence literature, Martin and Dubbert (1982, pp. 1007 - 1008) found that between 50% and 70% of exercise participants in organized programs had stopped exercising twelve to twenty-four months later. Most of the dropout occurred during the first three months. Little difference in adherence rates were found between populations who were healthy, at risk of developing heart disease or those who

had experienced a heart attack. The state of health and personal experience with disease symptoms did not appear to influence compliance with recommended exercise behavior.

The important problems with interpreting the results of the exercise adherence literature reviewed were identified by Martin and Dubbert. The method of evaluating the drop out rate varied among studies. People who had dropped out of formal programs but had continued to exercise on their own were included in the drop out rate. Despite these problems of interpretation, exercise adherence was judged to be low (Martin and Dubbert 1982, p. 1008).

Martin and Dubbert (1982, pp. 1011, 104) concluded that exercise as a health intervention is less effective than it could be because adherence rates are low. Exercise participation behavioral changes are more likely to be successful if the period of intervention is lengthy, includes both instructor reinforcement and self-reinforcement, and that responsibility for reinforcement of behavior is transferred to the learner.

It is possible to interpret a 50% to 70% failure rate as proof that health education is ineffective type of intervention. What such an interpretation neglects is that 30% to 50% of participants were still exercising. Adopting exercise as a habit is a major change in a person's lifestyle. A 30% to 50% success rate may be an acceptable level of success for any given intervention designed to help people change from being inactive to being people who exercise on a regular basis.

Dietary changes are equally hard to institute. Glanz (1979, p. 631) states that the actual compliance rate with prescribed dietary intervention is unknown but is generally assumed to be less than the compliance rate with medication prescriptions. The studies reviewed in preparing for this investigation demonstrate low compliance rates. The drop out rate from educational dietary change interventions has been assessed and varies between 20% and 80%, depending on the study (Ferguson 1978, p. 232). The problems of non-compliance and high drop out rates are important because increasingly people are being told to make dietary changes to prevent or manage chronic diseases (Glanz 1979, p. 631). Despite the magnitude of the problem of compliance, health education interventions have been shown to have some degree of success. The results of two weight control studies demonstrate this relative success.

In one study Adams et al (1983, pp. 306 - 309) demonstrate successful long term behavioral change for a proportion of participants despite a high drop out rate. The study included 125 participants divided into twelve separate classes. The drop out rate was 49% for three classes of fifteen weeks and 58% for the remaining classes which were twenty weeks long. Weight loss was calculated using all 125 participants, including drop outs. In this sample, 74% lost weight, 20% remained at the same weight and 7% gained weight. A follow-up assessment was conducted twelve to thirty-six months after the interventions ended. Sixty of the original participants were included in this follow-up. Of the people who had lost weight in the program, 33%

reported an additional weight loss, 26% had maintained the weight loss and 40% had gained weight. This study demonstrates that the intervention was effective for some participants. The actual success rate was not calculated because there is no way to determine if the respondents in the follow-up questionnaire were representative of the whole sample or contained mostly successful participants. The researchers estimated the success rate of maintaining weight loss as being between 20% to 60%, depending on the assumptions made about respondents to the follow-up questionnaire.

In another study, Holm, Taussig and Carlton (1983, pp. 170 - 174) compared a cognitive behavioral health education program with regular dietary counselling offered at the same institute. He found that attendance was higher and the amount of weight lost was higher for participants in the health education program. The attrition rate in the education program was over 50%. A long term follow-up one year later was possible on 46% of the people who completed the program. Of these people 13% had maintained their weight loss. These results were reported to be comparable to other cognitive behavioral interventions for weight control.

These studies demonstrate that changing dietary behavior is a difficult task. They also demonstrate that at least for some participants, health education interventions help people make the required changes and maintain these changes. Although providing health education is not the total solution to the

problem of convincing people to make dietary changes, it is part of the solution.

Lifestyle habits including smoking, dietary and exercise practices are important behaviours which have been shown to influence health. Giving up smoking, participating in regular exercise and improving diet are lifestyle habits associated with the avoidance of disease. Convincing people to adopt health promoting lifestyle habits is an important goal for health education. The health education literature demonstrates that this goal is hard to achieve. Health education has been shown to be only partially successful in facilitating change in behavior. The process of behavior change is very complex and depends on multiple factors (Kasl 1974, pp. 447 - 448). It would be unrealistic to believe that health education will be successful in all situations with all people. However, it appears that health education is an intervention which does contribute to the enormous task of lowering the lifestyle risks for chronic diseases.

The literature that has been so far reviewed was selected because it dealt with lifestyle changes that are recommended for the prevention and management of osteoporosis. The applicability of the findings of the reported studies to osteoporosis varies depending on the behavior discussed. There is every reason to assume that if studies were conducted using women at risk of developing osteoporosis and women with osteoporosis as the subjects, the success of smoking cessation programs and rates of exercise participation would be similar to

the studies reported above. In terms of smoking behavior, osteoporotics and women with many risk factors are not a unique population. The smoking cessation behavior for these groups would likely be similar to smoking cessation behavior of other women.

The presence or absence of chronic diseases was shown by Martin and Dubbert (1982, pp. 1007 - 1008) not to be a factor in exercise adherence. They also reported that adherence rates were similar for different clinical populations. It is likely that if exercise programs were available to osteoporotics and at-risk women, adherence rates similar to those reported by Martin and Dubbert would be found.

The results on dietary compliance reported above are less transferable. The dietary changes required for long term weight control are not comparable to the dietary changes required for osteoporosis prevention and management. Weight control requires both helping people make major changes in the type and amount of food they eat and helping them change their relationship to food. The recommended changes related to osteoporosis are less dramatic. For example, pre-menopausal women need only include two glasses of skim milk or its equivalent in their diet on a daily basis. This inclusion of milk to a varied diet which contains vegetables and other foods which contain calcium ensures that women get their recommended daily intake of calcium. Post-menopausal women are often advised to further increase dietary calcium. Even with these additional increases the dietary changes for many women are small compared to the

dietary changes required for weight control. This difference may suggest that educational dietary interventions related to osteoporosis may have a higher success rate than educational dietary interventions for weight control.

Health education can be defended as an appropriate intervention for both the reduction of lifestyle risk factors and the management of osteoporosis. The successful outcomes of such interventions are likely to be similar to the outcomes reported for other health problems. It is unrealistic to expect health education to totally solve the problems presented by poor health habits. However, health education has been shown to be an intervention which has helped individuals make important and difficult behavior changes.

Health Education Related to Environmental and Health Care Organization Factors

Two important disease factors which can be influenced by health education are drug safety and patient compliance with medically prescribed treatments. The research articles reviewed in this section were selected because they either demonstrated that health education was required to solve a problem or that patient education was likely to help patients to assume an increased level of responsibility for treatment management. Patient responsibility is an important issue in osteoporosis. Once the disease of osteoporosis has been diagnosed, the level of dietary intake of calcium and appropriate physical activity become patient compliance issues as well as lifestyle disease

factors. Effective treatment requires the active participation of the patient. Only the patient can implement prescribed lifestyle changes.

Drug Safety

Ideally, women should be able to assume that the drugs they use with or without prescription are safe. This assumption places the full responsibility for drug safety on professionals such as physicians, pharmacists, drug companies and national agencies which determine which drugs will be marketed in Canada and the United States. It is unwise for people to trust that these authorities will always protect them. All drugs have potential side effects. This fact is confirmed by browsing through the Compendium of Pharmaceuticals and Specialists (Krogh, 1986). Members of the general public interested in decreasing disease risk related to drug safety need to know both the therapeutic effects and side effects of the drugs they are using. Drug users are often unaware of the effects and side effects of the drugs they use.

Two surveys conducted for the Federal Food and Drug Administration (Miller 1983, pp. 6 - 7) have shown that patients are not well informed about the risks related to drug therapy. Thirty-five percent of patients reported they had not received any information about the possible side effects of prescribed drugs from either their physician or their pharmacist. Only 25% remembered being told about possible side effects. Survey information collected from physicians demonstrated that there

were important gaps in the types of information they routinely gave to patients. Information often excluded from discussions with patients about drug therapy were: 1. the length of time the drug needed to be used; 2. the name and purpose of the drug, and 3. the side effects of the drug. These surveys indicate that it cannot be assumed that patients are routinely well informed about the medications they are taking.

There is evidence that at least some patients want more information about the drugs they use. Books such as The Essential Guide to Prescription Drugs (Long, 1985) and The People's Pharmacy (Graedon and Graedon, 1985) have been written for the single purpose of providing more drug information to the general public. The authors of both books stress that these books were written in response to a public demand for more information (Long 1985, p. xi; and Graedon and Graedon 1985, pp. 1 - 2). The Vancouver Public Library reports that requests for drug information are very common and increasing annually (Irwin 1986, pp. 2 - 3). Irwin (1986, p. 3) also reported that when librarians recommend to clients that they consult their physician, many clients respond by complaining that their physician is not a good source of information about drugs. This evidence indicates that at least some of the patients who are concerned about side effects experience difficulty in obtaining adequate information from physicians and books.

The surveys conducted for the Federal Food and Drug Administration, the drug books published for the general public and the current use of the public library as a drug information

resource indicate that patients want and probably require more information about drugs than is routinely provided by their physicians. The impact of the disease factor associated with drug safety may be affected by increasing the general public's knowledge about drugs.

Osteoporosis health education should include information both about medications that increase the risk of getting osteoporosis and drugs that are used to treat osteoporosis. Without this information women cannot minimize their risk by avoiding drugs believed to affect bone mass. The drugs prescribed for osteoporosis have side effects. Women need to be informed about these risks so they can make informed choices. The Ostop education program includes information about drugs. Medical experts and a pharmacist both have provided drug information and answered members' questions. The provision of knowledge about medications is part of Ostop's program. Several of the physicians and the pharmacist provide members with helpful information related to drugs. The topic of drugs is given little emphasis in this study at the request of Ostop's president. This decision is discussed further in Chapter IV.

Health Education and Patient Compliance

Effective management of osteoporosis requires that patients comply with prescribed treatments. These prescriptions include the proper use of drugs to increase bone mass and advice about lifestyle factors.

Health education has been shown to increase the rate of compliance with medical advice. Patients must have adequate knowledge about expected behavior and the necessary skills if they are to be successful in complying with medical expectations. No studies were found to demonstrate how patient education affected compliance in osteoporotics. The studies reported here demonstrate the effect of education on the compliance of patients with other chronic diseases.

In one study, hemophiliacs were taught how to evaluate bleeding episodes and how to administer treatment techniques at home. The success of this intervention was measured by reductions in time lost from work and school and decreased use of medical services. There was a 74% reduction in the absenteeism rate and an 89% reduction in the number of days that patients spent in hospital (Levine and Britten 1973, pp. 196 - 199).

Another study was designed to reduce the number of visits diabetics made to a hospital emergency room. One aspect of changed services was that patients were provided with a telphone hot line. Patients could use this hot line to get medical information, make clinic appointments and renew prescriptions. The easy access to information about their disease was considered to be one factor in the success of this program which was evaluated by assessing the rate of hospital admission for diabetics. The rate of admission declined. In 1968, before the program began, 3,300 patients were admitted. In 1970, only 1,250 patients were admitted. This drop in admissions occurred

despite an increase in diabetic patient population from 4,000 patients to 6,000 patients (Miller and Goldstein 1972, pp. 1388 - 1390).

A third study evaluated the effectiveness of educational interventions provided for asthmatics in an emergency department prior to discharge. The goal of the program was to reduce the number of emergency room admissions for asthmatics. The study group was provided with information selected because it would enable patients to prevent and control their asthma attacks better. They were also encouraged to comply with treatment prescriptions and to believe that they could have more control. The instructor was a nurse who also had asthma. The patients who received the intervention from this nurse used the emergency room less frequently. The authors concluded that patient education is an important factor in increasing compliance with medical advice and that the effectiveness of patient education is influenced by the characteristics of the instructor. The nurse with a personal history of asthma was a more effective instructor than non-asthmatic emergency nurses. The authors infered that this finding may indicate that patients with access to people who suffer from the same medical problem may be more likely to adopt recommended behavior (Maiman et al 1979, pp. 1919 - 1922).

These three studies demonstrate that patients with chronic diseases can reduce and control the symptoms of their disease if they have been provided with the information and the skills they need to manage their medical problem. The study on asthmatic

patients also suggests that successful role models with the disease may be more effective in persuading clients to make the necessary changes. This evidence supports the position that providing osteoporotics with sufficient information and practical skills about their drugs, and required dietary and exercise behavior may increase their compliance with these commonly prescribed interventions.

As already discussed, the Ostop Board does understand the value of women being informed about their drugs. This knowledge is related to medical compliance as well as drug safety factors.

Dietary and exercise habits become medical compliance issues when they are interventions prescribed to help manage a chronic disease. That is, the behaviors of consuming adequate calcium and engaging in exercise can be assigned to either the lifestyle factor category or the health care organization factors category. The assignment depends on who gives the advice and the health status of the client. If a physician recommends adequate dietary intake for an osteoporotic, a problem with non-compliance is a health care organization problem. However, if a dietitian from the Dairy Foundation recommends that women eat high calcium foods to get their necessary daily intake, failure to comply is a lifestyle factor. This overlap is not a serious problem. The goal is to motivate women of all ages with and without osteoporosis to adopt recommended dietary and exercise habits.

In this study, self-reported dietary and exercise behavior is measured. The study design precludes evaluating cause and

effect relationships, but it was designed to assess the degree of members' compliance with recommended osteoporosis behaviors.

Knowledge about drugs and patient compliance are important disease factors in osteoporosis which can be affected by health education interventions. The Ostop education program provides both drug information and makes lifestyle recommendations to members. Health education has been shown to be a useful intervention in helping people minimize the influence of disease factors related to drug safety and health care organization factors.

Summary

Selected literature has been reviewed for the purpose of demonstrating that health education has been used effectively as an intervention to reduce the incidence of diseases and to help control medical problems related to chronic diseases. It has been shown that:

1. Increasing people's knowledge about disease risk and the consequences of a disease results in improved participation rates in preventive procedures.
2. Knowledge is an important factor for people who are being assisted to adopt recommended lifestyles.
3. The division between cognitive and behavioral interventions is not clear cut. Both approaches have been shown to influence people to change their behavior. People appear to benefit both from having knowledge about a disease, its

prevention or treatment, and receiving help with instituting and maintaining behavioral changes.

4. Providing patients with information about their disease and the prescribed treatments for its management result in increased compliance with medically prescribed behavior.
5. Some members of the general public want more information about their drugs.

These findings support the use of health education as an intervention to help women reduce their risks of developing osteoporosis and to help women with osteoporosis behave in a manner which is believed to minimize the effects of this disease.

Regardless of the approach used or the client group involved, the overall goal of health education is to facilitate desirable behavior change. This objective is very ambitious. For example, health education directed at reducing chronic diseases involves first making people aware of a problem and then convincing them to make major changes in their lifestyle. One explanation of the low success rate of health education interventions may be the unrealistic expectation that one intervention or one type of intervention will accomplish this major change in an individual.

It may be possible to demonstrate that health education is effective if programs are developed which have specific program objectives chosen realistically and reflecting outcomes that are likely to be attainable. For example, an intervention designed to inform a previously uninformed population of women about

osteoporosis may have as its main objective an increased level of awareness that osteoporosis is a disease which should concern them. Such an intervention has a successful outcome if an increased number of women in the target population become aware of osteoporosis. The evaluation of this type of intervention should not include the expectation that people will have changed their major life habits. However, if the goal is to help people who are already aware of osteoporosis adopt recommended behaviors, the expected outcome is that people will be both knowledgeable about osteoporosis and be performing the recommended behaviors of consuming adequate calcium and leading an active lifestyle. For health education to be effective, the objectives of specific interventions must be appropriately matched to the requirements of the target population.

Another reason for the apparently low success rate demonstrated in several of the studies which measured behavioral outcome may be the length of time required for major behavior changes to occur. Behavior change may be a gradual process which requires a variety of interventions. Dropout rates may be an indication that specific interventions are unsuccessful for the people who leave the program but it is not possible to state that the dropouts never change. They may change later, perhaps after exposure to another intervention. Only longitudinal studies would assess the relative effectiveness of health education. Such studies might demonstrate that behavior change is a gradual process. No such studies have been done in the area of health education. Because of this situation it is not

possible to fully evaluate the impact health education has on the process of helping people change their behavior.

Nevertheless, it can be concluded that health education is an important but imperfect intervention. Individual health education interventions are likely to have low success rates when behavior change is the criterion used for determining success. This is a problem, but it does not invalidate the use of health education to effect change. In most cases, adults cannot be forced to attend screening tests, seek diagnosis, follow dietary and exercise recommendations or to comply with medical advice. People must be convinced to adopt recommended health behaviors. Despite the low success rate of individual programs the health education research demonstrates that educational interventions do help some people change. This evidence supports the use of health education as part of the process of helping women avoid osteoporosis or minimize its consequences. At present there is no agreement in the health education field about how this task is best accomplished. Practitioners and researchers use a variety of learning and change theories to guide their work. No single approach has been shown to be universally superior. This lack of a widely accepted theory means that practitioners and researchers must choose for themselves the theory which they believe best explains the phenomena of interest to them.

Theoretical Framework

The selection of a learning theory for this study was made after the researcher had had several interviews with Ostop's president, Mrs. Gerda Todd, and after having attended Ostop meetings for one year. These interviews and observations of the meetings provided the researcher with qualitative data about why Ostop had been founded and what educational goals the founders were attempting to achieve. The theory chosen to guide this study needed to reflect and facilitate articulation of Ostop's educational philosophy. The theory also had to provide an explanation of how the educational interventions provided by the Ostop organization influenced members' knowledge and behavior. Describing Ostop's educational interventions based on a learning theory was an essential prerequisite to generating research questions. Social learning theory as described by Bandura (1969 and 1977) was the theory chosen.

Social learning theory as described by Bandura (1969 and 1977) was selected for the following reasons. First, it is a broad theory which explains how people learn and change their behavior. Bandura describes multiple factors which influence this process. Both the breadth of the theory and the identification of influencing factors make social learning theory useful for the task of describing the influence of Ostop's educational program on members. Second, once Ostop's education program had been explained theoretically, by using the theory it was possible to identify several areas for research evaluation. Social learning theory was used to generate logical

research questions and to guide the development of measures to evaluate these questions and to explain the research results. The third and final reason for selecting this theory was that it is not biased towards the use of either cognitive or behavioral strategies. It acknowledges that both are appropriate and both can be used to facilitate behavioral change. All of these reasons are related to the goal of this study, which is to attempt to provide an explanation of how Ostop functions as a provider of osteoporosis health education.

In the remainder of this chapter social learning theory is described and related to Ostop. The discussion is divided into the following subsections: 1) General description of social learning theory; 2) Relevance of social learning theory to this study; and 3) Summary.

General Description of Social Learning Theory

Bandura describes social learning theory in two books Principles of Behavior Modification (1969) and Social Learning Theory (1977). The descriptions of social learning theory concepts presented in this section are based on both of these books.

Social learning theory states that many human attitudes and behaviors are learned by the process of learners being exposed to a variety of models in their environment. This exposure provides observers with information which they interpret and symbolically encode (Bandura 1969, p. 120; 1977, p. 22).

Once stimuli have been symbolically coded, observational learning may be said to have occurred. A key point in this theory is that the observer does not have to perform the behavior for it to have been learned. The symbolic codes can later be recalled and used to guide delayed performance. This means that people can learn behavior solely by observation (Bandura 1977, pp. 22 - 23).

Another important concept is modeling, the process by which information is transmitted to the observer. In children prior to the development of language this process is dependent on the availability of actual models demonstrating behaviors in the environment. However, once language skills have been developed other types of models become useful. For example, verbal instruction, either written or oral, about a behavior can be used to transmit information to a learner (Bandura 1977, p. 39).

Verbal models may potentially be less effective because they depend on the observer having sufficiently well-developed verbal skills to understand the verbal instructions. Despite this disadvantage, they are very common (Bandura 1977, pp. 39 - 40). The reason Bandura gives for the frequent use of verbal models is that "one can convey with words an almost infinite variety of behaviors that would be inconvenient and time consuming to portray behaviorally" (Bandura, 1977, p. 39).

In addition to live models who may either demonstrate behavior or provide verbal information, other sources of information may also serve as models. These include television, films and printed sources of information. The process of

modeling is the same regardless of the information source (Bandura 1977, pp. 39 - 40).

The key point of this social learning theory is that much of what people learn in society they learn by being exposed to a variety of models. The term models as used by Bandura includes most sources of information in society. People learn by observing and may later reproduce the behavior. They may also choose not to reproduce modeled behavior. What behaviors they learn and choose to reproduce are influenced by a variety of factors (Bandura 1977, pp. 23 - 23, 39).

Factors Which Influence Observational Learning

Factors which influence the behavioral outcome of observational learning include attentional processes and behavior reproduction processes (Bandura 1969, pp. 136 - 143; and 1977, pp. 24 - 28).

Attentional Processes

The first step in observational learning is capturing the attention of the observers. It is the observers who make the choices which determine which models will be observed. Factors which influence this choice include observer characteristics, the observer's perception of the value of the behavior being transmitted and characteristics of the model.

Observer characteristics. Observers bring to the learning situation personal characteristics which influence their choice

of models. These include all internal factors which determine what information will be judged as relevant and attainable. For example, the learners' personal abilities influence their choice of models.

People are more likely to attend to a model who is presenting behavior which seems attainable than to a model presenting behavior which appears to be beyond the ability of the learner. Educators do not have control over these factors.

Value of the behavior. The modeled activity must have functional value to the observer. Bandura states that this is a very important factor. An observer alerted in advance to the value of a behavior is likely to attend to a model presenting that behavior. This aspect of social learning theory relates directly to the work on beliefs presented earlier. Informing women about the consequences of osteoporosis may make them increase their attention to learning risk factors and learning about preventive and treatment behavior.

Model characteristics. The characteristics of the model also affect the situation. Observers are likely to choose human models who appear to have high levels of competence and high social status. Bandura suggests that although these factors influence the choice of models, they are less important than the functional value of a behavior for the observer.

Observer characteristics, the functional value of the behavior, and model characteristics are all factors which influence the likelihood that observers will attend to a role model. If the role model does not capture the attention of the

observer then the process of observational learning does not occur. This point is important because some of the factors related to attentional processes are not within the control of the change agent.

Behavior Reproduction

The actual performance of a behavior depends on the accuracy of the symbolic code, practice and motivation.

Accuracy of the symbolic code. Delayed performance requires that the observers convert their observations into a symbolic form. Observations are encoded in memory either as images or words, and are later reviewed and used to guide performance.

The accuracy of the behavior reproduced depends on how accurate a symbolic code is retrieved from memory. This code is recalled and is used to guide behavior. Discrepancies between the code and performance serve as feedback to the learners.

Practice. By repeating the behavior the discrepancies between an accurate symbolic code and performance are eliminated. Practice alone is not sufficient unless the symbolic code is accurate and the learners already have the required skills to perform the behavior. Complex skills often require supervised practice before accurate reproduction is possible. Practice is a process which increases the accuracy of the symbolic codes.

Motivation. The observer must be motivated to perform the behavior. The value of the behavior was discussed under the

heading of attentional processes. Not only must the behavior be valued if it is to initiate the process of observational learning it must also have sufficient value to the observer to facilitate performance. The observer determines the value of the behavior and also evaluates the consequences of possible outcomes. Limited value or negative consequences lower the possibility that the observers will apply what they have learned observationally.

Performance does not necessarily follow acquisition. An observer may have learned a behavior but the decision to perform the behavior depends on multiple factors including the accuracy of the symbolic code, the presence of the skills required to perform the behavior, the opportunity to practice and the value of the likely outcomes.

Summary

Social learning theory can be used to explain the process of behavioral change. This process is influenced by multiple factors. As a result, the behavior outcomes are variable and depend on factors which originate in the learner; the person or information source perceived as a model, and the environment. Providing learners with high profile models who accurately and consistently demonstrate the desired behavior, and providing incentives in the environment facilitates, but does not guarantee learners' adoption of the desired behavior (Bandura 1977, p. 143; 1977, p. 29).

Social learning theory states clearly that it is not possible to control all of the factors which influence behavioral change. Accordingly, educators have only limited control over the outcome of educational interventions. They can manipulate the immediate learning environment but the effectiveness of their efforts will be influenced by the actions and characteristics of the learner and the learner's life environment.

Relevance of Social Learning Theory to this Study

The Ostop educational program had not been studied prior to this research. As a result, no research-based information was available to guide this study. This study used Bandura's social learning theory as a conceptual framework for two purposes. The first was to analyze qualitative information about Ostop members and the Ostop educational program. This process was essential because it was not possible to generate logical research questions until an attempt was made to determine the characteristics of Ostop members and to understand how the Ostop education program appears to exert its influence on the members.

The qualitative information came from three sources. Mrs. Gerda Todd, co-founder and President of Ostop, described the population she assumes Ostop is serving. She also described why Ostop was founded and the goals of its educational program. The second source of information was the observation of Ostop meetings by the researcher, and the third source was a review of

the literature provided by Ostop to its members. Social learning theory concepts described in the previous section were very useful in providing a framework to organize this information. This analysis is presented subsequently under the heading of Ostop's educational program.

The second use of social learning theory concepts in this study was to generate research questions. The concepts were used to identify theoretically important variables and measure their influence. This application to social learning theory is discussed further in chapters IV and IV.

Ostop's Education Program

Ostop was founded by a small group of women who have had personal experience with osteoporosis. Members of this core group had experienced frustration in their attempts to be diagnosed and treated. With the help of health care professionals as advisors these women designed the Ostop educational program to help other women more easily become informed about osteoporosis.

The purpose of Ostop's education program is to transmit information related to osteoporosis to its members. The type of information includes knowledge about disease risk factors, knowledge about diagnosis and treatment, recommendations regarding the adoption of specific lifestyle health habits, and information about the effects and side effects of drugs.

This purpose is achieved by providing members with access to selected sources of information. These include women with

the disease, professional experts and printed materials. Social learning theory would classify all of these sources as models.

The general assumption that the Ostop Board makes about learning is that if women are provided with easy access to appropriate role models, they will become knowledgeable about osteoporosis and may adopt recommended behaviors. This assumption agrees with the social learning concept that exposure to models can lead to the transmission of information to the learner and changed behavior.

Ostop exists within a social context and the role it plays is affected by this context. Osteoporosis is not a new disease but, as discussed in Chapter I, it is a disease which is currently receiving increasing attention. A body of knowledge now exists which indicates that it is largely a preventable disease and one that can be treated effectively once it has developed. However, the prevention, diagnosis and management of osteoporosis are not yet standard public health or medical practices. This means that women do not automatically receive up to date information about osteoporosis prevention from traditional healthcare services nor do they necessarily receive comprehensive medical management once osteoporosis has been diagnosed. Many women are exposed primarily to role models who still maintain the position that little can be done to prevent or manage osteoporosis. One of Ostop's goals is to change this situation so that women eventually become accurately informed about osteoporosis.

Ostop provides its members and the interested general public with up to date information about osteoporosis. A variety of approaches is used:

1. Each year the organization arranges nine public lectures on different aspects of osteoporosis. These lectures are free and are held in the City of Vancouver.
2. An annual newsletter is sent to members. This newsletter features information about osteoporosis.
3. The Ostop Secretary provides written information about osteoporosis. Women can get this material at meetings or by phoning or writing to Ostop. This material includes articles written for the general public and articles written for health care professionals.
4. The Ostop Board stimulates a variety of other groups and organizations to arrange local radio and television programs about osteoporosis.

The goal of the organization is to provide accurate and appropriate models for the prevention and management of osteoporosis for women with few or no models available, and for women with inaccurate models. The organization provides written models and expert live models who depend on transmitting by verbal explanations. It also encourages and cooperates with other organizations to provide media models.

Factors Which Influence the Effectiveness of Ostop

Attentional and behavior reproduction processes exert an influence on the effectiveness of the observational learning process. Because no research information is available on Ostop, discussions with Ostop board members and observations made at meetings are used here in an attempt to identify important factors.

Attentional Processes

Observer characteristics. Ostop members are the observers in this discussion. The specific characteristics of Ostop members have not been assessed. It is obvious that these women are not representative of the general population of women. First they are a self-selected group. They have shown sufficient interest to join an osteoporosis organization. Second, observing the group over a twelve-month period has shown this researcher that most of these women are at least forty years of age and many of them have obvious deformities of the spine indicating the likely presence of osteoporosis. These women appear to be representative of a segment of the population which has a high risk of developing osteoporosis or that has the condition and may have already sustained fractures. Suffering the consequences of osteoporosis or identifying oneself as being at risk of breaking a bone are both characteristics which are likely to increase the women's interest in models who are providing relevant information. Third, Ostop relies on verbal

symbolic models. To fully benefit from Ostop's efforts women need to have well developed verbal skills. This may mean that Ostop members are mostly women who have been graduated from high school or who have higher levels of educational attainment. These characteristics are all likely to influence which women attend to the models provided by Ostop.

The Value of the modeled behavior. This factor is important in both getting the attention of the women and in motivating them to adopt the recommended behaviors. The value of the modeled behavior is discussed subsequently under the heading of motivation.

Characteristics of the model. The models provided by Ostop are of two types. First, there are the professionals. Ostop arranges lectures which are given by health care and health promotion professionals. These professionals have expert knowledge in the area of osteoporosis, and have expressed a special interest in this problem. The authors of articles provided by Ostop to its members either at meetings or through the mail are also members of the professional community. These lectures and authors appear to be competent and some such as physicians have high status.

The second type of model is women with osteoporosis. These women have the disease and may have developed the characteristic deformity, but they stress the value of early diagnosis and report the effectiveness of treatments. All of the models provided by Ostop express clearly the value of prevention, early diagnosis and comprehensive medical management of this problem.

The models provided by Ostop are believed to be good models. Members who pay attention to these models will receive a different message from those received by women who are only exposed to less well-informed or less interested professionals, and women with osteoporosis who believe that nothing can be done about it.

Reproduction of Recommended Behavior

Social learning theory may also explain the degree to which recommended behaviors are adopted. Prior to this study no attempt had been made to evaluate the behavior of Ostop members. Observation of the program suggested that both the clarity of the modeling and the complexity of recommended behaviors may affect behavior adoption.

The different behaviors were modeled with different degrees of emphasis and clarity. Comparing the modeling of calcium related behaviors and modeling of exercise behavior demonstrates this effect. Calcium intake was emphasized at four of the nine sessions during 1985. Different experts presented variable beliefs about the value of a high calcium intake. The amount of daily calcium intake recommended varied between 800 mg and 1500 mg. This variation reflects the current state of the calcium research. The amount of daily calcium intake recommended was not consistent but all speakers clearly recommended that osteoporotics maintain a high calcium intake while the researchers continue to study calcium metabolism. Members were made aware of the conflicted nature of the research

but were also given direct advice on what the recommended behavior is in relation to calcium intake.

The value of exercise received less emphasis and no ideal behavior was modeled. Exercise was the focus of only one of the nine lectures. Other lectures mentioned exercise but it was not the main emphasis of the lecture. Several speakers qualified their comments about exercise by emphasizing that exercise has not been proven to be effective. This lack of proof about the value of exercise was not presented as a conflict between researchers with different research results, but was left for members to interpret. No speaker gave clear directions about what exercise behavior is recommended for osteoporotics at the present time in light of the current state of the research. Exercise behavior was less clearly modeled than calcium intake behavior.

The difference in the complexity of the skills required for adoption of appropriate dietary behavior compared to the skills required for adoption of appropriate exercise behavior will influence behavior adoption. For example, by drinking three glasses of milk and taking one 500 mg calcium supplement daily, an osteoporotic can guarantee she will have ingested 1,500 mg of calcium. These behaviors are simple to comprehend and all participants have the required skills to achieve this behavioral change.

Adopting appropriate exercise habits is more complex. This statement is particularly appropriate for women who have already sustained fractures. The process most likely requires personal

guidance and feedback to ensure correct performance and safe levels of activity.

Even if clear directions about recommended exercise behavior had been provided, the use of a lecture format is unlikely to be the most effective way to model this behavior. Exercise is a complex physical skill. Its application to women with osteoporosis is not something that can be accomplished by either a lecture format or the provision of written information. At best, a lecture format can be useful for the purpose of stressing the value of exercise but it cannot be expected to transmit sufficient information to enable members to learn how to exercise safely and effectively.

The clarity with which the information is transmitted, the selection of appropriate models and the complexity the behavior influence behavioral adoption. Based on the present education program, it is more likely that Ostop members will make dietary changes than exercise habit changes. Behavioral reproduction of recommended osteoporosis behaviors is most likely to vary depending on the emphasis given to a topic and the complexity of the behaviors.

Social learning theory has been shown to be a useful theory for analyzing the Ostop education program. This analysis demonstrates that the social context and a variety of other factors would be expected to influence the adoption of recommended osteoporosis related behaviors. This analysis of possible influences on behavior is the basis on which the research hypotheses were generated and tested.

Summary

Social learning theory has been described and then used to analyse the current Ostop education program. The analysis is focused on describing the Ostop education program and the factors that are likely to explain the influence the Ostop program has on changing women's knowledge and behavior related to osteoporosis. This analysis suggests that Ostop is most likely reaching only a self selected group of women. It also suggests that model characteristics; the method and clarity of delivery of the information; the value of the information and the complexity of the recommended behavior will all influence the effect Ostop has on helping women change. This analysis provides the basis for generating survey questions to determine member characteristics and for generating research hypotheses which will look for correlational evidence that demonstrates that association with Ostop is related to being knowledgeable and adopting the recommended behaviors.

Chapter Summary

The goal of this study is to investigate the use of a health education intervention aimed at increasing knowledge and health-related behavior of individuals who have or may be at risk of developing osteoporosis. To accomplish this goal it was necessary to; 1. Understand the medical problem of osteoporosis; 2. Evaluate the effectiveness of health education as a health care intervention; 3. Provide a theoretical basis

for the study; and 4. Relate Ostop's educational activities to the described education theory.

In this chapter osteoporosis was shown to be a chronic condition which most likely develops as a result of the interaction of a variety of disease factors. Biological factors, lifestyle factors and health care organization factors were shown to contribute to the development of osteoporosis. Once these disease factors were identified it was possible to evaluate if health education had a role to play in helping women to reduce their personal risk factors or in helping women with osteoporosis deal with this condition.

The role of health education was evaluated by reviewing selected articles from the health education literature. Because no literature related to health education for osteoporosis was located, this section of the literature review was developed using articles related to other medical problems. Health education was shown to be an important but imperfect intervention which does have a role to play in controling chronic disease.

Bandura's social learning theory was selected to provide the educational theory foundation for this study. The major concepts of the theory were described and then used to explain how Ostop functions as a health care provider. The articulation of a theoretical explanation of Ostop's educational programs based on educational theory was an essential step in the

development of this study. Relating Ostop's educational activities to Bandura's social learning theory made it possible to generate theory based research questions.

CHAPTER III

RESEARCH DESIGN

Chapter III presents the research design for this study. The chapter is divided into three sections. The first section, population and study sample, describes and compares the population from which the study sample was selected, and the study sample itself. After this discussion the procedures used to select the study sample were described.

In the second section, research procedures, the type of research methods used in the study are stated and the reasons for these choices are explained. Next, the data collection method is described and the choice of a mailed questionnaire justified. At the end of the section uncontrollable influences that may have influenced the results are briefly discussed.

Although the study measures are part of the research design and would logically be the next section, this discussion is not included in Chapter III. Discussion of the measures including the development of measures and the pilot test is found in Chapter IV.

The third section, plan for analysis, identifies the statistical tests that will be used to analyse the data. These

include Pearson correlation coefficients and regression analysis.

Population and Study Sample

The purposes of this section are to describe the population from which the study sample was selected, describe the study sample, demonstrate how well the sample represents the population and describe the procedures used to select the sample.

The discussion of the population from which the sample was selected is divided into two parts, the target population and the accessible population. The target population is defined as the segment of the population of Canadian women to which Ostop members belong. The accessible population is the segment of the target population which was available to the researcher for sample selection. In this study Ostop members are the accessible population. By describing and comparing the accessible population of Ostop members and the target population, it will be demonstrated that the accessible population is not fully representative of the target population. Identification of this lack of congruence was important and demonstrates that the research finding cannot properly be used to make inferences about the whole target population.

Next the study sample is described. It is shown to be congruent with the accessible population, which means that the research findings can be used to make inferences about Ostop members. The description of the study sample also explains how

and why some members were excluded before making the selection of study participants.

The description of the study sample is followed by a brief section which describes the methods used to select study participants. The procedures were used in an effort to insure that the study sample was a random group of Ostop members.

Target Population

The reduction of the incidence and the effective treatment of osteoporosis depend in part on all women being full informed about the risk factors related to disease development, methods of diagnosis, recommended lifestyle habits and available medical treatments. Theoretically, all Canadian women need to be informed about this disease but different segments of this population of women need different types of information. This study is concerned with only a segment of this population.

The segment of the population of Canadian women that is relevant to this study is called the target population. The target population is all Canadian women who have reached bone maturity and whose bones have started the natural process of decreasing bone mass. This population includes Canadian women thirty years of age and older.

Members of the target population do not have homogenous osteoporosis-related characteristics. The target population includes:

1. Women with both high and low risk levels of developing osteoporosis.

2. Women who are totally unaware of osteoporosis as a medical problem, as well as women who are aware of this problem.
3. Women with and without the disease.
4. Women with all levels of educational attainment.
5. Women in their thirties as well as older women.

This is a population that varies widely in manifestations of osteoporosis. Ostop members belong to this population but do not represent all of its aspects.

The Accessible Population

The experimentally accessible population is Ostop members. Ostop members do not reflect the full range of variation found in the target population. As stated earlier in Chapter II, quantitative descriptive data on the members of Ostop do not exist, but members of Ostop are believed to represent only a selected segment of the target population.

As no current demographic data are available on Ostop members, the differences between Ostop members and the target population could only be hypothesized. Discussions with Mrs. Todd suggested that the accessible population has the following characteristics:

1. With very few exceptions, Ostop members are forty years of age or older. The age range extends from age forty to the mid-eighties. Within this age range, approximately 85% of members would be older than sixty-five. The few members who are younger than forty would be exceptions to the general population profile.

2. Ostop's membership is almost exclusively women. The few men members are spouses of women members or medical professionals.
3. The majority of women members either have the medical problem of osteoporosis or have identified themselves as having a higher than average risk of developing osteoporosis.

In addition to the characteristics identified by Mrs. Todd, two others became obvious as a result of the researcher's association with Ostop.

1. Members are women who have shown sufficient interest in osteoporosis to join an organization related to this disease. This action indicated both an interest in and knowledge about osteoporosis that was sufficient to at least be aware of osteoporosis as a medical problem.
2. It is likely that most Ostop members will have at least been graduated from high school, and some members will have educational attainment beyond high school. This characteristic was hypothesized based on observing the type of educational programs provided and by observing the questions asked by Ostop members at meetings. Both the lecture series and most of the written material available to members requires that participants have well integrated verbal skills. At meetings the quality of questions asked by members demonstrated a variable level of knowledge. Some members asked questions that were simple and easily answered. More commonly, the questions asked reflected

that some members are very knowledgeable about osteoporosis. It is not uncommon for members to ask questions which stimulate lecturers to discuss new findings in the osteoporosis research or to explain the lack of research or practice on which to base answers. This hypothesized educational level is also predicted by the adult education literature. Cross (1981, pp. 53 - 55) reviewed adult education participation studies and reported that adult participation in organized educational activities is positively correlated with level of educational attainment. Based on the type of education intervention, the type of questions asked by members and adult education theory it is likely that the typical Ostop member will have completed high school.

These member characteristics strongly suggest that Ostop members are not truly representative of the target population. This group of women appear to be a selected segment of the target population. They represent a self-selected group of middle-aged and older women who typically have osteoporosis or believe they have it, or are at risk of developing it; who are aware that osteoporosis is a medical problem; who are sufficiently interested to join a self-help group and who have adequate verbal skills to benefit from the type of program provided by Ostop. This lack of representativeness compared to the target population affects the generalizability of the results.

The findings of this study can not properly be generalized to the target population. This limitation does not negate the potential importance of this study. Ostop members are representative of a large number of women in the target population. If the study results are positive, it would be possible to generalize the study results to other groups of women with some or all of the characteristics of Ostop members. For example, the findings of this study could be used to predict variable relationships in other osteoporosis self-help groups in other cities and provinces. If the study results are negative, this information will also be useful in beginning to understand how Ostop functions as an organization which provides health education.

Another reason that this lack of generalizability to the target population is not considered to be a serious problem is that this study was developed primarily to assist Ostop in the process of evaluating its program. This task emphasized the need for the sample selection to accurately reflect the accessible population but minimized the importance of representativeness between the accessible population and the target population.

The Study Sample

This study sample was a randomly selected group of one hundred and twenty Ostop members. A member in this study is any person who has joined Ostop since it was founded in November 1983. This includes women who have joined only once

and not renewed their annual membership, and women who have joined and annually renew their membership. Women who have not renewed their membership were included because at the time that the study was conducted, Ostop had not made membership renewal a priority. There was no way to determine which of these women with non-renewed memberships would choose to renew their memberships if approached, and which women would discontinue membership. Ostop included these lapsed members on its membership roll. For the purpose of this study members include both lapsed members and women who have paid their annual membership during the last twelve months.

The selection of the study sample was made from a specific sub-group of members. Included were all women members who lived in the Greater Vancouver area. This area extended as far east as Mission and Chilliwack. The other boundaries were established by the geographic boundaries of mountains and water to the north and west, and U.S.A./Canadian international boundary to the south.

These geographic boundaries were established to limit the sample to members who have all had the opportunity to attend Ostop meetings. All members who were included in the membership list used to select the study sample lived no further away from Vancouver than approximately a one hour drive.

Generating this limited membership list was an important step because one research hypothesis attempted to evaluate the relationships between the independent variable of meeting attendance and the dependent variables of knowledge and

behavior. To assess these relationships fairly it was decided that all women included in the study should have had the opportunity to attend the meetings.

Once this selected membership list was generated, further exclusions were made. Men were excluded because osteoporosis is less common in men and they are not the primary focus of Ostop. There was little reason to believe that men members were osteoporotics or at risk of becoming osteoporotics. Two men were physicians associated with Ostop and ten others were the spouses of women members. The study was intended to focus on women with osteoporosis or likely to develop osteoporosis. For these reasons it was believed justifiable to eliminate the sixteen men who would otherwise have been included in the list used to select the sample. Sixteen women members were also excluded because they had helped with developing the questionnaire. This group included women board members and participants in the pilot test. After these exclusions, the selected list of members was considered complete.

This list contained 261 names and represented 69.6% of the total membership. Other than meeting attendance, there is no reason to believe that the women included in the selected membership list have characteristics that are different from those of the women members who were excluded. Unfortunately, no data exist to test this assumption. This selected membership list was used to select the study sample.

Procedure Uses to Select the Study Sample

The random sample used in the study was selected using a random number table. First each name on the selected membership list was assigned a number. The first name on the list became number 1. The rest of the names were numbered consecutively to 261. Following this, a random number table was used to select one hundred and twenty participants. This process provided the random sample of Ostop members who were mailed questionnaires.

Summary

The target population, the accessible population and the study sample have been described. The accessible population of Ostop members is most likely not representative of the target population. This lack of representativeness will preclude generalization of the study results to the target population. This lack of transferability of the results was not judged to be a serious problem because of the purposes of the study. The study sample is believed to be representative of the accessible population. Lack of descriptive data on Ostop members precluded actually comparing the study sample with all Ostop members. The random study sample was chosen from a selected segment of the Ostop membership. The elimination of some members prior to selection of the sample was justified by explaining how one of the research hypotheses depended on sample members having had access to the lecture series provided by Ostop.

Research Procedures

The purpose of this section is to describe the research procedures used in this study. The section is divided into three parts: 1. types of research, 2. data collection method, and 3. uncontrollable influences.

In the first part, types of research, the reasons for selecting description and correlation research methods are given. These methods are related to the purpose of this study and their choice is defended.

In the second part, data collection methods are described. Other methods besides a mailed questionnaire were considered but rejected. This process is discussed and the choice of a mailed questionnaire is defended. Following this description, the procedures used to increase the return rate are discussed.

In the third part, uncontrollable influences which may have influenced the results of this study are briefly discussed.

Type of Research

Both survey and correlational research methods were used in this study. The data were collected to accomplish two research goals. The first was to provide Ostop with descriptive information about the characteristics of its members. The characteristics used for this purpose were: selected demographic data, level of knowledge about osteoporosis, level of reported osteoporosis related health behaviours, information about meeting attendance and members' perceived utilization of models. These areas were selected for evaluation because of

their potential usefulness to Ostop. Up to date information about members would assist the organization in improving its current programs and in developing outreach programs to attempt to serve a larger segment of women. These variables were also selected because they were relevant to the second purpose of the study.

The second goal of the study was to explore and explain the influence of Ostop's educational program on its members. The correlational method of research was chosen because it is a useful method in exploratory research. When little or no research has been conducted in an area, correlational research can be used to evaluate the relationship between multiple variables in one study. The correlational method is also useful when multiple factors are believed to act in combination to influence behaviour (Borg and Gall 1979, pp. 477 - 479). Both of these applications of correlational research apply to this study. The Ostop education program had not been studied prior to this project. The relationships between the program's expected educational outcomes and influencing factors were unknown.

In Chapter II, social learning theory was used to demonstrate that multiple factors combined to influence the learning outcomes of the Ostop's education program. Based on the lack of research and the relationships suggested by application of theory, the correlation method was judged to be an appropriate method to explore the study variables listed above.

The correlation method imposes limitations on the study results. Correlational research is not designed to determine cause and effect. The lack of quantitative information about Ostop's health education programs made it impractical to design a closely controlled experimental study demonstrating cause and effect. Because of this lack of information a correlation design was considered acceptable. Identifying correlations between relevant variables would help determine which variables might be the focus for future experimental studies. If the correlations in this study are both positive and statistically significant, this evidence would help the Ostop Board understand how they function as health education providers. Such evidence would also provide the basis to justify further research using experimental methods.

Both the survey and correlation methods of research are part of the research design. These methods are insufficient to demonstrate cause effect relationships in the Ostop educational program but they do provide useful information which will help Ostop modify and expand its programs. Additionally, if significant correlations are found, the information produced by this study may be useful in guiding further research using an experimental design.

Data Collection Methods

The data were collected by means of a questionnaire mailed to study participants. This method of data collection was chosen after considering other methods. Because no quantitative

descriptive data were available which described Ostop members and the organization's education program, the case study method of research was considered. This approach would have resulted in the collection of indepth information about a small easily accessible sample of volunteers. This approach was rejected because this type of information was already available. The women members of the Ostop Board have close contact with members and already have a wealth of qualitative information based on listening to members' histories and informally following their changes over time. This information is not organized or recorded, but it is known by the women who plan the educational activities. A case study approach to data collection would have documented this area of knowledge, but it probably would not have provided Ostop with much new information. It was believed that using a questionnaire would make it possible to obtain more objective data that would provide Ostop with new information and confirm the undocumented knowledge base that the Ostop Board uses to guide its education programs.

After deciding to use a questionnaire, a decision had to be made about collecting the data by means of mailing the questionnaire or interviewing members. Both methods could have been used to collect the required data. The use of the interview method would have had some distinct advantages. The interviewer could have asked additonal and clarifying questions to increase the quality and accuracy of the information obtained. This approach would have been especially helpful in obtaining detailed information about current bone status,

osteoporosis knowledge and health behavior. These are complex topics and difficult to completely evaluate with set questions. Despite the acknowledged value of the interview approach to data collection, this approach was rejected because of financial restrictions.

The interview approach would have been expensive and time-consuming. The researcher privately funded this study and as a result limited funds severely restricted the choice of data collection techniques. The lack of funding eliminated the possibility of using paid interviewers. This limitation meant that using an interview process to complete the questionnaire would have required that the researcher conduct all of the interviews personally. The time involved to interview a sufficient number of participants to effectively evaluate the research questions was prohibitive.

To increase the return rate of questionnaires, several procedures were employed. A self-addressed envelope was provided, a follow-up letter was sent to non-respondents four weeks after the initial mailing, and attention was drawn to the project at the regular May and June 1986 Ostop lectures.

This section has explained the reasons for selecting a mailed questionnaire as the method of data collection, and listed the procedures used to improve the return rate. A mailed questionnaire was chosen because: 1. this method of data collection would provide Ostop with new information about its members and educational interventions. 2. It was a suitable format to collect data for the purpose of analyzing the research

questions, and 3. Financial and time constraints imposed restrictions. Return of the questionnaire was facilitated by both reminding members about the project and providing them with a stamped envelope.

Uncontrollable Influences

It was not possible to limit information sources either prior to the study or during the study period. The questionnaires were returned over an eight week period. During this period of time, participants may have been influenced by both Ostop and media information sources. During the study period, Ostop provided two lectures. These lectures may have influenced the knowledge scores for participants who attended these lectures prior to returning the questionnaire. Osteoporosis is currently a popular subject. Participants may also have been exposed to media sources of information such as radio, television, magazine articles and newspaper articles. During the study period, these media were superficially monitored. Osteoporosis did not appear to receive special attention in these media during May and June 1986. This means that the conditions during the study period were not unusual. Because Ostop is only one of multiple sources of information about osteoporosis the study results can not be totally attributed to Ostop's influence. No attempt was made in this exploratory study to determine the relative amount different sources of osteoporosis knowledge had contributed to participants' knowledge and behavior related to osteoporosis.

Plan for Analysis

In this section the plans for analysing the data are presented. This discussion is dependent on information about the type of scores available for analysis. The decision to discuss the measures in a separate chapter necessitates presenting here a summary of the type of scores generated by the questionnaire.

With two exceptions all of the measures provide scores that were either continuous scores or dichotomies. The two exceptions were the personal characteristic variables of menopause status and educational attainment. These variables provided ordinal scores.

The descriptive data collected in the questionnaire will be analyzed by calculating frequency distributions and means where appropriate. The distribution of respondents' answers will be used to summarize the data.

Pearson correlation coefficients will be computed to evaluate the correlations between the study variables. The use of Pearson correlation coefficients is only appropriate if the data produce continuous and dichotomous scores. The data do meet this criteria except for the data collected on the personal characteristic variables of menopause status and educational attainment. These variables provided ordinal scores. According to the authors of Statistical Package for the Social Sciences (Nie, et al. 1975, p. 276), a case can be made that it is appropriate to use ordinal data in calculating Pearson correlation coefficients. However this practice is not

generally accepted. In this study the two variables which produced ordinal data were included in the calculation of the correlation.

Multiple regression scores were also calculated using knowledge about osteoporosis and osteoporosis related behaviour as the dependent variables and entering the other study variables in a forward method. This statistic was calculated to evaluate the relative influence of the various factors which correlated with the knowledge and behaviour scores. The level of significance was set at the .05 level for both the individual correlations and the regression analysis.

Chapter Summary

In this chapter, the research design was discussed. The population from which the study sample was selected and the study sample were described. This description included differentiating between the accessible population and the target population. The study sample was shown to be representative of the accessible population but not necessarily representative of the target population.

The discussion of the research procedures identified the survey and correlation methods of research as being methods suitable for the purposes of this study. These methods will not demonstrate cause and effect relationships but they will provide useful information for Ostop and may provide research results which would justify a study using an experimental design.

A mailed questionnaire was chosen as the method of data collection. Inclusion of a self-addressed envelope, follow-up letters and announcement of Ostop meetings were the procedures used to increase the return rate of questionnaires.

Exposure to information about osteoporosis during the study period was identified as a factor which may have influenced the study results. No attempt was made to monitor any events that acted as models during the study period for any of the respondents.

The plan for analysing the data involved calculating Pearson correlation coefficients to evaluate the relationship between individual study variables. Multiple regression scores were also calculated. These scores evaluate the influence of different study variables on the dependent variables of osteoporosis knowledge and osteoporosis related behaviour. The level of significance was set at the .05 level of probability for both the individual correlations and the regression analysis.

Not included in this chapter on the research design was a discussion of the measures used in the study. This discussion is the subject of the next chapter.

CHAPTER IV

QUESTIONNAIRE DEVELOPMENT AND PILOT TEST

In this chapter, the development of the questionnaire is discussed. The chapter is arranged in six sections: 1. Factors which influenced questionnaire development, 2. research hypotheses, 3. description of the measures, 4. stages of questionnaire development, 5. validity, reliability and objectivity, and 6. pilot test.

In the first section, the factors which influenced the development process are presented. These include the influence of: the research procedures discussed in Chapter III; limitations set by the Ostop Board; the advice of content experts; and the use of social learning theory as the conceptual framework to identify the study variables and the projected relationships between variables.

The research hypotheses are then restated. These hypotheses are stated in the null form and include the variables and relationships discussed in the previous section.

The description of the measures includes identification of the content of each part of the questionnaire and a discussion of the areas which created problems. The method of scoring each measure is also explained.

Next, the stages of developing the questionnaire are briefly outlined. The points in the process where content experts offered advice are indicated.

The pilot test is described next, including the procedures used to select the participants and to conduct the test. The findings of the pilot test are reported and, based on these findings, the final revision of the questionnaire was made. These changes are described.

The validity, reliability and objectivity of the questionnaire are the last topics in this chapter. The chapter is then summarized.

Factors Which Influenced Questionnaire Development

The process of constructing the measures was influenced by a variety of factors. These factors include, the research procedures, limitations established by Ostop Board, the advice of content experts and the use of social learning theory as the conceptual framework.

The Influence of the Research Procedures

The type of research methods and the method of data collection affected the process of questionnaire development. The survey method was used to collect descriptive data that would have value for Ostop. The main issue related to the survey method was deciding which information was important to collect. These decisions were influenced by the osteoporosis

and social learning theory literature review, the advice of content experts, and recommendations made by the Ostop Board.

The decision to use Pearson's product-moment correlation technique required that the questionnaire be designed to provide continuous and dichotomous scores (Borg and Gall 1979, pp. 488 - 489; Nie et al 1975, p. 276). Both types of score can be used to calculate Pearson product-moment correlation coefficents.

The use of a mailed questionnaire for data collection also influenced the type of questions developed. This choice made it essential that each question and the question instructions be worded clearly using language that was easily understood. Also, the overall length of the questionnaire was a major consideration because too lengthy a questionnaire might result in a low return rate. The final questionnaire was eleven pages in length.

The Influences of Limitations Imposed by the Ostop Board

Although Ostop provides a comprehensive program of osteoporosis health education related to all of the goals identified in Chapter Two, not all aspects of the education program were available for evaluation. Mrs. Todd stressed that the growing influence of Ostop in Vancouver was related in part to the close working relationship Ostop has with interested physicians. Evaluation of indepth knowledge about drug therapy and compliance with medically prescribed treatments was considered to be controversial and might have a negative effect

on Ostop's relationship with physicians. As a result of this possibility, the researcher was advised not to evaluate these areas.

Excluding these topics affected the comprehensiveness of the knowledge and behavior measures developed for the study. The effect of this decision is unknown, but it may have influenced the study results. If Ostop models, in this case physicians and selected medical literature, transmit drug information well, they may: 1. motivate women to continue with appropriate long term drug therapy, 2. provide women with accurate information that motivates them to seek medical treatment, and 3. motivate women to question possibly inappropriate medical treatment. These are important osteoporosis-related health behaviors, and may be among the more important outcomes of Ostop's education program. Their exclusion may have affected the correlations which included knowledge and behavior variables.

Acceptance of the advice to exclude these topics can be defended. The comprehensiveness of Ostop's educational efforts made a total evaluation difficult. To evaluate all aspects of the program in a mailed questionnaire would have required either an excessively long questionnaire that might have been discarded by those whose responses it was intended to collect or the use of very few and possibly somewhat superficial questions in each area. The process of excluding some topics made it possible to increase the depth of analysis in other areas.

The Influence of Content Expert Advice

The choice of topics to be included, the type of questions and the wording of the questions were all influenced by the content experts consulted during the development process. This consultation process was essential because of the lack of prior osteoporosis related educational research to guide the study and the lack of agreement among researchers in the area of osteoporosis. The experts consulted were two Ostop Board members who have osteoporosis, health care professionals who advise Ostop and professionals external to Ostop.

Mrs. Gerda Todd and Mrs. Robina Guinn are Ostop Board members who have personal experience with osteoporosis and an extensive acquaintance with Ostop membership. Both women have a health care background and have been involved as volunteers with other health education programs. They gave excellent advice about what information should be included and helped to clarify the language used in the questionnaire.

The health care professionals who advise Ostop include: Eugene C. Cameron, M.D., a Vancouver physician whose practice includes many osteoporotics, N. Copp, Ph.D., the discoverer of calcitonin, Mrs. Beverly Grice, a dietitian practicing in the area of community health and Mrs. Shirley Saloman, a physiotherapist, working in the area of extended care with elderly clients. All of these experts, except Dr. Copp, were Ostop Board members at the time the study was conducted.

The professionals external to Ostop included: Susan Barr, Ph.D., Assistant Professor in the School of Family and Nutritional Sciences at U.B.C., who provided expert advice on the content related to calcium knowledge. Dr. Barr was consulted because she has a special interest in calcium metabolism. Her advice was based on current research and coincided with the clinical advice given by Mrs. Grice. Dr. Stanley R. Brown, Ph.D., Professor and Graduate Advisor of the School of Physical Education and Recreation at U.B.C., provided content advice on the sections related to exercise. Dr. Brown is interested in osteoporosis and has conducted an exploratory exercise program with a small number of Ostop members who have osteoporosis.

These experts all provided useful criticism. The experts associated with Ostop were involved at each stage of questionnaire revision. This consultation with experts is believed to have resulted in the development of a questionnaire which reflects accurately the present state of knowledge about osteoporosis and is suitable to collect data from Ostop members.

The Influence of Social Learning Theory

One purpose of this study is to explain and explore correlational relationships that may help the Ostop Board understand how its education program influences members to learn about osteoporosis and change their osteoporosis-related behavior. The relationships chosen for analysis are based on

the theoretical explanation of Ostop's education program developed in Chapter II.

Central to understanding how Ostop members learn about osteoporosis and change their behavior are the concepts which describe the observational learning process. According to social learning theory (Bandura 1977, pp. 39 - 40), people learn by observing models. The role of the model is to transmit information to the observer who symbolically encodes this information for later use. Ostop provides models, called Ostop models in this study, which present written and oral information about osteoporosis to Ostop members. Ostop members are the observers and their task to symbolically encode the information presented by the Ostop models. The degree to which the transmitted information is encoded is the degree to which observational learning has occurred.

To measure the relationship between exposure to Ostop models and the observational learning outcome of knowledge about osteoporosis, a measure to evaluate knowledge is required. Knowledge in this study is equated with evidence of symbolic encoding. That is, if members have learned information about osteoporosis they have symbolically encoded this information. Evidence of this code would be the level of a member's knowledge about osteoporosis. A measure called osteoporosis knowledge was developed to measure this variable.

Social learning theory identifies attentional factors which influence the process of observational learning. This study limits evaluation to two sets of attentional factors which are

thought to influence the accuracy and completeness of the symbolic code. The first set has to do with recorded Ostop participation and the perceived influence of the models. The second has to do with personal characteristics which may influence a member to pay attention to osteoporosis information.

Participation in Ostop indicates exposure to Ostop models. A cluster of measures was developed to evaluate the influence of participation and member-perceived usefulness of models. Included are two measures of participation. Participation is measured by length of membership and meeting attendance. Perceived utilization of models is a measure developed to provide information about which models in the environment are perceived by Ostop members to be useful in helping them to learn about osteoporosis and influencing them to change their behavior. If the models provided by Ostop are influencing members, then members should identify Ostop role models as important sources of information. This measure does not directly measure the influence of models on observational learning but it does provide information about members' perceptions of model usefulness. If these perceptions correlate with osteoporosis knowledge, it is possible to suggest that exposure to Ostop models has influenced its members.

Members' personal characteristics are the second set of factors which are believed to influence quality of attention members pay to osteoporosis models. The personal characteristics included were chosen because they were believed to be factors which would specifically influence members'

attention to models for transmitting osteoporosis knowledge. This cluster of variables is called Personal Characteristics, and includes age; menopause status; diagnosis; fracture history and loss of physical height; and level of educational attainment.

Social learning theory stresses that observational learning may or may not result in behavioral reproduction of the modeled behavior. Factors which influence behavioral reproduction include the accuracy of the symbolic code, the presence of the required skills and motivation (Bandura 1977, pp. 27 - 29. The influence of the accuracy of the symbolic code of osteoporosis knowledge on practice of osteoporosis-related health behaviors is an important relationship to evaluate. This evaluation uses the osteoporosis knowledge measure mentioned earlier and requires that a measure be developed to evaluate members' performance of recommended osteoporosis-related health behaviors. This measure is called Osteoporosis-Related Health Behavior.

The other factors which influence behavior reproduction are the presence of skills and motivation. These are not measured in this study. Motivation is indirectly assessed by two of the measures mentioned above. The presence of personal characteristics which increase a member's risk of developing osteoporosis may motivate her to perform the recommended behaviors. Women with characteristics which suggest they have osteoporosis may also be influenced to practice the recommended behaviors because of the possibility of reducing the

consequences of the disease. The influence of personal characteristics on the practice of osteoporosis behavior is studied by using the measures of Personal Characteristics of Members and Osteoporosis-Related Health Behavior.

The Ostop models include motivational messages in their presentations. They stress the value of the recommended behaviors to members. This alerting of observers to the potential value of a behavior is one motivating factor which social learning theory suggests influences behavioral reproduction. Although this study did not attempt to directly measure motivation, the measure of Perceived Utilization of Models is an indirect measure of the influence of Ostop models on members. If the motivational messages provided by Ostop models are factors in helping members practice recommended behaviors then a relationship should exist between perceived utilization of Ostop models and the performance of osteoporosis-related behavior. No new measures are needed to study this relationship.

In this section, social learning theory has been used to identify the relationships that will be evaluated using the correlational methods. Also identified are the measures which are needed to study these relationships. In the next section the hypotheses based on the discussion in this section are described.

Research Hypotheses

The research hypotheses are stated in this section. The first hypothesis measures the relationship between osteoporosis knowledge and participation, and perceived utilization of models. The null hypothesis for the relationship is: Hypothesis One: there is no statistically significant correlation ($p \leqq .05$) between knowledge about osteoporosis and respondents' participation in Ostop, as defined by length of membership and meeting attendance, or their perceived utilization of Ostop models.

The second hypothesis measures the relationship between osteoporosis knowledge and personal characteristics. The null hypothesis for this relationship is: Hypothesis Two: there is no statistically significant correlation ($p \leqq .05$) between knowledge about osteoporosis and respondents' personal characteristics as defined by the presence of a diagnosis, loss of height, presence of a fracture history, age, menopause status and educational level.

The third hypothesis is the first of three which evaluate the influence of different factors on the behavior reproduction of the recommended behaviors. The third hypothesis evaluates the influence of osteoporosis knowledge on osteoporosis-related behavior. The null hypothesis for this relationship is: Hypothesis Three: there is no statistically significant correlation ($p \leqq .05$) between reported performance of osteoporosis-related health behaviors and respondents' knowledge about osteoporosis.

The fourth hypothesis evaluates the influence of participation and perceived utilization of models on the performance of Osteoporosis Related Behaviors. The null hypothesis for this relationship is: Hypothesis Four: there is no statistically significant correlation ($p \leq .05$) between reported performance of osteoporosis-related health behaviors and respondents' participation in Ostop as defined by length of membership and meeting attendance, or their perceived utilization of Ostop models.

The fifth and final hypothesis evaluates the influence of personal characteristics on the performance of osteoporosis-related behaviors. The null hypothesis for this relationship is: Hypothesis Five: there is no statistically significant correlation ($p \leq .05$) between reported participation in osteoporosis-related health behaviors and respondents' personal characteristics as defined by presence of diagnosis, loss of height, incidence of fractures, age, menopause status and education level.

These hypotheses are based on social learning theory and they evaluate information that is believed to be useful to the Ostop Board.

Description of the Measures

The four groups of measures which have been identified are described in this section. They include: Osteoporosis Knowledge, Osteoporosis-Related Health Behavior; Participation and Perceived Utilization of Models and Personal

Characteristics. A copy of the questionnaire, the answer key and coding information are provided in Appendix A.

Osteoporosis Knowledge

The osteoporosis knowledge instrument was designed to evaluate the extent to which information about osteoporosis has been learned by respondents. Knowledge about osteoporosis is assumed to represent the symbolic code which resulted from the process of observational learning. That is, respondents observed models in the environment, interpreted their observations, and symbolically encoded these observations.

As already explained, the content of this measure was influenced by osteoporosis literature, observation of Ostop lectures and consultation with content experts and social learning theory. This process resulted in developing items that included osteoporosis knowledge about: personal risk factors, physical signs of osteoporosis, current diagnostic practices, prevention and treatment, recommended dietary and calcium supplement behavior and general information about exercise.

Some items in the knowledge instrument evaluate information that was transmitted for the purpose of convincing women that the recommended behaviors are valuable. For example, knowing genetic risk factors does not change a woman's risk level but this knowledge may increase the value she places on other information, such as that dealing with recommended dietary practices. This type of information may have motivational value. Other areas of the knowledge questionnaire include

knowledge about signs that should warn a woman she may have osteoporosis and knowledge about effective diagnosis and treatment interventions.

The remaining two areas evaluate knowledge about dietary behaviors and general information about exercise. These areas include information which women need to know to be able to perform the recommended behavior.

The questions in the knowledge instrument were designed to test how much knowledge related to osteoporosis respondents have. Although the instrument measures osteoporosis knowledge, it does not attempt to measure an optimal level of knowledge. No standard exists which can be defined as the optimal amount of osteoporosis knowledge. The assumption made here is that all the knowledge included in this instrument is equally important. Ideally, Ostop members should know all of this information. The higher a participant's scores, the more likely it is that she has learned the information that experts believe she should know. It is also important to draw attention to the fact that this instrument not only evaluates the information learned exclusively from sources provided by Ostop, it includes knowledge learned from all other sources in the observer's environment.

The method of scoring was to assign one point for each correct answer. This resulted in a continuous score with a maximum of thirty-seven points. No attempt was made to weight the different areas of the measure to represent the relative importance of the information because there were no standards on

which to make those decisions. The content experts described earlier in this chapter were relied upon to determine the correct answer to each item. The score generated by this measure is called the Knowledge Score.

In addition to designing items to generate a continuous score, the items of the measure were designed to provide descriptive data as well. For example, in question four, respondents are asked to report the recommended daily intake of calcium. The response requires stating an amount of calcium. This information is used for descriptive purposes. It is judged for correctness and assigned a score of correct or incorrect.

The osteoporosis knowledge measure contains information that women need to adopt recommended behaviors and information that will increase the perceived value of the practical advice recommended by the models. This measure generates a continuous score with a maximum of thirty-seven points. The items also provide descriptive data.

Osteoporosis-Related Health Behaviors

The osteoporosis literature clearly indicates that women's health-related behavior is a factor which influences both the development of osteoporosis and its management. Exactly what behavior is considered ideal is yet to be defined. Despite this lack of validated knowledge about optimal behavior, women are being advised to adopt specific health behaviors. The development of an instrument to measure behavior was based on the same sources of information as was the knowledge instrument.

The advice of the content experts was especially helpful in developing this measure because of the lack of agreement in the literature related to behavior.

It was decided to emphasize only those behaviors about which experts have some degree of consensus. The behaviors evaluated by this instrument include: 1. calcium intake behavior, 2. exercise behavior, 3. smoking behavior, and 4. alcohol consumption behavior. Not all these behaviors were judged to have equal value. The osteoporosis literature reviewed in Chapter II and the opinions of the content experts resulted in the decision to give more emphasis to calcium intake behavior and exercise behavior than to smoking and alcohol intake behavior.

Appropriate smoking behavior was defined as not smoking. This definition reflects current medical attitudes towards smoking. Smoking cigarettes has been associated with the presence of osteoporosis; however, this relationship was not clearly defined in the osteoporosis literature reviewed for this study. The identification of the relationship between smoking and low bone density is one more piece of evidence which motivates health-care experts to strongly recommend not smoking as the appropriate health behavior for everyone not only osteoporotics. For this reason, not smoking rather than limited use of cigarettes was the recommended behavior in this study.

The influence of alcohol consumption on bone mass is also not clearly understood. The relationship between alcohol intake and low bone mass has been shown in alcoholics but it has not

been studied in populations which use alcohol in moderation. The professional advisors to Ostop recommend limiting alcohol consumption but they currently do not advise that it is necessary to avoid alcohol altogether to have healthy bones. Acceptable alcohol-related behavior in this study reflects the recommendations currently being made to members. Any participant who was consuming no more than the equivalent of two drinks per day earned one point.

Dietary behavior was limited to calcium intake behavior. Six questions evaluated this behavior. The method of scoring was the same as for the knowledge measure. One point was given for each correct answer. The content experts described earlier in this chapter were consulted to determine which questions most accurately reflect the best current advice. The highest total score that could be achieved was six points. For this study, a score of six on dietary behavior was defined as optimal calcium intake behavior.

The exercise measure was designed both to collect descriptive information about members' physical activity and to generate a score that would represent optimal exercise behavior. Designing the measure which collected descriptive data was relatively easy. It was necessary that the measure reflect both the variety of activity and the frequency of participation. The questionnaire included eight categories for types of exercise done and four categories for frequency of participation. This measure provided useful descriptive information about the kind and the amount of exercise performed by the respondents.

Resolving the design problems related to producing quantative data was not so straight forward as developing questionnaire items to provide descriptive data related to exercise. The criteria that had to be satisfied included these: the measure had to generate a continous score and the score for optimal exercise behavior had to be roughly equivalent to the score for optimal calcium intake behavior.

The most difficult problem to solve was the problem of defining optimal exercise. The ideal amount of exercise is variable. No set range exists as with calcium intake where a well defined lower and upper limits are stated. No such limits exist for exercise. In Chapter II the review of the exercise literature related to bone density concluded that the amount and type of exercise was related to bone density. Translating this knowledge into practice suggests that ideally women need to lead physically active lives to minimize their risk of developing osteoporosis. The more physically active a woman is, the more she stimulates her bones to increase or maintain their density. The specific ideal exercise prescription for each individual is harder to establish than the general principle of being physically active. Insufficient data are available to make ideal exercise prescriptions for the prevention or management of osteoporosis. Despite this lack of data, the general principle of being as physically active as possible and the clinical evaluation of a woman's physical condition do make it possible to suggest appropriate physical activity levels. For example, it may be good advice to suggest that a healthy forty-five year

old woman walk daily, continue playing tennis, and attend a stretch and strength class for middle aged women. Such advice is general health advice as opposed to specific advice for preventing bone mass loss. The recent exercise research suggests that this lifestyle may both prevent bone mass loss or may even increase bone mass as well as contribute to a healthy heart. The same advice is obviously inappropriate for a seventy year old osteoporotic with vertebral fractures.

The problem of limits was solved by considering the projected sample, the goals of Ostop and the recommendations in the literature. The typical respondent was assumed to be over sixty-five years of age and most likely to have had a diagnosis of osteoporosis and/or signs of the disease. Ostop is a support group for osteoporotics, and although it is very interested in the prevention of osteoporosis, most of its current efforts are directed towards women with the problem. These two factors made it clear that optimal exercise behavior for Ostop members should be achievable by typical Ostop members and not only by younger women with strong bones.

To establish a description of optimal exercise, the osteoporosis literature and content experts were used. As well as using literature reviewed in Chapter II and advice from Dr. Brown, the clinical experience of the researcher as a physical therapist was employed in establishing a standard of optimal exercise for this study.

In this study, optimal exercise behavior was set at the level that is believed to stop or slow bone mass loss

(Notelovitz and Ware 1982, pp. 128 - 132; Smith 1982, p. 76). To achieve a score that would be equivalent to the score for optimal calcium intake, a member would have to participate in a minimum of two types of exercise, and would have to exercise a minimum of four times a week. To generate this score, a value of 3 was assigned to an exercise frequency of 3 or more sessions per week, and 1.5 points was assigned for 1 or 2 sessions per week. Exercise done less frequently was scored 0 because it was considered to be too irregular to contribute significantly to bone mass maintenance. Two examples illustrate how an optimal score could be achieved. A woman who walked 3 times a week for 20 minutes and did floor exercises 3 times a week would have a score of 6 which equals optimal behavior. A second example demonstrates a different pattern. A woman who walks 3 times a week for 20 minutes, attends a water exercise class twice a week and practises a 20-minute set of prescribed physiotherapy exercises twice a week also earns an optimal exercise score. This method of scoring made the optimal behavior for exercise obtainable by members equal to the optimal calcium intake behavior score. This solution created another problem.

The scoring method made it possible to obtain an exercise score of higher than six. Theoretically, a very active member could obtain a score of twenty-four by participating in eight activities three or more times a week. This would be most unlikely but even the top score would not reflect excessive exercise. It would reflect 24 20-minute sessions or 8 hours of exercise per week. That is just over 1 hour a day. Exercise is

not believed to negatively affect calcium balance unless it is very excessive. For example, young women distance runners who exercise to the point where menstruation stops may be suffering bone mass loss (National Institute of Health 1984, p. 653). The scale included in the questionnaire does not measure such an extreme level of exercise. Some women in the study are likely to earn more than the optimal exercise score. For example, a woman who walks three times a week, performs daily stretching exercises and swims twice a week would earn an exercise score of 7.5. This higher than optimal score will mean exercise is weighed more heavily in the total behavior score than calcium intake behavior. This imbalance was accepted because the higher score may actually represent a higher level of health behavior related to osteoporosis.

In summary, the scoring of the exercise scale was designed to make optimal exercise behavior for osteoporotics equal to optimal calcium intake behavior. This was done because both of these behaviors were considered to be approximately equal in importance. Women who participate in exercise at the level recommended by osteoporosis experts would earn an optimal score of six. More active women could earn a score higher than six. These higher scores would influence the total behavior score. This was acceptable because: 1. it may reflect a higher level of health behavior, and 2. this effect was considered to be less of a problem than establishing a scoring system in which osteoporotics who were exercising at the level recommended for women with weakened bones were penalized.

The maximum total osteoporosis related health behavior score is twenty-one. Calcium intake behavior contributes six points to this score. Exercise behavior score has a upper limit of twenty-four but it is expected that the exercise scores will be well below this maximum. This issue will be discussed further in Chapter V when the data are presented. The optimal exercise score is six and equivalent to optimal calcium intake score. Non-smoking behavior contributes one point and minimum alcohol consumption behavior contributes one point.

Participation and Perceived Utilization of Models

Participation and Perceived Utilization of Models are measures of factors which may influence observational learning.

Participation

Participation in Ostop is measured by two variables; length of membership and number of meetings attended. Both measures indicate exposure to the models provided by Ostop.

Membership

Membership was measured by using Ostop records, and is recorded in months since first joined. This variable will provide Ostop with descriptive data on its growth rate. In addition, it is a measure of exposure to models. At the time of this study, all Ostop members were receiving an annual newsletter, had access to written literature about osteoporosis

and were phoned by another member to inform them about meetings. This exposure to models may influence observational learning.

Meeting Attendance

Members were provided with a list of the lecturers and the lecture topics for the period between September 1984 and April 1986. They were asked to report which meetings they had attended. The reporting period was chosen because lectures start in the fall each year. This period represented last season's lectures and this season's lectures up to the time of the study. It was hoped that providing these lists would help members remember which meeting they had attended.

Originally, meeting attendance was to be measured by using the meeting attendance records. Such an approach would have provided much more accurate data on attendance than asking the respondents to report their attendance based on the list of lectures on page ten of the questionnaire. Unfortunately, seven of the sixteen meeting attendance records could not be located.

Meeting attendance was considered to be a very important variable. It is at meetings that women have direct access to the health care and health promotion experts that Ostop judges to be important models. This variable was expected to influence observational learning. Total meeting attendance provided a continuous score.

Perceived Utilization of Models

The perceived utilization of models measure was developed to evaluate which of the models respondents identified as being important sources of information and influence. Respondents were given a list of fourteen "live" models from which they were asked to choose up to five models who had influenced them the most to learn about osteoporosis or to change their osteoporosis-related health behavior. The next question gave respondents the opportunity to identify up to six other sources of information, including print sources, and radio and television programs.

This instrument had two purposes. First, it would provide descriptive data about which models members believed had helped them learn about osteoporosis. The second function was to provide two separate continuous scores. A total of seven of the models from both questions were models provided by Ostop. The Ostop model score is the number of these Ostop models identified by respondents. The other was the total model score which was calculated by counting all the models identified by respondents.

Respondents were also asked to identify the model which had influenced them the most. This question was intended to provide descriptive data.

Personal Characteristics

The selection of members' personal characteristics selected as variables for this study has two purposes. One purpose is that they will be used to provide Ostop with descriptive

information about its membership. The other purpose is that they are believed to be factors which may influence the observation learning process. These personal characteristics include: age, menopause status, diagnosis, fracture history and loss of height, and level of educational attainment.

Age

Age was requested primarily for its descriptive value. Information about the age distribution of the members will most likely confirm the observation the Ostop Board has made about its membership. The age of respondents is not expected to be a variable that directly influences knowledge. Its potential influence may be because of its relationship to other variables such as menopause status. This question produced a continuous score in years.

Menopause Status

A woman's menopause status is a variable that should help determine the degree of attention a woman pays to osteoporosis-related role models. Of all the risk factors which are related to osteoporosis development, the decrease in estrogen which occurs during menopause has been stressed in the research literature as one of the most important. As a result, as women age and pass through menopause, their risk of developing osteoporosis increases. Social learning theory would suggest that this increasing risk level may be a factor which motivates women to increase the amount of attention they pay to

osteoporosis-related education. One problem with this prediction is that all of the respondents are members of Ostop. These women have demonstrated sufficient interest in osteoporosis to become members of the organization. As a result, the influence of menopause status in this study is difficult to predict.

This personal characteristic is scored to produce ordinal data with three levels: 1. pre-menopausal, 2. in-menopause, and 3. post-menopausal. This scale is related to a progressive decrease in estrogen and an increasing risk of developing osteoporosis.

Diagnosis

Participants were asked if a doctor had told them they had osteoporosis. This variable is dicotomous with the two categories being women with and without a diagnosis of osteoporosis. This variable does not measure the actual incidence of osteoporosis but measures the number of women for whom osteoporosis has been diagnosed. Some members may have osteoporosis which is not diagnosed or which has been diagnosed, and they have not been given this information.

Fracture History and
Loss of Height

The first definitive sign of osteoporosis may be the presence of a fracture. Certain fractures are common among osteoporotics. Despite this, the presence of a fracture history

alone is not equatable with a diagnosis of osteoporosis. Two questions related to fracture history were included. The first asked if respondents had broken any bones. The choices given were fractures commonly associated with osteoporosis. This question provided a dicotomous score of absence of a fracture history or presence of a fracture history and a frequency distribution of the reported fractures.

The second question asked if participants had become shorter in recent years. It is possible for vertebrae to collapse without women being diagnosed as having vertebral fractures. This collapse is not always painful and therefore not necessarily diagnosed. Even if a diganosis is made, women are not always aware that collapsed vertebrae is a fracture. Women are usual aware that they are getting shorter. This question was included to identify the women with possible vertebral fractures. This variable provides a dicotomous score of no loss of height or loss of height.

Diagnosis, fracture history and loss of height are all factors which are associated with the presence of the disease or the possible presence of the disease. Their occurrence in a member means that she has had personal experience with the consequences of osteoporosis. These factors are believed to be attentional factors which will motivate a woman to pay attention to osteoporosis education and to perform the recommended behaviors.

Level of Educational Attainment

Respondents were asked to report their highest level of educational attainment. The data collected were ordinal data. There were seven categories with completion of eight grade assigned one and a graduate degree assigned seven. This variable was included because social learning theory suggests that to benefit from information presented by written and oral formats such as print sources and lectures, the observer needs to have well integrated verbal skills. Ostop depends almost totally on these types of models. As a result, it is likely that they attract mostly women who have at least been graduated from high school. If this is true, the Ostop format is only serving and is likely to serve only the segment of the population with sufficient education to benefit from the program.

In this section, the measures contained in the questionnaire have been described. The next section describes the stages of development that resulted in the final questionnaire.

Stages of Questionnaire Development

The development of the questionnaire took place in three main stages. The initial stage was the development of the first draft of the questionnaire. The first draft was developed based on two interviews with Mrs. Gerda Todd, attendance at Ostop lectures over a period of one year, evaluation of written articles provided to members, a review of the relevant

osteoporosis literature and the application of social learning theory to generate hypotheses that deal with Ostop's education program.

This initial questionnaire was then evaluated by the content experts described earlier in this chapter. The advice from all of these sources was integrated and the questionnaire was revised. The main changes included:

1. modification of language to increase clarity,
2. revising questions such that they reflected more accurately the current research knowledge about osteoporosis.
3. several questions were eliminated because the research literature was sufficiently conflicted that no simple correct answer could be given by knowledgeable people.

This revised questionnaire was submitted to both the Ostop Board and University of British Columbia Behavioral Sciences Screening Committee. Both groups gave their approval and the questionnaire was prepared for the pilot study. Following this approval, a small pilot test of the questionnaire was concluded. A description of the pilot test and the results are presented in the next section of this chapter. Based on the results of the pilot test and further advice from the Ostop Board, the questionnaire was revised a second time. At this stage of revision the Ostop Board's recommendations were minimal consisting of small changes in wording to increase clarity and approval of the changes suggested by the researcher. This revised questionnaire was again sent to the Ostop Board. No further changes were recommended.

The final step in this questionnaire development process was to seek advice from a person with experience in questionnaire coding and statistical analysis. This consultation did not identify any major problems. The questionnaire development process was considered completed and the questionnaire was prepared for mailing to a sample of Ostop members.

Pilot Test

The main purpose of the pilot test was to evaluate the questionnaire using women who were believed to be similar to the study population. This was done by using a small number of women who volunteered at a regular Ostop meeting. This section describes that process and the revisions that were made as a result of the pilot test.

Selection of Pilot Study Participants

At a regular Ostop meeting, the intention to conduct a research study using Ostop members as participants was announced. The purpose of the study was described and members were informed that participation was voluntary. Volunteers were then requested to help improve the questionnaire. They were told that they would be required to complete the questionnaire and then be interviewed in their home at their convenience approximately one week later. Fifteen women volunteered and agreed that the researcher could phone them to provide them with more information. Three of these volunteers were excluded

because they lived outside of the City of Vancouver and the City of Burnaby.

Questionnaires were delivered to the twelve remaining volunteers. Approximately one week later the women were called and interview times were arranged. When possible, the interview was set at least one week after the date the women stated they had completed the questionnaire. Three women withdrew from the pilot study because of personal reasons including vacations and obligations to out of town guests. The nine remaining women were interviewed.

Representativeness of the Pilot Study Sample

It was not possible to assess the representativeness of the pilot study volunteers compared to the Ostop membership because no suitable data were available. The sample included women with the demographic characteristics which were thought to be common among Ostop members.

The sample included women with the following characteristics. The age of the women ranged between fifty-four years and seventy-seven years. Pre-menopausal women in their forties and women in their eighties were unrepresented. This lack of representation was acceptable because both of these groups were believed to form a smaller segment of the membership than women between fifty and eighty years of age. Four women had been diagnosed as having osteoporosis. The average attendance at meetings during the last two seasons for women in

the pilot study was three, with a range from one to eight. Only one woman had not completed high school. Of the other eight, three had completed high school, three had professional or some university training, one had completed a university undergraduate degree and one had completed a graduate degree. Based on Mrs. Todd's description of the characteristics of Ostop members, the pilot study sample was believed to be representative because it contained women beween forty and eighty, women with and without a diagnosis of osteoporosis, women with different histories of contact with Ostop and women with sufficient education to suggest that they could deal with an educational program which depended heavily on the use of written and oral models of communicating information.

Interview Process

Each woman was interviewed for approximately one hour. The intention was to identify any defects in the questionnaire including language problems and reliability problems. During the interview, the participant was provided with a fresh questionnaire. The questionnaire questions were re-asked by the researcher and leading questions encouraged the participant to offer suggestions about modifying questions, report if she had guessed at the answers and seek additional information about topics included in the questionnaire. Also, the volunteers were encouraged to answer any questions they had originally left blank. This process provided very useful information for

revising the questionnaire, as described in the following section.

Evaluation of the Pilot Test

The results of the pilot test presented here include general observations that apply to the whole questionnaire and an evaluation of the different measures.

General Observations

The general observations were:

1. None of the pilot study sample had difficulty following the directions in the questionnaire except the request to report calcium intake.
2. The comment section at the end of the questionnaire was not completed.
3. None of the women felt that the questionnaire was either too long or complicated.

Evaluation of the Measures

The pilot test provided useful information related to the separate study measures.

Osteoporosis Knowledge

The women in the pilot test had average scores of 76.5%. Out of a total possible score of 40 points, the mean score was 30.6 points for the questionnaire completed prior to the interview and 31.6 for the retest done using during the

interview. Table 1 reports the number of respondents who changed their answers and the direction of the changes. Six respondents earned a higher score on the retest. This probably indicates that the women learned about osteoporosis while completing the questionnaire. Only one woman scored lower on the retest. Table 2 demonstrates that 13.7% of the knowledge responses were changed on the retest. Overall, the knowledge instrument appears to be reliable.

Osteoporosis-Related Health Behavior

The behavior instrument had a total score of between fourteen and twenty-eight. The optimal score was considered to be fourteen points. This represented a perfect calcium intake score, a score of six points on the exercise section and 1 point each for not smoking and drinking minimum alcohol. The mean score of 11.3 was the same for both the test and retest. Only two women changed their answers on the re-test, resulting in a change rate of 4% (see Table 1). The low number of changes indicates that this section of the questionnaire is sufficiently reliable.

The question related to calcium intake was generally poorly answered. All of the women reported that it was a difficult question to answer. Several women left it blank, while several others admitted they had guessed at the answer. Further questioning indicated they knew what they had eaten, but did not know the calcium content of foods.

TABLE 1

CHANGE IN PILOT TEST
RESPONDENTS' SCORES AT INTERVIEWED RETEST

	Respondents With Same Score at Interview	Respondents With Higher Score at Interview	Average Increase in Points	Respondents With Lower Score at Interview	Average Decrease in Points
Knowledge Score	2	6	3.17	1	2.0
Behavior Score	6	2	2.5	1	1.0
Ostop Models	8	-	-	1	1

TABLE 2

RESPONSES CHANGED AT INTERVIEW BY PILOT STUDY RESPONDENTS

	Total Responses on Questionnaire by All Respondents	Responses Changed at Interview	Percent Changed
Knowledge Score	360	49	13.7
Behavior Score	162	7	4.0
Ostop Models	54	1	1.8

Perceived Utilization of Models

All the volunteers reported at least one Ostop model. On the retest only one volunteer changed her model choices. She did not remember one model on the retest (see Table 1). In both the test and retest the average number of models identified was between one and two.

The most important finding related to this measure was that all of the women reported that they had been influenced by television and/or print sources of information. These sources of information had not been included in the pilot test questionnaire.

Meeting Attendance

The meeting attendance question was not included in the original questionnaire. Just prior to the interviews, it was established that meeting attendance could not be measured using Ostop records, as explained in an earlier section. At the

interview, each woman was given this question for the first time. As expected, some women had difficulty remembering the meetings but this question seemed to function well. Most women took time to read it and although they often did not remember the name of the presenter they recognized the topic. Three of the nine women, without prompting, took time to check the list against their appointment calendars.

The average number of meetings attended was 3.3. This number may be inflated compared with the study sample because the volunteers for the pilot study were chosen from people at a meeting. This procedure eliminated from the pilot test the members who do not attend meetings.

Personal Characteristics

There were no problems experienced with these questions. The volunteers willingly gave the personal information requested on the questionnaire. Additionally, three women, without being prompted, gave a complete history of their problems related to osteoporosis.

Summary

No major problems were identified as a result of conducting the pilot test. The test retest procedure demonstrated that the questions have a moderate degree of reliability. As seen in Table 2, most of the changed answers were knowledge questions. Also, during the interview the women were encouraged to answer the questions they had left blank. This encouragement produced

responses which were often identified as guesses by the volunteer.

In the behavior section, the only problem encountered was related to calcium intake behavior reporting. The women did not know how to calculate their calcium intake in milligrams.

The other problems were with the clarity and organization of the questionnaire. The information gained by conducting the pilot test was used to revise the questionnaire.

Questionnaire Revision Based on Pilot Test

The questionnaire was revised in the following ways:

1. Several of the questions were reworded.
2. Sections requesting comments were moved from the end of the questionnaire to appropriate sections within the body of the questionnaire.
3. The calcium intake section was redesigned, with help from Mrs. Grice. Participants were asked to report foods eaten, and list the number of servings and the serving sizes. The amount of calcium was calculated from this information by the researcher.
4. A question was added to the section on Perceived Model Utilization. This question provided a list of sources of osteoporosis information including radio, television and printed material.

These revisions were the last revisions made on the questionnaire. The questionnaire was then ready to be sent to the study sample.

Validity, Reliability and Objectivity

The questionnaire was developed for this study. The validity of the questions has not been quantitatively evaluated. This means that there is no measure of validity for the questions used to collect the data. The face validity of the questions is probably high because they are based on the current osteoporosis literature and were revised to meet the standards of the content experts consulted during the development period.

The only measure of reliability was provided by the test retest procedure conducted using pilot study participants. This procedure demonstrated that participants were relatively consistent in their responses.

No attempt was made to determine the interviewer's influence on the way subjects responded to the questions. This means that the objectivity of the questionnaire is unknown.

Chapter Summary

The purpose of this chapter was to describe how the questionnaire was developed. The development process was influenced by the research procedures selected for the study, limitations established by Ostop, the advice of content experts, and the selection of social learning theory as the theoretical framework for the study. Within the limitations set by the

first three factors, social learning theory was used to identify relationships that would help explain how Ostop functioned as a health education provider and to identify the variables that would be used to evaluate these relationships.

Four measures were needed to assess the relationships stated in the research hypotheses. They are: 1. osteoporosis knowledge, 2. osteoporosis-related health behavior, 3. participation and perceived utilization of models, and 4. personal characteristics. Each of these measures was described. The description included the content of the measure, problems with development and the method of scoring.

The development of the study measures was a process that involved three revisions of the questionnaire. These revisions were based on advice from content experts about the content and wording of the questions, and on the results of a small pilot test conducted using eight Ostop members. The validity and statistical reliability of the measures used are unknown. This process resulted in the questionnaire used to collect the data for this study.

CHAPTER V

RESULTS AND DISCUSSION

This last chapter presents the results of the study, a discussion of the results and some implications for practice and research. The study has two broad goals. The results related to each goal will be discussed in separate sections. The first goal is to provide Ostop with relevant, descriptive information about the organization's members, their participation in Ostop education programs and members' perceived utilization of Ostop models. The results and discussion of the descriptive information is presented in the first section.

The second goal is to study the correlations of various factors including selected member characteristics, participation and model utilization with knowledge about osteoporosis, and with performance of osteoporosis-related health behaviors. The results and discussion related to these correlations are presented in the second section.

The final section of the chapter uses the research results in proposing changes to the existing education program provided by Ostop and health education interventions that could be offered by health care and health promotion professionals. Also several ideas are suggested for future research that would

contribute to the understanding of osteoporosis health education.

The results presented in this chapter are based on seventy-four returned questionnaires, which represents a 61.7% return rate. Sixty-two questionnaires were returned prior to mailing a follow-up letter requesting that non-respondents return the questionnaire. After this request seventeen more questionnaires were returned to the researcher for a total of seventy-nine questionnaires. Of these five were excluded for the following reasons. Two questionnaires were returned by women less than forty years of age. These women were younger than the limits set for the study. It is interesting to note, however, that only two respondents were less than forty years of age. This represents only 2.5% of the returned questionnaires. Three other questionnaires were eliminated because they included very few answers or no answers.

Descriptive Information

This section includes a summary of relevant descriptive information about Ostop member characteristics, about their participation in programs and their perceived utilization of models. The information presented here is organized under four headings; relevant personal characteristics; level of knowledge about osteoporosis; level of osteoporosis-related health behaviors; and participation and perceived utilization of Ostop models. The information presented in this section was selected because of its potential usefulness to Ostop and because of its

relationship to social learning theory. That relationship will be discussed in the second section of this chapter. Under each heading the results are first reported and then the importance of the results are discussed.

Personal Characteristics

The personal characteristics of members reported are: medical diagnosis and presence of medical signs of osteoporosis, menopause status, age and level of educational attainment.

Medical Diagnosis and Presence of Medical Signs of Osteoporosis

The first characteristics reported are the presence or absence of a medical diagnosis of osteoporosis and the presence or absence of medical signs including loss of height and bone fractures, which are often associated with osteoporosis. As seen in Table 3, 54.1% of the respondents have received the medical diagnosis of osteoporosis. Loss of height was reported by 67.6% of the respondents and 39.2% reported the occurrence of bone fractures.

TABLE 3

PRESENCE OF DIAGNOSIS OR SIGNS OF OSTEOPOROSIS

	yes		no		no response	
Medical Diagnosis	40	(54.1)*	34	(45.9)	-	
Fractures	29	(39.2)	45	(60.8)	-	
Loss of Height	50	(67.6)	19	(25.7)	5	(6.8)

*Number in parenthesis indicates percent of total respondents.

Menopause Status

Women who are post-menopausal have an increased risk of developing osteoporosis compared to women who are pre-menopausal. Sixty-one of the respondents have completed menopause (see Table 4). There is a positive correlation of .27 significant at the .05 level, between menopause status and the diagnosis of osteoporosis.

TABLE 4

MENOPAUSE STATUS

	number	percent
Pre-menopausal	3	4.1
In menopause	6	8.1
Post-menopausal	61	82.4
No response	4	5.4

Age

The youngest of the respondents was 46 years and the oldest was 85 years. The median age was 68 years. Table 5 presents the ages of repondents by decades. Respondents in their 60s or 70s constituted 67.8% of the sample.

TABLE 5

AGE OF RESPONDENTS BY DECADES

	number	percent
40 - 49	5	6.8
50 - 59	14	19.2
60 - 69	25	33.9
70 - 79	25	33.9
80 - 89	4	5.6
No response	1	1.4

Level of Educational Attainment

The respondents were quite well educated. Fifty-eight percent had attended university or received professional training (see Table 6).

TABLE 6

EDUCATIONAL LEVEL OF RESPONDENTS

	number	percent
High school not completed	15	20.3
High school completed	15	20.3
University or professional training	43	58.0
No response	1	1.4

Discussion

The survey findings demonstrate that the predictions made in Chapter III about Ostop's members are accurate. Typical members are post-menopausal women in their sixties and seventies who have osteoporosis and who have an educational attainment of at least being graduated from high school. The actual incidence

of osteoporosis among members may be higher than stated in the results. The diagnosis question asked members if a doctor had told them they have osteoporosis. The answers do not measure the actual incidence of osteoporosis among members. It provides only the number of women who have received a medical diagnosis. It is likely that some members have osteoporosis which has not been diagnosed. This proposed higher incidence may be supported by the finding that 67.6% of the respondents report that they have lost height. Although loss of height is not a diagnosis of osteoporosis, it is sometimes the first obvious clinical sign that it is present.

The presence of fractures is also a sign that osteoporosis may be present. In this study, vertebral fractures may have been under-reported. It is not uncommon for women to have vertebral fractures associated with loss of height without receiving a diagnosis of the fracture itself. Women who are losing height may be having fractures without being aware that a fracture has occurred.

The findings related to diagnosis, loss of height and vertebral fractures strongly suggest that Ostop is serving primarily women who have osteoporosis. This includes women who have been diagnosed and women who probably have osteoporosis, but who have not yet been diagnosed. The organization is not attracting as members many women who are pre-menopausal and prime candidates for preventive health education related to osteoporosis.

As predicted, most of the respondents had as a minimum educational attainment of being graduated from high school. This finding indicates that Ostop's education program is not reaching women with lower education levels. This is not a surprising result for two reasons:

1. Ostop depends on models which provide either oral or written information. This approach means that to receive maximum benefit from Ostop's education program participants must have well integrated verbal skills.
2. The adult education participation research indicates that adult participation in organized educational activities is positively correlated with level of eduational attainment.

It is important to know the level of educational attainment of members because it demonstrates that Ostop's current approach to health education most probably serves a self-selected group of women who learn easily from written and oral presentations. Women who have less well-developed verbal skills are unlikely to turn to Ostop for education. This finding in no way negates the value of the current program, but it does demonstrate that a large section of the female population is not being attracted to Ostop.

The summaries of personal characteristics reported and discussed in this section provides the Ostop Board with quantative data which describes who the organization is presently serving. Equally, they demonstrate that women with different characteristics who need access to information about osteoporosis are not being served directly by Ostop.

Level of Knowledge About Osteoporosis

The knowledge Ostop members have about osteoporosis is important. The literature review and the advice of the content experts consulted were used to identify knowledge that members should have. These sources identify knowledge in the following areas: knowledge about risk factors for osteoporosis; knowledge of the symptoms; knowledge about diagnosis of the disease; knowledge about prevention and treatment; knowledge about calcium intake; and knowledge about exercise.

As discussed in Chapter III, no attempt was made to measure a level of knowledge which could be considered sufficient or a level that could be considered insufficient. All knowledge was considered important, and it was assumed that more knowledge was more valuable than less knowledge. It was possible to earn a knowledge score of 37 points if all knowledge questions were answered correctly. The lowest score earned was 15 points, and the highest was 35 points. The mean score was 27.6 points. This average represents 75% of the knowledge thought by the experts consulted to be important. Forty respondents were able to answer at least 75% of the knowledge questions correctly, while only two of the respondents answered less than 50% of the knowledge questions correctly (see Table 7).

TABLE 7

OSTEOPOROSIS KNOWLEDGE
DEMONSTRATED BY RESPONDENTS

Percent of correct answers	number	percent
Less than 50%	2	2.8
50 to 74%	32	43.5
75 to 100%	40	54.2

These results indicate that although there is a range of knowledge levels most members are well informed about the disease. That is, they have a symbolic code that indicates they have learned about osteoporosis.

Level of Osteoporosis-Related Health Behavior

Respondents' performance of the recommended health behaviors is reported next. These behaviors are described in Chapter III and are limited to dietary and calcium supplement behavior, amount of alcohol consumed, smoking habits and the amount and kinds of exercise done. The reported performance of behaviors in each of these areas were accumulated into the behavior score.

The optimal behavior score is fourteen points. That is, if a respondent earned fourteen points she would be seen as having dietary and calcium supplement behavior, smoking and alcohol consumption behaviors and exercise behavior that are defined in this study as important behaviors aimed at preventing or slowing of the loss of bone mass. The mean behavior score for the

respondents was 11.8 points, which represents 84.3% of the optimal behaviors. The lowest score was 5.5 points and the highest was 26.0 points. Fifteen of the respondents earned scores higher than the defined optimal level of fourteen points. This is because they did more exercise than that thought to be required for preventing loss of bone mass. These scores were included in the calculation of the mean score.

Forty respondents report that they engage in at least 75% of the optimal osteoporosis-related health behaviors. Only two women reported behavior which received a score of less than 50% of the optimal behaviors. Surprisingly, these and other data presented in Table 8 are exactly the same as the data for osteoporosis knowledge demonstrated by respondents (see Table 7). While the correlation between the knowledge score and the behavior score is significant at the $p \leqq .05$ level, it is still only a weak correlation of .23, indicating that there is far from a one-to-one match between level of knowledge and level of behavior for the group members. The overall behavior scores indicate that Ostop members are practising many of the recommended behaviors.

TABLE 8

OSTEOPOROSIS-RELATED HEALTH BEHAVIOUR SCORE

Percent of optimal score	number	percent
Less than 50%	2	2.8
50 to 74%	32	43.5
75 to 100%	40	54.2

The optimal score for diet and calcium supplement behaviors is six points. An optimal score indicates that the respondent is meeting all of the recommended dietary and calcium supplement behaviors. A score of five or six points would reflect good dietary and calcium supplement behavior. Table 9 shows that fifty-six of the respondents earned five or six points. Only six women earned three or fewer points, indicating they were participating in half or less of the recommended behaviors. These results indicate that most members are practising behaviors that are believed to help maintain a positive calcium balance and minimize bone mass loss.

TABLE 9

REPORTED DIET AND CALCIUM SUPPLEMENT BEHAVIOUR OF RESPONDENTS

	number	percent
0 to 3 points	6	8.1
4 points	12	16.2
5 or 6 points	56	75.7

Although these scores are high, it is interesting to note that fifty respondents which represent 67.7% of the sample lost one point on their dietary and calcium supplement behavior because their reported intake was not within the recommended range. In this study the appropriate range of daily calcium intake has been defined as 800 to 1500 mg. Table 10 indicates that only four respondents report intakes below this range. This suggests that respondents are aware of the need for

sufficient calcium intake, however, only 21 of the 74 respondents reported calcium intake in the appropriate range. Forty-six respondents had intakes above the recommended maximum including twenty-four respondents who had a daily intake above 2000 mg. The highest reported calcium intake was 3244 mg per day. This finding is revealing because there is evidence that intakes that exceed 2000 mg per day may be associated with the development of kidney stones in some individuals.

TABLE 10

REPORTED DAILY CALCIUM INTAKE
OF RESPONDENTS

	number	percent
Less than 800 mg	4	5.6
800 to 1500 mg	21	28.3
1501 to 2000 mg	22	29.7
More than 2000 mg	24	32.4
Insufficient data to calculate	3	4.1

One possible reason for the high levels of calcium intake among members may be that members have altered their diets. For example, a woman may have been prescribed a 1,000 mg of calcium supplement per day. This would mean she only needed 500 mg from food. If she alters her diet to include a variety of calcium rich foods, she may have too high a calcium intake. If her new diet contains 1,500 mg of calcium and she continues to take the 1,000 mg/day calcium supplement, her total intake would be 2,500 mg/day.

The reliability of the calcium intake reporting is important. These levels of intake may not represent typical daily intakes of calcium. Beverly Grice, a dietitian, was consulted and she suggested that very likely members reported honestly but reported a high calcium day rather than a typical daily intake.

These results indicate that members either do not know how to calculate their calcium intake or that they have not learned that ingesting calcium above 2,000 mg per day may be dangerous. This problem is discussed further in the discussion of the correlational results.

Table 11 suggests that, as a group, the respondents are compliant with the recommended health behaviors related to smoking and alcohol consumption. The recommended behavior is not smoking; also it is considered unhealthy to smoke. The recommended behavior for alcohol ranges from never drinking alcohol to seldom drinking more than two drinks per day. Unhealthy behavior is usually drinking more than two drinks per day. For both behaviors, approximately 95% of the respondents reported practising healthy behavior.

With the data collected it was not possible to determine if the reported smoking and alcohol consumption behaviors represented new behaviors adopted as a result of contact with Ostop, or behaviors practiced prior to joining. Question number 18 and 19 (see Appendix A) attempted to collect this data; however, the information provided by the respondents was

insufficient to draw any conclusions regarding behavior changes related to association with Ostop.

TABLE 11

SMOKING AND ALCOHOL CONSUMPTION BEHAVIOURS OF RESPONDENTS

	healthful behavior		unhealthful behavior	
Smoking	70	(94.6)*	4	(5.4)
Alcohol consumption	71	(95.9)	3	(4.1)

*Number in parenthesis indicates percent of total respondents.

The optimal score for exercise behavior is defined as six points. This score represents participation in at least three twenty-minute periods of exercise per week for each of two kinds of exercise; for instance, walking and general floor or chair exercises. Both the overall amount of exercise and the performance of a variety of exercise activities are factors which contribute to an optimal exercise level. The optimal level of exercise behavior sufficient to retard bone mass loss was set to be achievable by many women with osteoporosis. Table 12 shows that 40.7% of the respondents earned six or more points. This includes 23.1% of the respondents who earned scores higher than six indicating that they are exercising at a higher level than was set as optimal in this study. As seen in Table 12 the range of scores for the women who earned higher than optimal scores was from 7.5 points to 18 points. No respondent earned an exercise score above 18. Respondents

earning three or fewer points comprised 47% of the study sample, indicating they were performing half or less of the recommended behavior. This suggests that they exercise fewer than three sessions per week, and/or engage in less than two exercise activities. Thirteen percent of the respondents report they do no regular exercise.

These findings related to exercise behavior indicated that exercise is a problem for many respondents. Compared to dietary behavior, fewer women had optimal scores. The reasons given for low levels of exercise participation or avoidance of exercise were varied. Thirty-six respondents gave reasons for their low exercise behavior. Of these, 53% reported that physical problems made exercising difficult or impossible to do. The physical problems included arthritis, heart disease, pain and a fracture history. Two women reported that a physiotherapist had told them that exercise was contra-indicated. Six respondents stated they did not know what kind of exercise was advisable. Finally, additional reasons included disliking exercise and being too busy.

The findings of lower exercise compliance in contrast with dietary compliance is important because regular exercise is believed to be an important part of managing or preventing osteoporosis. This problem is discussed further in the section on correlation results.

TABLE 12

REPORTED EXERCISE BEHAVIOUR
OF RESPONDENTS

Points	number	percent
0.0	10	13.5
1.5	4	5.4
3.0	21	28.4
4.5	9	12.2
6.0	13	17.6
7.5	4	5.4
9.0	4	5.4
10.5	3	4.1
12.0	2	2.7
15.0	3	4.1
18.0	1	1.4
19 - 24	0	0.0
Total	74	100.0

Participation and Perceived Utilization of Ostop Models

Three measures were used to evaluate the members' association with Ostop. Two are measures of participation and a third of members' reported perceptions about useful models.

Length of Membership

The data in Table 13 indicate that most of the respondents have been involved with Ostop for more than one year. Twenty-three percent had joined the group in the last twelve months. All members receive an annual Ostop newsletter and have access to written materials available from Ostop. In addition, they are informed of upcoming Ostop meetings by other members.

TABLE 13

LENGTH OF MEMBERSHIP IN
OSTOP ORGANIZATION

	number	percent
1 to 12 months	17	22.9
13 to 24 months	44	59.4
More than 24 months	13	17.6

Meeting Attendance

A measure of more active participation is attendance by the respondents at meetings. Fifteen regular meetings, which include a lecture, were held during the reporting period for the study. The mean number of meetings attended by the respondents was 2.2 meetings, but 41.9% of the respondents reported attending only one meeting (see Table 14). The largest number of meetings attended was eight, reported by one person. It would appear that the respondents attend surprisingly few meetings, even though these women have joined Ostop and demonstrate enough interest in osteoporosis and the organization to participate in an Ostop sponsored research project. Several respondents provided written comments on the question of meeting attendance. These comments were of two kinds. Many of the respondents offered positive comments about how valuable they find the speakers and experts provided by Ostop. Twenty percent of the respondents offered specific comments about why they didn't attend meetings regularly. Almost half of these comments indicated that respondents found it difficult or impossible to attend meetings specifically because the meetings were held in

the evenings and they were either too tired to attend, or found it hard to be out after nightfall. Several other respondents identified difficulty with transportation.

TABLE 14

NUMBER OF OSTOP MEETINGS ATTENDED BY RESPONDENTS

	number	percent
0 meetings	8	10.8
1 meeting	31	41.9
2 to 4 meetings	27	36.5
5 to 8 meetings	8	10.8
9 to 15 meetings	0	0.0

The descriptive data on meeting attendance indicates that most of the meetings were attended by 10% to 15% of the respondents. Only three lectures were attended by more than 15 % of the respondents. The reported rates of attendance for these lectures were 33% for Dr. R.A. Sutton's lecture, "Screening, Treatment and Research in Osteoporosis", 28% for Dr. E.C. Cameron's lecture, "Osteoporosis - Past, Present and Future: Screening Diagnosis, Treatment and Research", and 22% for a pharmacist, Mr. D. Danforth's lecture, "Boning Up on Calcium: A Review and Update". These results may indicate that members who attend meetings are most concerned about problems they believe are the perogative of physicians or the problems related to calcium supplementation.

Perceived Utilization of Ostop Models

Respondents were asked to identify up to five individuals who have served as models about osteoporosis for them. These models were individuals who had helped them learn about osteoporosis or influenced them to make osteoporosis-related behavioral changes in their life. In addition, respondents could identify up to six other sources of information, including print sources and radio and television programs. Of the nineteen models provided as choices, seven were identified as being associated with Ostop.

All but twelve respondents identified at least one Ostop-related model (see Table 15). The mean number of Ostop-related models identified by respondents was 1.9 models. The highest number was six models reported by one respondent.

TABLE 15

NUMBER OF OSTOP ASSOCIATED MODELS IDENTIFIED

	number	percent
0	12	16.2
1	22	29.7
2	14	18.9
3	15	20.3
4	7	9.5
5	3	4.1
6	1	1.4

Each respondent was also asked to select the one model that she believed had influenced her the most to make changes in her life with regard to osteoporosis. Of the fifty-five respondents

making their choice, 49.1% chose a print source as their most influential model (see Table 16). Twenty-four percent chose a physician as the most important model. The dominant influence of print material as a source of information is perhaps not surprising for this group. As noted earlier, many respondents have indicated they find it difficult or impossible to have access to the "live" models provided by Ostop at the organization's meetings. As a group, these women have a relatively high education level. It is reasonable to expect that these women are able to comfortably and successfully obtain information from print sources.

TABLE 16

PREFERRED MODEL

	Number	Percentage Three Respondents
Printed material magazines, newspaper articles, books	27	49.1
Ostop physician	7	12.7
Family physician	6	10.9
Television programs	5	9.1
Exercise instructor	2	3.6
Friend or family member	1	1.8
Other	7	12.7

Note: 19 respondents did not report a preferred model.

Factors Associated with Osteoporosis Knowledge and Osteoporosis-Related Health Behaviors

According to social learning theory, people learn by observing models. The role of the model is to transmit

information to the observer, who symbolically encodes this information for later use. In the process of analyzing the research results within this context, it is useful to look first at the factors which are related to the encoding of osteoporosis information or knowledge, and then at the factors which are related to the use of the information or performance of osteoporosis-related health behaviors.

Factors Associated with Osteoporosis Knowledge

In this study, participants' knowledge scores are used to measure the degree to which information about osteoporosis has been symbolically encoded. According to social learning theory, attentional processes influence the amount and quality of the symbolic coding. As has already been explained, high attentional levels can be assumed for all respondents in the study because of their ongoing relationship with Ostop, and their willingness and effort to participate in this study. The goal here was to consider possible factors which which might measure a refined level of the influence of these potential attentional factors. Two sets of factors related to attentional processes have been evaluated. The first set has to do with recorded Ostop participation and perceived influence of Ostop models. The second has to do with personal characteristics which may contribute to increased attention to osteoporosis learning.

Hypothesis One

The null hypothesis for the first set of factors is: there is no statistically significant correlation ($p \leqq .05$) between knowledge about osteoporosis and respondents' participation in Ostop, as defined by length of membership and meeting attendance, or their perceived utilization of Ostop models. In this hypothesis individual correlations between each of the factors and the knowledge score were made. In addition, a regression analysis was made with the knowledge score as the dependent variable and selected factors which might have potential attentional value. The independent variables include those factors noted in the hypothesis, that is, length of membership, meeting attendance, and perceived utilization of Ostop models. The second perceived model utilization score was also included. This score was the total number of models perceived by the respondents as useful. The models included in the score were not necessarily associated with Ostop. Other factors with potential attentional value that were included were presence of diagnosis, loss of height, presence of a fracture history, age, menopause status, and educational level. The method of regression analysis used was forward, and the factors were entered to the $p \leqq .05$ level of significance.

The first step in considering the relationship between knowledge and Ostop participation and perceived use of Ostop models was to evaluate the individual correlations. Neither length of membership nor number of meetings attended was correlated with the knowledge score. These results indicate

that participation measured by length of membership and attendance at meetings are not factors which influence members' osteoporosis knowledge level. Both variables measured actual exposure to models. As stated in Chapter III, membership included both active members and those whose memberships had not been renewed. Members do receive an annual newsletter and can request written material; however, time since first joined does not measure which members have read the newsletter or requested written information. It is not surprising that this variable does not significantly influence the knowledge level of members.

Meeting attendance was expected to be an important variable. It is at meetings that women have direct access to a variety of models chosen by the Ostop Board. These models were chosen because they are believed to transmit important information to members. However, the descriptive data already discussed indicate that meeting attendance is low. Many members have only been directly exposed to one or two of the lecturers during the past two seasons and some members have never been exposed. This low attendance may explain why this variable is not correlated with knowledge about osteoporosis.

The Perceived Utilization of Models Measure provided a score which represented the number of Ostop provided models, including printed materials, that respondents perceived as having influenced them. This score was called the Ostop Model Score. The Ostop model score was significantly and positively correlated with the knowledge score at the $p = .001$ level. The correlation was .395. This moderate correlation suggests that

women who identify a greater number of Ostop models as being important and influential for them demonstrate greater knowledge about osteoporosis. This individual correlation was strongly supported by the regression analysis when all factors with potential attentional value were related to knowledge in the forward fashion. The Ostop model score was entered first and was analysed as contributing most of the regression of all the attentional factors against knowledge. The result was a beta score of .332 which was significant at the p = .002 level (see Table 17).

TABLE 17

RESULTS OF REGRESSION ANALYSIS OF FACTORS WITH POTENTIAL ATTENTIONAL VALUE AGAINST KNOWLEDGE

Variables entered in forward analysis	Beta	T	Sig T
Ostop models	.332	3.25	.0018
Age	-.317	-3.13	.0025
Menopause status	-.213	-2.07	.0419

Variables not entered in forward analysis: Diagnosis, loss of height, presence of fractures, educational level, length of membership, meetings attended, total perceived models.

One possible interpretation of the positive correlation between the Ostop Model score and the level of knowledge is that Ostop models have influenced members' osteoporosis knowledge. However, because the correlational research design does not demonstrate cause and effect, a possible alternative

interpretation is suggested. It is possible that women who are already knowledgeable are alerted to sources of osteoporosis information and once they join Ostop they identify Ostop models as useful. Two reasons support the first interpretation. First women were asked to identify models which helped them learn and influenced their behavior. They were not asked which models they liked or thought were good models. Second, social learning theory stresses that models can influence observational learning.

Hypothesis Two

The second set of factors related to attentional processes to be considered were selected personal characteristics of the respondents. The null hypothesis is: there is no statistically significant correlation ($p \leqq .05$) between knowledge about osteoporosis and respondents' personal characteristics as defined by the presence of a diagnosis, loss of height, presence of a fracture history, age, menopause status and educational level.

Again, individual correlations of each factor with knowledge were evaluated. Also, each factor was included, along with participation factors and perceived utilization of model scores in the regression analysis, described above. The only personal characteristics that were significantly correlated with knowledge were age and menopause status, and these were both negatively correlated. The correlation for age was -.372 and was significant at the $p = .001$ level. The correlation for

menopause status was -.323 and was significant at the p = .001 level.

These correlations were reflected in the regression analysis where age and menopause status were the second and third factors to be entered after Ostop models. As seen in Table 17, age had a negative beta significant beyond the $p \leqq .01$ level. Menopause status also had negative bata significant at the $p \leqq .05$ level. These findings suggest that respondents who are younger and are pre-menopausal or in menopause tend to have more knowledge about osteoporosis than older women who are post-menopausal. It may be that these characteristics have an attentional value or contribute to attentional processes for learning about osteoporosis because these women are in or anticipating a transition when their risk of developing osteoporosis increases. At the same time, they may feel that having the knowledge can be of good use to them because it is "not too late" to find out about this disease. That is, the knowledge may be perceived as having functional value.

None of the other personal characteristics of diagnosis, loss of height, presence of a fracture history and educational level were correlated with level of knowledge and they did not enter the regression at the $p \leqq .05$ level of significance. Social learning theory suggested that these characteristics may have been attentional factors. One reason for the lack of correlation may be that these characteristics function primarily as factors which influence who joins Ostop. The self-selection

process may mean that members are generally already attentive to osteoporosis-related models. An alternative interpretation may be that these factors do not influence attention. The influence of these factors remains unknown.

Factors Associated with Osteoporosis-related Health Behavior

People learn by observing models. They symbolically encode the information that they observe from the models and then may choose to reproduce it behaviorally. This section looks at the factors associated with the behavioral reproduction or performance of osteoporosis related health behaviors by the respondents.

Social learning theory suggests that there are three factors that influence the behavioral reproduction of learning information. The first factor is that information must be accurately, symbolically encoded. The second factor is that the observer must have the necessary skills to do the behavior, or the opportunity to practise the skills of the behavior. The third factor is that the observer is motivated to perform the behavior. That is, that the observer must perceive that the behavior has some personal functional value.

The study data were analysed to evaluate the relationship between the performance of Ostop related health behaviors measured by the behavior score and several other factors. These factors were: knowledge score; participation in Ostop and perceived utilization of Ostop models; and personal

characteristics. These relationships will be presented below and then discussed in terms of the three factors which influence the behavioral reproduction of learned behaviors stated above.

Hypothesis Three

With respect to knowledge and behavior, the null hypothesis is: there is no statistically correlation ($p \leqq .05$) between reported performance of osteoporosis-related health behaviors and respondents' knowledge about osteoporosis.

In this analysis the individual correlation between the behavior score and the knowledge score was computed. Additionally, a regression analysis was made with the behavior score as the dependent variable. The independent variables included: the knowledge score; the three scores associated with Ostop participation and perceived use of Ostop models, that is, length of membership, meeting attendance and the Ostop model score; and the selected personal characteristic scores of diagnosis, loss of height, presence of fractures, age, menopause status and educational level. The regression method was forward and the significance level was $p \leqq .05$.

The individual correlation between the knowledge score and the behavior score is a positive correlation of .234 and is significant at the $p \leqq .05$ level. In the regression analysis against the behavior score, the knowledge score was the only variable to enter the regression and was significant at the $p \leqq .05$ level (see Table 18). These results indicate that there is a tendency for respondents with higher knowledge to

record higher levels of osteoporosis-related health behaviors. This correlation is weak, despite its level of significance.

Hypothesis Four

With respect to the relation of participation in Ostop and perceived utilization of Ostop models, the null hypothesis is: there is no statistically significant correlation ($p \leqq .05$) between reported participation in osteoporosis-related health behaviors and respondents' participation in Ostop, as defined by length of membership and meeting attendance, or their perceived utilization of Ostop models.

TABLE 18

RESULTS OF REGRESSION ANALYSIS OF KNOWLEDGE, PARTICIPATION, PERCEIVED UTILIZATION OF MODELS AND PERSONAL CHARACTERISTICS AGAINST OSTEOPOROSIS-RELATED HEALTH BEHAVIOUR

Variables entered in forward analysis	Beta	T	Sig T
Knowledge score	.233	2.01	.048

Variables not entered in forward analysis:
Diagnosis, loss of height, presence of fractures, age, menopause status, educational level, ostop models, total perceived models, length of membership, meetings attended.

In this case the null hypothesis was supported. There were no significant correlations between osteoporosis related health behaviors and any of the factors used to describe participation

or perceived utilization of Ostop models. And none of these factors entered the regression against the behavior score.

Hypothesis Five

With respect to the relationship between personal characteristics and osteoporosis health behavior, the null hypothesis is: there is no statistically significant correlation ($p \leqq .05$) between reported participation in osteoporosis-related health behaviors and respondents' personal characteristics as defined by presence of diagnosis, loss of height, incidence of fractures, age, menopause status and educational level.

Again, the null hypothesis was supported. There was no significant correlation between the behavior score and any of these factors, and none of these factors entered the regression against the behavior score at the $p \leqq .05$ level.

Discussion of Results

Taken together, these results suggest that of the various factors considered, the only factor that relates to the performance of osteoporosis related health behaviors is knowledge about osteoporosis. Participation or utilization of Ostop models were not related significantly. And no personal characteristics were related to the performance of the recommended behaviors.

The three factors identified by social learning theory as important to the performance of learned behaviors are accurate

symbolic encoding, opportunity to do or practise the skill, and motivation to do the behavior. These three factors will be discussed in relation to the results.

Knowledge

In this study, symbolic encoding is defined as knowledge. An expected relationship between knowledge and the performance of behavior is a major component of Ostop's educational approach. The Ostop board has defined a major goal of providing accurate and up to date knowledge about osteoporosis with the expectation that appropriate health behavior will then follow. To some extent this expectation is supported by the study results. There is a positive correlation between knowledge and behavior; however, both the low level of the correlation and the theory suggest that accurate knowledge is not necessarily a sufficient condition to produce the desired behavior.

Practice

The second condition for behavioral performance identified by the theory is the ability on the part of the observer to perform the behavior, or the opportunity to practise the behavior. Complex behaviors may need practice supervised by a model, or a chance to receive feedback from the model. Ostop's current educational program does not provide the opportunity for supervised practice, and it provides only a very limited opportunity for observers to receive feedback. The data suggest that while utilization of Ostop models is directly related to

having knowledge, it is not directly related to performing the behaviors. This may be in part because Ostop models tend not to provide all the information observers need. That is, they do not transmit sufficient information to result in a symbolic code which is adequate for the observer to later reproduce the modeled behavior accurately. Neither are practice sessions currently provided to increase the accuracy of the code.

The data on daily calcium intake may be explained by this lack of the opportunity to practise behaviors. Eighty-nine percent of the respondents knew the recommended calcium intake and 75% scored 5 or 6 on the dietary and calcium supplements behavior. However, 61.1% had daily intakes of calcium above the recommended level. During the year in which the researcher observed Ostop's education program, it was noted that on several occasions participants could learn the importance of calcium intake, the appropriate range of daily intake, and even that they should calculate their own intake. However there was little opportunity to receive feedback or supervised practice in doing that. This lack of opportunity to practise may help explain the excessively high calcium intakes of members.

A similar lack of opportunity may contribute to the finding that 59.5% of the respondents perform less than the optimal amount of exercise. For the older woman with osteoporotic changes, the learning of an appropriate exercise regime may be a complex process requiring supervised practice and feedback from an expert model. This type of help is not presently available from Ostop models.

The Ostop models may provide theoretical information, but the reliance on verbal instructions may be insufficient to transmit enough information to result in a code sufficiently clear to facilitate behavior reproduction. The more complex the behavior, the more likely members need an opportunity for supervised practice to learn to reproduce the recommended behaviors.

Motivation

The third factor which influences the performance of behaviors that are identified by social learning theory is motivation. That is, for observers to perform learned behavior, they must believe that the performance of the behavior will have a functional value for them. This study did not attempt to directly evaluate the motivation of respondents to perform osteoporosis related behaviors. The results indicate that none of the personal characteristics associated with osteoporotic changes, increased risk or level of educational attainment, were directly related to performing the behaviors.

Social learning theory suggests that a major source of motivation which influences an observer's choice to perform a behavior is the value placed on the behavior by the model. If observers are alerted to the importance of a behavior, they tend to be motivated to learn and perform the behavior. Ostop models tended to express different degrees of value for calcium intake and exercise behavior, possibly creating an element of confusion in the minds of members.

The impact of this may be reflected in a more detailed look at the behavior score. As noted earlier, most Ostop models tended to be quite clear, emphatic and enthusiastic about providing participants with information about the importance of proper diet containing high calcium foods. On the other hand, models were observed to be less clear and emphatic when presenting information about proper exercise. It is interesting to observe that the correlation between the knowledge score and diet and calcium supplement behavior score is positive and significant at the $p \leqq .05$ level. The exercise behavior score is not significantly correlated with the knowledge score. This may in part reflect that respondents have been less alerted by models to the importance of exercise performance and have received less clear and emphatic information.

Methodological Limitations

The results and discussions reported in the previous sections must be considered with an awareness of the methological limitations of this study. Four limitations are identified.

The first and most important limitation is the use of instruments which have not been evaluated for validity and reliability to collect the data. The decision to use researcher constructed instruments was made because no standardized instruments were available. The validity and reliability of the instruments were assessed in very practical ways. The content experts described in Chapter IV were relied upon to assess the

face validity of the instruments but the instruments have not been statistically tested for validity. The reliability of the instruments is also unknown. The pilot study did indicate that participants tended to improve their knowledge scores on a retest and that they consistently reported their behavior on the retest (see Tables 1 and 2). This lack of statistical assessment of the validity and reliability of the instruments suggests that caution should be used in applying the results of this study to guide educational program development related to osteoporosis. The measures developed should be viewed as a starting point for the evaluation of osteoporosis-related health education.

The second limitation is the use of a correlational research design. Correlational techniques make it possible to investigate the relationship between two variables or the relationship between one variable and several variables, but this method does not evaluate causality. The use of social learning theory to develop the correlational research hypotheses and to interpret the findings provides a rationale for choosing dependent and independent variables, but the research design does not permit a causal interpretation. That is, the variability in the independent variables cannot be shown to have caused the variability in the dependent variable regardless of how strong the correlation. The theory may suggest a causal relationship but an experimental research design would be required to demonstrate cause and effect.

The third limitation is the use of self-reporting as the method of collecting behavior information. Members could report optimal behavior even if their behavior were not optimal. There was no way to avoid this problem. It is impossible to observe members' lifestyle behavior. The results potentially may have been influenced by the over-reporting of behavior. Although this possibility exists, the researcher's opinion is that most likely members answered honestly. This opinion is based on the subjective interpretation of the quality of the information obtained during the pilot test interviews. The women interviewed consistently reported their behavior and elaborated on their reasons for both doing and not doing specific behaviors. The one exception may be reporting of dietary calcium. As already suggested, respondents may have reported a high calcium day rather than a typical day. This choice may have skewed the calcium intake reported by respondents towards higher daily intakes than would have been found in a study that more accurately measured dietary calcium over a longer period such as one week. This potential problem was not identified until after the data were collected.

The fourth and final limitation is related to the assessment of meeting attendance. It may have been unreasonable to expect that members could remember accurately the lectures they had attended during two seasons of Ostop's education program. The original intention had been to use meeting attendance records to evaluate attendance. Unfortunately, seven of the fifteen records were unavailable. The pilot study

demonstrated that members could remember at least some of the meetings they had attended, but meeting attendance may be inaccurately reported. This possibility may have influenced the results by obscuring existing correlations.

Implications for Practice and for Research

The result of this study show that only certain kinds of women are being reached by Ostop's education program. This means that a large section of at-risk women are not being reached directly by it, and suggests that there is a need for alternative health education programs. These alternative programs could be offered by Ostop or by other organizations. The discussion in this section includes: 1. Suggestions about how Ostop may be able to expand its education program, 2. suggestions about other ways that preventive health education and patient education can be provided for British Columbian women, and 3. suggestions for future educational research.

Ostop is not reaching all women who would benefit from osteoporosis health education. The organization does not attract very many pre-menopausal women members. To reduce the incidence of osteoporosis, younger women need to be well informed about this disease. The prospect of sustaining fractures which may occur twenty or thirty years in the future is unlikely to motivate younger women to attend Ostop's lecture series. These women are more likely to be reached by providing osteoporosis health education through other sources. Several

examples include: 1. Fitness programs could provide osteoporosis information to participants. 2. More indepth articles about osteoporosis should be written and published in magazines which reach younger women such as fashion and fitness magazines. 3. The provision of more information about osteoporosis on television. 4. Osteoporosis education could also be included in employee education programs. For example, hospitals employ many women. Staff education could include information about how to prevent osteoporosis. The same approach could be used for other employers of large numbers of women.

Another group of women not served by Ostop are women with lower levels of education. This group includes women of all ages. Some of the younger women with lower education levels may be reached by the methods already suggested. Older women also have access to television. Television may be an important way to reach women who are unlikely to read about osteoporosis or unlikely to attend lectures. Ostop can contribute to this process by continuing its efforts to stimulate local television programs about osteoporosis. For this media to be fully utilized, osteoporosis health education will have to be assigned a higher priority by both health care professionals and the people who influence public policy.

Women with osteoporosis often have contact with the health care system. When they fracture bones they see physicians and sometimes physiotherapists, and in the case of a hospital admission, they are also seen by nurses. Older women with

temporary or permanent disability are sometimes clients of home support services including nursing, physiotherapy and homemakers. Women receiving medical or support services are connected to the health care system and could be provided with osteoporosis health education if the decision were made to make the management of osteoporosis a high priority. Many health professionals already are providing patient education but it is not usually focused on osteoporosis. To facilitate this change in focus would require osteoporosis related continuing education for health care professionals. Ostop is not likely to be the organization to provide this intermediate step; however, it can facilitate this process by continuing and increasing its efforts to stimulate physicians and other health care professionals to initiate the process of continuing professional education.

At the time of the study Ostop had a membership of 359 women. The Ostop Board may be able to actively reach more women if it increases its efforts to inform health care professionals about its organization. For example, if all physicians in British Columbia received brochures with a cover letter written by a respected colleague promoting Ostop as an appropriate source of patient education about osteoporosis, some physicians would pass the information on to their patients. Similarly, hospital physiotherapy departments, orthopaedic nursing wards, and hospital-based patient education departments should have more information about Ostop's educational programs. Health care professionals interested in osteoporosis may currently be

unaware of Ostop, and if their awareness was increased they may direct more women to the organization.

Meeting attendance by members was found to be low. The most common reason for not attending meetings was that women stated that they cannot get to meetings. Ostop could try some daytime meetings to see if this made attendance easier for non-attending members. Alternatively, a series of home self-teaching programs could be developed. An appropriately funded project could produce audio tapes and self-testing materials that women could use at home to learn about osteoporosis. The taping of lectures is already being done by Ostop. These tapes could be duplicated and supplemented with visual aids used by the lecturers. Members could then use the tapes to learn up-to-date information about osteoporosis.

The results indicate that Ostop members need help with learning how to calculate their calcium intake and with learning how to exercise at an appropriate level. Members would benefit from having access to education programs that provide personal evaluation, supervised practise and feedback about behavioral performance. Such an approach may help women to learn how to calculate and adjust their calcium intake. It also may provide women with the help they need to learn an exercise program appropriate to their bone strength and functional ability. Ostop may choose to offer such programs to its members or to stimulate their development within the health care system.

The results of this study also suggest several areas for further research. The positive and significant correlations

found between perceived utilization of models and knowledge about osteoporosis, and between knowledge about osteoporosis and performance of osteoporosis-related behaviors could be evaluated for cause and effect by designing an experimental study. New Ostop members could be evaluated shortly after they first contacted Ostop, their contact with Ostop would be monitored and then a year later these members could be re-evaluated. Such a design would demonstrate if changes in knowledge about osteoporosis and changes in osteoporosis behavior are a result of involvement with Ostop.

If new programs are made available to members, such as exercise programs or personal dietary counselling, these programs could be researched. Evaluating the successes with which new programs help women change their osteoporosis-related behavior would determine the value of new programs. Programs which are shown to be effective are more likely to receive funding or to be adopted by existing health care organizations.

Research unrelated to Ostop's education program but related to osteoporosis health education could also be based on this study. The knowledge and behavior instruments could be used to evaluate other groups of women. For example, women receiving fracture treatment could be evaluated to determine if they needed osteoporosis health education. Other groups that could be evaluated include women seeking help related to menopause and women who are participating in exercise programs. Evaluation of these groups would provide valuable information about how well informed women are about osteoporosis and about which lifestyle

factors should be the major focus of public health education related to osteoporosis.

Finally, more research is required to determine the actual calcium intake and exercise requirements that will help prevent or minimize the loss of bone mass as women age. Until these standards are clearly established by experimental research, health education programs will lack the essential biological information necessary to develop researched-based interventions.

In Conclusion

The prevention and management of osteoporosis is a topic which is currently receiving attention from both the medical community and the general public. Osteoporosis is no longer considered to be a condition about which nothing can be done. Although it is unrealistic to expect that all cases of osteoporosis can be prevented, it is appropriate to have as health care goals: 1. a reduction in the incidence of osteoporosis, 2. early diagnosis, and 3. effective medical management for affected individuals.

For these goals to be achieved there must be continued basic science and clinical research related to osteoporosis. Prevention, diagnosis and effective management all depend on accurate knowledge about how bone mass is gained, maintained or lost. As the body of scientific knowledge related to osteoporosis grows physicians, physiotherapists, nutritionists, lifestyle counselors, physical education experts and health educators will have more information to guide their practice.

For example, in coming years the debate about how much calcium women of different ages should ingest is likely to be settled as research into the role of calcium in bone metabolism continues. Settling this debate will assist the professionals who provide health education about calcium requirements.

Further medical research is essential but an increase in the available knowledge about osteoporosis will not necessarily mean that fewer women will be affected by this condition. Improved health education related to osteoporosis is also essential in any attempt to reduce the incidence of osteoporosis or to effectively manage it once it has developed. This is because osteoporosis is influenced by lifestyle factors and its treatment requires long term compliance with medical regimes. If women are expected to adopt specific health habits permanently or to take medication indefinitely, it is essential that they have easy access to comprehensive information about osteoporosis. In addition to factual information many women also need help with the process of evaluating and where necessary changing their lifestyle habits. Appropriate health education interventions can help women adopt appropriate behaviors. Over the long term these behavior changes will contribute to the prevention of osteoporosis in some women and may minimize its consequences in others.

At the present time women in British Columbia do not routinely have access to comprehensive health education related to osteoporosis. Women in Vancouver who seek out Ostop and utilize its services can become well informed, however Ostop's

current educational interventions are limited to the provision of information. Women who want more practical help with diet evaluation and advice about appropriate exercise behavior will not find such services routinely available. This situation is very likely to change.

As health care professionals increase their interest in osteoporosis and informed women request better health care services, there is likely to be a gradual increase in osteoporosis-related health services. This process has already started in B.C. At the beginning of this study bone density measurement was available to a very limited number of women. Such measurements are now available to a much larger number of women because of the purchase of a dual photon absorptiometer by a Vancouver hospital. This increased capacity to diagnose osteoporosis is currently acting as a stimulus to the development of an osteoporosis clinic. These signs of progress may indicate that British Columbian women will soon have available a variety of osteoporosis-related health services including comprehensive health education. Such developments will also influence Ostop. If the health care system in B.C. assumes some of the role of educating women about osteoporosis, Ostop may be able to alter or expand its educational programs to include a larger range of educational interventions and to reach a broader group of women. There is every reason to believe that in future years women will have access to the services they need to help them avoid the consequences of osteoporosis.

APPENDIX A

Appendix A contains a copy of the questionnaire used to collect the data, and information on how the scores for each question or series of questions was calculated.

OSTEOPOROSIS SURVEY QUESTIONNAIRE

Questionnaire # _____

In the first part of the questionnaire (questions 1 - 9), we are interested to find out what you know or believe about Osteoporosis.

1. The actual cause of osteoporosis is not yet known. What is known is that some women have a greater chance than others of developing osteoporosis.

   Which of the following statements do you believe are associated with a woman having an increased risk of developing osteoporosis?
   For each statement, circle the code number in the appropriate column.

A Woman has Increased Risk of Developing Osteoporosis if she:	**Does** Increase the Risk	**Does not** Increase the Risk
a. Has large bones	1	2
b. Has had an early surgical menopause (ovaries removed)	1	2
c. Has a family history of heart disease	1	2
d. Has had a late natural menopause	1	2
e. Has a fair complexion	1	2
f. Has poor physical coordination	1	2
g. Has a physically inactive lifestyle	1	2
h. Smokes	1	2
i. Is overweight	1	2
j. Has a family history of osteoporosis	1	2
k. Is underweight	1	2

2. For each of the following statements about Osteoporosis, please indicate if it is true or false?
For each statement, circle the code number in the appropriate column.

		TRUE	FALSE
a.	The presence of peridontal disease (gum disease) should alert a woman to the possibility that she may have osteoporosis.	1	2
b.	A woman who adopts life habits that are believed to help prevent osteoporosis may still develop osteoporosis.	1	2
c.	Routine blood tests are a good way for your doctor to find out if you have osteoporosis.	1	2
d.	One of the signs that a woman may have osteoporosis is a decrease in physical stature (that is a woman notices she is getting shorter).	1	2
e.	Early in its development osteoporosis can be seen on an ordinary x-ray.	1	2
f.	More accurate methods of measuring bone mass have been developed. These tests are currently not widely available.	1	2
g.	Long standing back pain may be a sign of osteoporosis.	1	2
h.	Once a woman has osteoporosis it is too late for there to be any effective treatment.	1	2
i.	Osteoporosis is rarely ever present in women under the age of 65.	1	2
j.	Prescribed medications and supplements may reduce the probability of fractures in women with osteoporosis.	1	2

3. Certain dietary habits are believed to slow down the amount of bone a woman loses as she grows older.
For each statement, circle the code number in the appropriate column.

Which of the following dietary habits are believed to help lower a woman's risk of developing osteoporosis?

		TRUE	FALSE
a.	Avoiding high calorie foods	1	2
b.	Eating a diet which includes dairy products	1	2
c.	Avoiding foods high in cholesterol	1	2
d.	Limiting the amount of red meat in your diet	1	2

4. Canadian Nutrition experts have established standards for different nutrients. How much daily calcium intake is recommended for women who are 50 years of age or older?

Amount _____

5. A glass of milk is the standard which is often used to compare the calcium content of different foods.

a. How many glasses of milk would a woman fifty years of age or older need to drink in one day to get her total daily requirement of calcium from this source?

_____ 8 ounce glasses

b. A glass of skim milk is as equally good a source of calcium as a glass of whole milk.

True 1

False 2

c. A glass of whole milk equals how many ounces of HARD cheese?

_____ ounces

6. Calcium is found in a wide variety of foods. Please name six foods that you believe are good sources of calcium.

1 _____ 4 _____

2 _____ 5 _____

3 _____ 6 _____

7. Some nutritious foods contain calcium but they are not considered good sources of calcium because they also contain oxalates. If you know any such foods, please name two of them below.

1 _____

2 _____

8. Exercise may be one of the factors related to bone strength. For each of the following statements, please indicate if it is true or false.

		TRUE	FALSE
a.	The only kind of exercise that helps keep bones strong is aerobic exercise such as running, jumping and jogging.	1	2
b.	Some experts recommend walking as the best exercise for older people including women with osteoporosis	1	2
c.	Some fitness programs, including programs for seniors may be too vigorous for women with osteoporosis.	1	2
d.	After a fracture it is essential for a woman to remain inactive until <u>all</u> of the pain is gone.	1	2
e.	A woman who exercises regularly may still develop osteoporosis.	1	2

9. Which of the following medications and supplements are sometimes prescribed by doctors for the purpose of slowing down bone loss or lowering the risk of fractures?
Please circle the number code to the right of the product or products that may be prescribed for this purpose.

Estrogen	1
Aspirin	2
Codeine	3
Fluoride	4
Iron	5
Vitamin B_{12}	6
Calcium	7

In the next part of the Questionnaire, (questions 10 - 22), we are interested to know about your diet, exercise and smoking habits.
Please circle the appropriate number code or fill in the blank to the right of each statement.

		YES	NO
10.	I include two or more servings of dairy products in my diet almost every day	1	2
11.	I avoid milk products because I am unable to digest them or I am allergic to them	1	2
12.	I include calcium rich non-dairy foods in my diet on a regular basis	1	2

13. Do you eat a cereal which is high in bran or do you add bran to your diet?

Never	1
Occasionally	2
Once daily	3
More than once a day	4

14. How many cups of coffee or tea do you drink on an average day?

Tea _____
Coffee _____

15. What is your calcium intake on a typical day?

a. Calcium from supplements — Amount _____
Don't know _____

b. Calcium from food. Please list the high calcium foods which you have eaten in the **last 24 hours**

Estimate portion size in cups, ounces or pieces.

Name of Food	Number of Portions	Portion Size
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

16. How much alcohol do you drink? Two drinks are equal to 3 oz. of spirits or two beers or 8 oz. of wine.

I rarely or never drink alcohol	1
I occasionally have a drink	2
I almost never drink more than two drinks per day	3
It is common for me to drink more than two drinks per day	4

17. Do you smoke?

Yes	No
1	2

18. The last eight questions have asked you to record some of your lifestyle habits. We would also like to know if these habits represent changes in your lifestyle.

Look at your answers to questions 10 - 17. Do any of these answers represent changes you have made as a result of the lectures presented by Ostop?

Yes _____ No _____

a. If you answered yes, please describe the changes. Include both things you have added and things you have eliminated or decreased.

_____

_____

_____

_____

_____

b. Do any of your answers represent changes you have made in the last five years, but were changes you had made before attending Ostop lectures?

Yes _____ No _____

If you answered yes, please describe these changes. Include both things you have added and things you have eliminated or decreased.

_____

_____

_____

_____

_____

19. Everyone gets some exercise every day as they go about living. We are interested to know if you also do other kinds of exercise on a regular basis. Please read the following list and circle the number code in the appropriate column for each activity. A session means 20 minutes or more of the activity at one time.

		3 or more Sessions per Week	1 or 2 Sessions per Week	Occasionally At Least Once a Month	Less Than Once a Month or Never
a.	Walking	1	2	3	4
b.	General body exercises (on the floor or sitting on a chair)	1	2	3	4
c.	General body exercises that also include aerobic exercise such as walking, running or jumping	1	2	3	4
d.	Swimming or water exercises	1	2	3	4
e.	Dancing	1	2	3	4
f.	Weight lifting with small weights	1	2	3	4
g.	Physiotherapy home exercises	1	2	3	4
h.	Other (please specify) _____	1	2	3	4

20. During the past five years, the amount of exercise I get on a regular basis has:

Increased	1
Stayed the same	2
Decreased	3

21. As a result of what I have learned at Ostop lectures, the amount of exercise I get on a regular basis has:

Increased	1
Stayed the same	2
Decreased	3

22. Some people choose not to do additional exercise or have been advised not to exercise. If you are one of these people, we would be interested to know your reasons for not exercising.

_____

_____

_____

23. When a person is confronted with a complex medical problem, she often turns to a variety of sources for help. We are interested to know if there are people who you believe have helped you learn about osteoporosis or who have influenced you to make changes in your life habits.

The following is a list of individuals who may have influenced you to some degree. Choose up to **five** individuals who you believe influenced you the most. Indicate your choices by circling the code numbers on the right.

	Code Number
a pharmacist at the drug store you shop in	1
exercise experts who have lectured at Ostop meetings	2
the Ostop member who calls you about meetings	3
a hospital or community dietitian	4
an exercise instructor	5
physicians who have lectured at Ostop meetings	6
a physiotherapist	7
your personal family doctor	8
women you have met at Ostop meetings	9
a hospital or community nurse	10
a personal friend or family member	11
an acquaintance	12
the dietitian associated with Ostop	13
the pharmacist who has lectured to Ostop members	14
Other (please specify)	15

24. In addition to people, other sources of information such as TV or books may have helped you. We are interested to know if any of these other sources have influenced you to make changes in your life habits related to osteoporosis.

The following is a list of some of these sources. Circle the code number to the right of any source that you believe has influenced you.

a. Newspaper or magazine articles about osteoporosis 16

b. Books written about osteoporosis 17

c. Written material provided by Ostop 18

d. Radio programs about osteoporosis 19

e. Television programs about osteoporosis 20

f. Other (please specify) 21

25. Of all the sources of information and help you have circled in questions 23 and 24, which **ONE** do you believe has influenced you the most to make changes in your life with regard to osteoporosis?

write the code number here _____

26. We would be interested in any comments you have about the sources of information and help that have been important to you.

_____

_____

_____

_____

_____

_____

27. Please indicate which Ostop lecture you attended during the last two seasons by circling the number code to the right of each lecture description.

September: 1984	Dr. Kurt Van Peteghem Spinal Disorders Associated with Osteoporosis	1
October: 1984	Dr. E.C. Cameron Osteoporosis Update - Reports from Seattle and Victoria Meetings on Osteoporosis	2
November: 1984	Mr. Douglas Danforth, Pharmacist Osteoporosis, The Pharmacist's Viewpoint	3
January: 1985	Dr. Stan Brown The Principles for Personal Improvement of Body Structure and Function	4
February: 1985	Dr. Lynn Beatty After the Fall - Hip Fractures - Care and Treatment	5
March: 1985	Dr. Jerilyn Prior Does Very Strenuous and Prolonged Physical Training in Women Have a Negative Effect on Bone Mass	6
April: 1985	Dr. Roger Sutton Screening Treatment and Research in Osteoporosis	7
May: 1985	Ms. Andrea Lake and Mrs. Beverly Grice Calcium Throughout the Life Cycle: Nutrition	8
June: 1985	Dr. N.C. Copp History and Physiology of Calcitonin	9
September: 1985	Dr. Ian Gummerson Osteoporosis Prevention and Pain Management	10
October: 1985	Jackie Harris, Occupational Therapist How to Conserve Energy and Make Life Easier Particularly for the Arthritic and Osteoporotic Patient	11
November 1985	Meeting Cancelled	
January: 1986	Dr. E.C. Cameron Osteoporosis - Past, Present and Future Screening -Diagnosis - Treatment - Research	12
February: 1986	Mini-Film Fest "Be Well in the Later Years" and "The Silent Thief"	13
March: 1986	Mr. Doug Danforth, Pharmacist Boning Up On Calcium: A Review and Update	14
April: 1986	Mrs. Beverly Grice, Community Nutritionist Nutrition: Get What You Want and Save Energy Too	15

In this last section, questions 28 - 33, we have included questions about your personal history.

28. What is your birth date?

Month	Day	Year
_____	_____	_____

29. What is your menopause status?

Pre-Menopausal	1
In Menopause	2
Surgical Menopause before age 46 (ovaries removed)	3
Natural Menopause Completed	4

30. Since your fortieth birthday, have you fractured any of the following bones?

Wrist	1
Vertebrae (spine bones)	2
Hip	3
Rib/s	4
Other (Please specify)	5

_____

31. Has your doctor told you that you have osteoporosis?

Yes	1
No	2

32. Have you become shorter in recent years?

Yes	1
No	2

33. What is your highest level of education attained?

Eighth grade	1	Professional training such as nursing or secretarial school	5
Some high school	2	University degree	6
High school completed	3	Graduate degree	7
Some university	4		

Thank you for your participation in this study. If you have any additional comments, please write them on the back of this last page.

Measures Contained in the Questionnaire

The four measures contained in the questionnaire are: 1. Osteoporosis Knowledge, 2. Osteoporosis-Related Health Behaviors, 3. Participation and Perceived Utilization of Models, and 4. Personal Characteristics.

Osteoporosis Knowledge

The osteoporosis knowledge score was calculated using the answers to questions 1 - 9. This measure contained 37 items. Each item correctly answered was scored as 1 point resulting in a possible score that range from 0 - 37. Table 19 provides a key to the correct answers.

Osteoporosis-Related Health Behavior

The osteoporosis-related health behavior score was calculated by first calculating subscores for calcium intake, alcohol consumption, smoking behavior and exercise behavior, and then combining these scores into a total behavior score (see Table 20).

Participation and Perceived Utilization of Models

Length of Membership

The length of membership was calculated in months using the Ostop membership files.

Meeting Attendance

Question 27 was scored by adding the total number of meetings attended by respondents. Scores could range from 0 to 15.

Perceived Utilization of Models

Questions 23 and 24 provided the perceived utilization of model scores. The Ostop model score was calculated by scoring one point for each Ostop model code number circled. These models are identified by the code numbers 2, 3, 6, 9, 13, 14 and 18. The total model score was calculated by scoring 1 point for each model identified in both questions 23 and 24.

Personal Characteristics

Birthdate

Coded as age in years.

Menopause Status

Questionnaire codes used except that 3 and 4 were combined into category 3. This question provided an ordinal scale.

Fracture History

The questionnaire codes were used to calculate a frequency distribution. A dichotomy score was generated by scoring 1 for presence of a history of fractures and 0 for no history of fraction.

Osteoporosis Diagnosis and Loss of Height

Questionnaire codes provide dichotomy scores.

Educational Attainment

Questionnaire codes were used and resulted in an ordinal scale.

TABLE 19

ANSWER KEY FOR THE OSTEOPOROSIS KNOWLEDGE MEASURE

Question Number	Questionnaire Code for the Correct Answer	Correct Answers Provided by Respondents
1a	2	
1b	1	
1c	2	
1d	2	
1e	1	
1f	2	
1g	1	
1h	1	
1i	2	
1j	1	
1k	1	
2a	1	
2b	1	
2c	2	
2d	1	
2e	2	
2f	1	
2g	1	
2h	2	
2i	2	
2j	1	
3a	2	
3b	1	
3c	2	
3d	1	
4		800 - 1,500 mg

TABLE 19 - Continued

Question Number	Questionnaire Code for the Correct Answer	Correct Answers Provided by Respondents
5a		2 - 5
5b	1	
5c		1.5
6		Listed five foods correctly[a]
7		Listed two foods correctly[b]
8a	2	
8b	1	
8c	1	
8d	2	
8e	1	
9	1, 4 and 7[c]	

[a]A high calcium food was defined as any food which contained no less than 40 mg in a typical serving. Bowe's and Church's Food Values of Portions Commonly Used (Pennington & Church, 1980) was used to determine the calcium content of the foods reported.

[b]The British Columbia Diet Manual (B.C. Ministry of Health, Hospital Programs 1984) was used to identify foods high in oxalates).

[c]Respondents were required to circle all three code numbers to correctly answer question number nine.

TABLE 20

ANSWER KEY FOR THE OSTEOPOROSIS-RELATED HEALTH BEHAVIOR MEASURE

	Question Number	Questionnaire Code for the Correct Answer	Correct Answers Provided by Respondents
	Dietary and Calcium Supplement Behavior		
	10[a]	1	
	11[a]	2	
or	10[a]	2	
	11[a]	1	
	12	1	

TABLE 20 - Continued

Question Number	Questionnaire Code for the Correct Answer	Correct Answers Provided by Respondents
13	1, 2 or 3	
14		0 - 6
15a +15b[b]		800 - 1,500 mg
Alcohol Consumption		
16	1, 2 or 3	
Smoking		
17	2	
Exercise Behavior		
19	No correct answer. Score dependent on choices made by respondents[c]	

NOTE Questions 10 - 17, each correct was scored as one point.

[a]Question 10 and 11 had two correct patterns. The first pattern was correct for women with no problems with the consumption of dairy products. The second pattern was the correct choices for women with such problems.

[b]15a and 15b were added together to obtain the daily calcium intake of respondents. Bowe's and Church's Food Values of Portions Commonly Used (Pennington and Church, 1980) was used to determine the calcium content of the foods reported in Question 15b.

[c]The exercise score was calculated based on which codes were circled by respondents. The values of the codes were: 1=3; 2=1.5; 3=0 and 4=0. The possible exercise score ranged from 0 to 24 points.

APPENDIX B

Appendix B contains a copy of the computer printout of the Pearson correlation coefficients calculated using the scores for the different variables described in Chapter IV and Appendix A. Table 21 contains the variable labels for the codes used on the computer printout.

TABLE 21

VARIABLE LABELS

Variable Label	Printout Code
Osteoporosis Knowledge Score	KTOT
Osteoporosis-Related Health Behavior Score	BTOT
Age	AGE
Diagnosis	DIAG
Loss of Height	HT
Menopause Status	MENO
Fracture History	FRAC
Level of Education Attainment	ED
Ostop Model Score	ROS
Total Model Score	RMTOT
Meeting Attendance Score	MTGTOT
Length of Membership in Ostop	MEM1
Dietary and Calcium Supplement Behavior	B1
Exercise Behavior Score	B4

- - - - - - - - - - - - - - - P E A R S O N C O R R E L A T I O N C O E F F I C I E N T S - - - - - - - - - - - - - - -

	KTOT	BTOT	AGE	DIAG	HT	MENO	FRAC	ED	ROS	RMTOT	MTGTOT
KTOT	1.0000	.2337	-.3724	.1467	-.0591	-.3231	.0017	.2343	.3954	.3128	.1406
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .	P= .048	P= .001	P= .219	P= .622	P= .006	P= .989	P= .048	P= .001	P= .007	P= .239
BTOT	.2337	1.0000	-.0893	.0430	-.0633	.0066	-.1826	.1648	-.0394	.1232	.1082
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .048	P= .	P= .456	P= .720	P= .597	P= .956	P= .125	P= .166	P= .742	P= .302	P= .365
AGE	-.3724	-.0893	1.0000	-.3569	.0280	.1466	.3104	-.1470	-.0711	.1035	-.0330
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .001	P= .456	P= .	P= .002	P= .815	P= .219	P= .008	P= .218	P= .553	P= .387	P= .783
DIAG	.1467	.0430	-.3569	1.0000	.1014	-.2711	-.4713	.2279	-.1814	-.1526	-.1173
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .219	P= .720	P= .002	P= .	P= .397	P= .021	P= .000	P= .054	P= .127	P= .201	P= .327
HT	-.0591	-.0633	.0280	.1014	1.0000	-.0588	-.0706	.0432	-.0738	-.0785	.0223
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .622	P= .597	P= .815	P= .397	P= .	P= .624	P= .556	P= .719	P= .538	P= .512	P= .852
MENO	-.3231	.0066	.1466	-.2711	-.0588	1.0000	.0222	-.1817	-.1901	-.1429	-.1091
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .006	P= .956	P= .219	P= .021	P= .624	P= .	P= .853	P= .127	P= .110	P= .231	P= .362
FRAC	.0017	-.1826	.3104	-.4713	-.0706	.0222	1.0000	.0891	.1079	.0382	.0276
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .989	P= .125	P= .008	P= .000	P= .556	P= .853	P= .	P= .457	P= .367	P= .750	P= .818
ED	.2343	.1648	-.1470	.2279	.0432	-.1817	.0891	1.0000	-.0184	-.0374	-.0336
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .048	P= .166	P= .218	P= .054	P= .719	P= .127	P= .457	P= .	P= .878	P= .755	P= .780
ROS	.3954	-.0394	-.0711	-.1814	-.0738	-.1901	.1079	-.0184	1.0000	.5789	.4378
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .001	P= .742	P= .553	P= .127	P= .538	P= .110	P= .367	P= .878	P= .	P= .000	P= .000
RMTOT	.3128	.1232	.1035	-.1526	-.0785	-.1429	.0382	-.0374	.5789	1.0000	.2059
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .007	P= .302	P= .387	P= .201	P= .512	P= .231	P= .750	P= .755	P= .000	P= .	P= .083
MTGTOT	.1406	.1082	-.0330	-.1173	.0223	-.1091	.0276	-.0336	.4378	.2059	1.0000
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .239	P= .365	P= .783	P= .327	P= .852	P= .362	P= .818	P= .780	P= .000	P= .083	P= .

(COEFFICIENT / (CASES) / 2-TAILED SIG) " . " IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED

- - - - - - - - - - - - - - - - PEARSON CORRELATION COEFFICIENTS - - - - - - - - - - - - - - - -

	KTOT	BTOT	AGE	DIAG	HT	MENO	FRAC	ED	ROS	RMTOT	MTGTOT
MEM1	.1090	.1071	-.0657	-.1029	.1398	.0597	-.0752	-.0483	.2935	.0348	.4704
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .362	P= .370	P= .584	P= .390	P= .241	P= .618	P= .530	P= .687	P= .012	P= .772	P= .000
B1	.2470	.3627	-.0407	.0013	-.0816	-.2075	-.0187	.1827	-.0331	-.0235	-.1220
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .036	P= .002	P= .734	P= .991	P= .496	P= .080	P= .876	P= .124	P= .782	P= .845	P= .307
B4	.1804	.9754	-.0810	.0439	-.0571	.0469	-.1740	.1286	-.0283	.1333	.1493
	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)	(72)
	P= .129	P= .000	P= .499	P= .715	P= .634	P= .696	P= .144	P= .282	P= .814	P= .264	P= .211

(COEFFICIENT / (CASES) / 2-TAILED SIG) " . " IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED

PEARSON CORRELATION COEFFICIENTS

	MEM1	B1	B4
KTOT	.1090	.2470	.1804
	(72)	(72)	(72)
	P= .362	P= .036	P= .129
BTOT	.1071	.3627	.9754
	(72)	(72)	(72)
	P= .370	P= .002	P= .000
AGE	-.0657	-.0407	-.0810
	(72)	(72)	(72)
	P= .584	P= .734	P= .499
DIAG	-.1029	.0013	.0439
	(72)	(72)	(72)
	P= .390	P= .991	P= .715
HT	.1398	-.0816	-.0571
	(72)	(72)	(72)
	P= .241	P= .496	P= .634
MENO	.0597	-.2075	.0469
	(72)	(72)	(72)
	P= .618	P= .080	P= .696
FRAC	-.0752	-.0187	-.1740
	(72)	(72)	(72)
	P= .530	P= .876	P= .144
ED	-.0483	.1827	.1286
	(72)	(72)	(72)
	P= .687	P= .124	P= .282
ROS	.2935	-.0331	-.0283
	(72)	(72)	(72)
	P= .012	P= .782	P= .814
RMTOT	.0348	-.0235	.1333
	(72)	(72)	(72)
	P= .772	P= .845	P= .264
MTGTOT	.4704	-.1220	.1493
	(72)	(72)	(72)
	P= .000	P= .307	P= .211

(COEFFICIENT / (CASES) / 2-TAILED SIG) " . " IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED

- - - - - - - - - - - - - - - - PEARSON CORRELATION COEFFICIENTS - - - - - - - - - - - - - - - -

	MEM1	B1	B4
MEM1	1.0000 (72) P= .	.0600 (72) P= .617	.0975 (72) P= .415
B1	.0600 (72) P= .617	1.0000 (72) P= .	.1601 (72) P= .179
B4	.0975 (72) P= .415	.1601 (72) P= .179	1.0000 (72) P= .

(COEFFICIENT / (CASES) / 2-TAILED SIG) " . " IS PRINTED IF A COEFFICIENT CANNOT BE COMPUTED

SELECTED BIBLIOGRAPHY

Adams, S.; Grady, K.E.; Lund, A.K.; Muaida, C.; and Walk, C.H. 1983. Weight loss: Long term results in an ambulatory setting. J of the Am Diet Assoc. 83: 306 - 310.

Aioia, J.F. 1978. Prevention of involutional bone loss by exercise. Ann of Intern Med. 89: 356 - 358.

Bandura, A. 1969. Principles of behavior modification. New York: Holt Rinehart & Winston Inc.

Bandura, A. 1977. Social learning theory. Englewood Cliffs, N.J.: Prentice-Hall Inc.

Becker, M.H.; Kaback, M.M.; Rosenstock, I.M.; and Ruth, M.V. Some influences on public participation in a genetic screening program. 1975. J Community Health. 1(1); 3 - 14.

Becker, M.H., and Maiman, L.A. 1980. Strategies for enhancing patient compliance. J Community Health. 6: 113 - 135.

Blakeslee, A., and Stamler, J. 1966. Your heart has nine lives, condensed edition. New York: Benjamin Co. Inc.

Borg, W.R., and Gall, M.D. 1979. Educational research, New York: Longman Inc.

British Columbia. Ministry of Health, Hospital Programs. 1984. The British Columbia diet manual.

Brody, J. Calcium in the spotlight. The Vancouver Province, p. 26.

Cameron, E.C. January 22, 1986. Osteoporosis: past, present and future diagnosis, treatment and research. Ostop Society of B.C. lecture.

Cameron, E.C; Sutton, R.A.L.; and Prior, J.C. 1987. Osteoporosis and the menopause. BC Med J. 29(3): 153 - 156.

Canada. Department of National Health and Welfare, Health Promotion Branch, Bureau of Nutritional Sciences Food Directorate. 1983. Recommended Nutrient Intakes for Canadians.

Canada. 1985. Ministry of Supplies and Services. Canada Year Book.

Chow, R; Harrison, J.; and Notaries, C. 1987. "A feasibility study: The effects of two randomized exercise programs on bone mass of healthy post-menopausal women". Toronto General Hospital, Ontario. (Typewritten).

Clark, M.; Gosnell, M.; Nager, M.; and Doherty, S. January 27, 1986. The calcium craze. Newsweek, pp. 48 - 52.

Cross, K.P. 1981. Adults as learners. San Francisco, Calif.: Jossey-Bass.

Davis, M.S. 1968. Variation in patients' compliance with doctors' advice: An empirical analysis of patterns of communication Am J of Public Health. 58: 274 - 287.

Edwards, P. November 1985. Keep your bones healthy. Canadian Living, pp. 196, 198, 191 - 192, 196 - 197.

Erickson, D.J. 1978. Exercise for the older adult. Phys Sports Med. 5(10): 99 - 107.

Fardon, D.F. 1985. Osteoporosis: Your head start on prevention and treatment of brittle bones. New York: MacMillan Pub. Co.

Ferguson, J. 1978. Dietitians as behavior-change agents. J Am Diet Assoc. 73: 233 - 238.

Finlayson, A., and Silburt, D. April 7, 1986. New aid for bone victims. MacLean's, pp. 42 - 43.

Fromer, M.J. 1986. Osteoporosis. New York: Simon and Schuster Inc.

Glanz, K. 1979. Dieticians' effectiveness and patient compliance with dietary regimens. J Am Diet Assoc. 75: 631 - 636.

Graedon, J., and Graedon, T. 1985. The people's pharmacy. New York: St. Martin's Press.

Haefner, D.P., and Kirscht, J.P. 1967. Motivational and behavioral effects of modifying health beliefs. Public Health Rep. 85: 478 - 484.

Heaney, R.P. 1982. Preface to M. Notelovitz and M. Ware. 1982. Stand tall! The informed woman's guide to preventing osteoporosis. Gainsville, Florida: Triad Publishing Company; reprint edition, 1985. Toronto: Bantam Books.

Heaney, R.P.; Recker, R.R.; and Saville, P.D. 1977. Calcium balance and calcium requirements in middle-aged women. Am J Clin Nutr. 30: 1603 - 1611.

Heaney, R.P.; Recker, R.R.; and Saville, P.D. 1978a. Menopausal changes in bone remodeling. J Lab Clin Med. 92: 964 - 970.

Heaney, R.P.; Recker, R.R.; and Saville, P.D. 1978b. Menopausal changes in calcium balance performance. J Lab Clin Med. 92: 953 - 963.

Holm, R.P.; Taussig, M.T.; and Carlton, E. 1983. Behavior modification in a weight-reduction program. J Am Diet Assoc. 83: 170 - 174.

Horn, D. 1968. "Factors affecting the cessation of cigarette smoking: A prospective study." Paper presented at the meeting of the Eastern Psychology Assoc., Washington, D.C. Cited by S.V. Kasl. 1974. The health belief model and behavior related to chronic illness. Health Educ Monogr. 2: 444.

Irwin, L. 1986. Vancouver Public Library: The layperson's medical library. Health Libraries Assoc of BC Forum. 9: 1 - 4.

Irwin, T. 1974. Understanding your heart. New York: Public Affairs Pamphlets.

Kasl, S.V. 1974. The health belief model and behavior related to chronic illness. Health Educ Monogr. 2: 433 - 453.

Krogh, C.M.E., Ed. 1986. Compendium of pharmaceuticals and specialties. Ottawa: Canadian Pharmaceutical Assoc.

Lalonde, M. 1974. A new perspective on the health of Canadians. Ottawa, Ont.: Information Canada.

Levine, P.H., and Britten, A.F.H. 1973. Supervised patient management of hemophelia: A study of 45 patients with hemophelia A and B. Ann Intern Med. 78: 195 - 201.

Long, J. 1985. The essential guide to prescription drugs, 4th ed. New York: Harper and Row Publishers Inc.

McQuade, B. April 3, 1985. Getting to the bones of it. The Vancouver Sun. Sec. D, pp. 1, 5.

Maiman, L.A.; Green, L.W.; Gibson, G.; and Mackenzie, E.J. 1979. Education for self-treatment by adult asthmatics. JAMA. 241: 1919 - 1922.

Martin, J.E., and Dubbert, P.M. 1982. Exercise applications in behaviroal medicine: Current status and future directions. J Consult and Clin Psychol. 50: 1004 -1017.

Matkovic, V.; Kostial, K.; Simonovic, I.; Bozina, R.; Brodarec, A.; and Nordin, C. 1979. Bone status and fracture rates in two regions of Yugoslavia. Am J Clin Nutr. 32: 540 - 549.

Miller, L.V., and Goldstein, J. 1972. More efficient care of diabetic patients in a county-hospital setting. N Engl J Med. 286: 1388 - 1391.

Miller, R.W. 1983. Doctors, patients don't communicate. FDA Consumer. 17: 6 and 7.

Mullens, A. Getting the facts on how exercise affects women. The Vancouver Sun. Sec. B, p. 5.

National Institutes of Health. 1984. Osteoporosis. Conn Med. 48: 651 - 655.

Nie, N.H.; Hull, C.H.; Jenkins, J.G.; Steinbrenner, K.; and Bent, D.H. 1975. Statistical package for the social sciences, 2nd ed.New York: McGraw-Hill Book Co.

Nilsson, B.E., and Westlin, N.E. 1971. Bone density in athletes. Clin Orthop. 77: 179 - 182.

Notelovitz, M., and Ware, M. 1982. Stand tall! The informed woman's guide to preventing osteoporosis. Gainsville, Florida: Triad Publishing Company; reprinted, 1985. Toronto: Bantam Books.

Ostop Society of B.C. 1987. Accomplishments to date. Ostop Society News. 3: 3.

Pennington, J.A.T., and Church, H.N. Eds. 1980. Bowe's and Church's food values of portions commonly used. 13th ed. Toronto: J.B. Lippincott Co.

Riggs, B.L., and Melton III, L.J. 1986. Involutional osteoporosis. N Engl J Med. 314: 1676 - 1686.

Riggs, B.L.; Seeman, E.; Hodgson, S.F.; Taves, D.R.; and O'Fallon, W.M. 1985. Effect of fluoride/calcium regimen on vertebral fracture occurence in post-menopausal osteoporosis. N Engl J Med. 306: 446 - 450.

Rosenstock, I.M. 1974. The health belief model and preventive health behavior. Health Educ Monogr. 2: 354 - 386.

Smith, E.L. 1981. Bone changes in the exercising older adult, pp. 179 - 186. In E.L. Smith, and R.C. Serfass (Eds.). 1981. Exercise and aging: the scientific basis. New Jersey: Enslow Publishers.

Smith, E.L. 1982. Exercise for the prevention of osteoporosis: a review. Phys Sports Med. 10(3): 72 -83.

Smith, E.L.; Reddan, W.; and Smith, P.E. 1981. Physical activity and calcium modalities for bone mineral increase in aged women. Med Sci Sports Exerc. 13: 60 - 64.

Smith, E.L.; Sempos, C.T.; and Purvis, R.W. 1981. Bone mass and strength decline with age, pp. 59 - 87. In E.L. Smith and R.C. Serfass (Eds.). 1981. Exercise and aging: the scientific basis. New Jersey: Enslow Publishers.

Smith, E.L., and Serfass, R.C. (Eds.). 1981. Exercise and aging: the scientific basis. New Jersey: Enslow Publishers.

Smith, W., and Cohn, S.H. 1985. Osteoporosis: how to prevent the brittle bone disease. New York: Simon and Schuster, Inc.

Stainbrook, G., and Green, L.W. 1982. Behavior and behaviorism in health education. Health Educ. 13(6): 14 - 17.

Sutton, R.A. April 24, 1985. Screening, treatment research in osteoporosis. Ostop Soc. of B.C. lecture.

Sutton, R.A. May 28, 1986. Research in osteoporosis (brittle bones). Ostop Society of B.C. lecture.

Sutton, R.A., and Cameron, E.C. 1985. Osteoporosis: prevention and treatment. BC Med J. 27(3): 136 -139.

Swanson, J.C. 1972. Second thoughts on knowledge and attitude effects on behavior. J of Sch Health. 42: 363 - 365.

Todd, G. 1985a. The Ostop Society of B.C., Vancouver, B.C. Canada. Interview. July 3, 1985.

Todd, G. 1985b.The Ostop Society of B.C., Vancouver, B.C. Canada. Interview. November 1, 1985.

U.S. Dept. of Health, Education and Welfare. 1979. Healthy people: The Surgeon General's report on health promotion and disease prevention.