

LIFETIME POSITIVE LIFESTYLE EDUCATION  
AIMED AT REDUCING THE INCIDENCE OF CORONARY HEART DISEASE

by

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B.Sc., McGill University, 1946

A Thesis Submitted in Partial Fulfilment of  
The Requirements for the Degree of

MASTER OF SCIENCE  
(Health Services Planning)

in

THE FACULTY OF GRADUATE STUDIES  
(Department of Health Care and Epidemiology)

We accept this thesis as conforming  
to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

September 1981

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August 31 / 81

## A B S T R A C T

A review of a portion of the vast amount of literature on the subject of Coronary Heart Disease reveals that although the incidence of mortality from this disease has declined by over 20 per cent since the 1960's, it is still a major cause of death in Canada. There seems to be general agreement that there are certain "risk factors" for Coronary Heart Disease and that these can be modified positively by intervention such as education via the media, and counselling, as has been done in such studies as MRFIT, the Stanford Program, North Karelia, and "Know Your Body" Program.

Many investigators now agree that Coronary Heart Disease is a "pediatric disease" and that measures to reduce the effects of the known risk factors should be initiated early in life. This reduction can best be achieved by an education program which commences at least as early as at the kindergarten level and continues throughout life in the school and in the work milieu.

Governments will be the main source of funds for the development and implementation of health education programs, but will also provide support for the education and hiring of health educators. Other resources will be the health professionals in all disciplines and at all levels; industry, both at the occupational and consumer levels; the media; and various community facilities. In addition to incentives in the form of reduced insurance premiums offered by the private sector to participants in positive lifestyle programs, there

could be tax incentives to individuals and to industry for such participation, or for the provision of facilities to encourage participation.

It is suggested that the various programs aimed at helping Canadians to develop positive lifestyles for the prevention of Coronary Heart Disease be "married" into one inter-related, continuous program so that there is some rational relationship between programs at all levels. This would provide the continuous exposure necessary for enhancement of the learning process. Some recommendations are made for future studies.

Dr. J. H. Milsum

Thesis Chairman

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## A C K N O W L E D G E M E N T S

The author gratefully acknowledges the assistance, criticism and support of many persons.

To Dr. John H. Milsum, Director, Division of Health Systems, Health Sciences Centre, University of British Columbia, B.C., and my thesis Committee Chairman, I express my sincerest appreciation for his patience and guidance through virtually every page of this thesis. Special mention must also be made of the co-operation and genuine interest I received from the other members of my Committee. Thank you to Dr. Patricia Vertinsky, Associate Professor, Education, UBC, and to Dr. Fred Bass, Community Medicine, City of Vancouver.

Many thanks to Dr. Anne Crichton and Dr. Mort Warner of the Department of Health Care and Epidemiology, UBC, for their continuous encouragement during the course work, as well as for their valuable suggestions during the initial phases of the thesis.

To those people with whom I corresponded and who provided me with material as well as suggestions, I express my sincere appreciation.

Special thanks to Susan and her "Blazing Fingers" for the tremendous effort in producing the proofs and final draft on such short notice.

Finally, my deepest thanks to Anita, who suffered through the proof-reading, to Lois, Linda, Lianne and Paula, for without their support and confidence as well as gentle pushing, none of this would have been possible.

## PREFACE TO TABLES

Tables I.2 and I.3 were taken from Statistics Canada, "Causes of Death" for the years 1976 and 1978. These tables, however, only indicate the actual numbers of persons who died during the years specified of the diseases indicated without reference to the rate. In simplest terms these are absolute numbers.

Such statements have limited utility until further qualified with respect to two features: (1) in what population were these cases observed; and (2) when were they observed. This latter feature has already been indicated as 1976 and 1978. To allow for differences in population size, the frequencies must be expressed in the form of rates. A rate is defined as the frequency of a disease or characteristic expressed per unit of size of the population or group in which it is observed. For example, in Table I.2, having determined that the population of males aged 40-44 in Canada in 1976 was 643,600, one could then determine the death rate for that age group for that year as 76 per 100,000 population, knowing that 489 males in that age group had died of Coronary Heart Disease in 1976. By comparing this rate to other age groups in the same year, one could determine whether risk increased or decreased with age. Similarly, if the same age groups were used to compare the death rate for Coronary Heart Disease for two different years, one could determine whether the rates were increasing or decreasing. Using this information, the author would conclude that primary prevention as discussed in this thesis would be most effective in the younger age groups. Tables I.4 and I.5 also indicate absolute numbers without reference to population and, therefore, the same rate determinations would apply.

## CHAPTER I

### REVIEW OF THE LITERATURE

A review of the literature was conducted in the following areas:

- A. The extent of the problem of premature death due to Coronary Heart Disease.
- B. Government, group and individual recommendations and programs.
- C. Treatment or Prevention.
- D. Risk Factor Reduction Trials.
- E. Current Statistical Trend -- CHD.

#### A. THE EXTENT OF THE PROBLEM

##### 1. Introduction

The Committee on Diet and Cardiovascular Disease, Health and Welfare Canada [1976] in their statement for the public point out that Canadians enjoy one of the highest standards of living in the world and have a life expectancy from birth of 69.3 years for men and 76 years for women. These life expectancies are similar to those of other Western nations, and higher than in less industrialized nations. However, the Committee also points out that in Canada there is a high frequency of disease and death from atherosclerosis (hardening of the arteries causing heart attacks, strokes, etc.). Close to 50 per cent of all deaths in Canada are related to atherosclerosis. This condition occurs not only in old age, but also affects

significant numbers of Canadians in middle age. Because Canadian men 45 to 54 years of age have more than twice as many deaths from arteriosclerotic heart disease as men in Sweden, it is reasonable to infer that something can be done to reduce the high death rate in Canada from this cause, especially in the middle-age groups.

According to further findings of the Committee, some risk factors are definitely known for atherosclerosis and such of its complications as heart attacks. These risk factors include elevated blood fats (cholesterol and triglyceride), high blood pressure, smoking and diabetes. It is their opinion that most Canadians can improve their health and life expectancy by avoiding overeating and smoking. They state that medical examinations should include measurement of blood cholesterol, triglycerides, sugar and blood pressure. If any of these are found to be elevated, investigation and treatment should be carried out by a physician.

In addition to these definite health measures, the Committee advises Canadians to practise moderation in the use of those foods and beverages which tend to elevate blood fats, and to avoid foods which provide calories without essential vitamins and minerals. To help the public select a suitable diet, the Committee recommends some general dietary guidelines. These will be found later in this thesis.

Cardiovascular disease is one of the major causes of morbidity in the 40 to 70 year age group. Therefore, a program to delay or prevent cardiovascular disease during the productive, middle-age

period of life is important. It is also important to realize that one quarter of the people who have heart attacks die before reaching hospital, so that only prevention of atherosclerosis and its clinical complications can significantly reduce the incidence of sudden deaths from this cause. An estimate of the annual cost in 1975 in Canada of illness attributed to cardiovascular disease (includes hypertensive cardiovascular disease) is \$1.23 billion [Canadian Heart Foundation, 1975]. This includes loss of income due to morbidity and mortality.

## 2. Epidemiology

(i) International Statistics. The frequency of atherosclerotic heart disease (AHD) [AHD has the same meaning as other commonly used abbreviations; CHD (coronary heart disease) and IHD (ischaemic heart disease)] differs considerably in various countries. Table I.1 shows deaths from AHD per 100,000 males aged 35 - 64; in several countries in 1965 [WHO, 1970]; Canada ranks high, between the U.S.A. and the Netherlands. As can be seen from this table, over 41 per cent of "deaths from all causes" in Canada were due to AHD.

(ii) Canadian Statistics. At age 35 AHD begins to appear as a significant cause of death in the Canadian population. From age 40 it is the principal cause of death and in subsequent age groups there is an ever-increasing proportion of deaths attributable to AHD (Table I.2). Only the age groups 30 - 34 and higher are shown because death from AHD below the age of 30 is not significant. Table I.3 shows the number of deaths from AHD for provinces by sex.

TABLE I.1  
DEATHS FROM AHD AND "ALL CAUSES"  
IN EIGHT COUNTRIES

	DEATHS PER 100,000 MEN AGES 35 - 64 <sup>*</sup>	
	DEATHS FROM AHD	DEATHS FROM "ALL CAUSES"
GREECE	78	712
JAPAN	79	986
YUGOSLAVIA	116	950
ITALY	187	985
NETHERLANDS	243	831
CANADA	407	985
U.S.A.	461	1,266
FINLAND	534	1,432

Prepared from W.H.O. [1968]

\* Deaths per 100,000 men in 1965 from coronary heart disease and from all causes for ages 35-64, age-standardized (average of the three death rates for ages 35-44, 45-54, 55-64).

TABLE I.2

DEATHS FROM AHD IN CANADA  
BY SEX AND AGE

1976 AND 1978

		AGE (YEARS)								
		30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
1976	M	97	229	489	1135	1978	2717	3636	4299	4616
	F	14	36	88	184	369	638	1202	1955	2548
1978	M	79	224	476	996	1779	2698	3524	4344	4530
	F	13	48	96	198	384	678	1201	1816	2703

Prepared from Statistics Canada, 1976 and 1978.

TABLE I.3

DEATHS FROM IHD FOR PROVINCES  
BY SEX

1978

	CANADA	NFLD	P.E.I.	NOVA SCOTIA	NEW BRUNSWICK	QUEBEC	ONTARIO	MANITOBA	SASK.	ALTA.	B.C.
M	30,237	593	186	1,308	931	7,255	11,631	1,508	1,238	2,026	3,536
F	20,376	360	129	764	618	4,819	8,549	978	741	1,126	2,285

Morbidity, in respect to AHD, is harder to determine than mortality. Nevertheless, based on hospital data, diseases of the cardiovascular system are found to be one of the principal causes of hospitalization. AHD accounted for 7,600,000 hospital days out of a total of 38,600,000 in 1970 in acute general hospitals [Lalonde, 1975]. Hospital discharge statistics for the province of British Columbia [1978] give some idea of the morbidity, in respect to AHD, for this Province (Table I.4).

Table I.5 shows the number of days of stay associated with Ischaemic Heart Disease and related diseases [British Columbia, 1978].

The cost to the individual, the family and to the entire country can be determined fairly accurately from the following statistics. Calculations of the years of potential life lost by each cause of death in Canada for 1971, measured against a life expectancy of 70 and eliminating causes of infant mortality, are shown in Table I.6 [Lalonde, 1975].

### 3. Risk Factors

Hippocrates wrote over 2,000 years ago of the citizens of the Isle of Cos, "Those who are constitutionally very fat are more apt to die quickly than those who are thin" [1923]. Since Hippocrates noted this relationship between obesity and CHD, there has been a sizeable accumulation of epidemiologic data that has attempted to establish a relationship between certain metabolic and physical factors and the

TABLE I.4

SEPARATIONS BY PRIMARY DIAGNOSIS  
BY SEX AND AGE  
FOR ALL PERSONS HOSPITALIZED IN THE PROVINCE  
1978

CANADIAN LIST NUMBER AND DIAGNOSIS	SEX	TOTAL ADULTS AND CHILDREN*	25-44	45-59	60-74	75+
78. HYPERTENSIVE DISEASE	M	784	105	241	299	122
	F	1,023	109	284	393	230
79. ACUTE MYOCARDIAL INFARCTION	M	3,521	221	1,118	1,537	645
	F	1,511	42	260	645	563
80. OTHER ISCHEMIC HEART DISEASES	M	8,763	412	2,511	3,456	2,384
	F	5,833	110	903	2,161	2,656
ALL DIAGNOSES	M	174,802	33,661	32,715	36,632	19,738
	F	230,263	75,117	32,611	31,654	20,482

\* Neonates and age groups to 24, although not shown by groups, are, nevertheless, included in the totals.

TABLE I.5

PATIENT DAYS BY PRIMARY DIAGNOSIS  
BY SEX AND AGE  
FOR ALL PERSONS HOSPITALIZED IN THE PROVINCE  
1978

CANADIAN LIST NUMBER AND DIAGNOSIS	SEX	TOTAL ADULTS AND CHILDREN*	25-44	45-59	60-74	75+
78. HYPERTENSIVE DISEASE	M	6,869	654	1,597	2,815	1,672
	F	8,717	815	1,945	3,419	2,488
79. ACUTE MYOCARDIAL INFARCTION	M	42,886	2,566	13,117	19,349	7,854
	F	21,846	635	4,015	9,317	7,878
80. OTHER ISCHEMIC HEART DISEASES	M	82,833	2,445	17,829	30,041	32,518
	F	68,341	697	6,459	21,058	40,111
ALL DIAGNOSES	M	1,569,362	231,434	293,360	428,522	316,373
	F	1,883,808	451,939	295,519	391,268	377,761

\* Neonates and age groups to 24, although not shown by groups, are, nevertheless, included in the totals.

TABLE I.6

YEARS OF POTENTIAL LIFE LOST  
MEASURED AGAINST A LIFE EXPECTANCY OF 70

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CAUSE	TOTAL POTENTIAL YEARS OF LIFE LOST
MOTOR VEHICLE ACCIDENTS	213,000
ISCHAEMIC HEART DISEASE	193,000
ALL OTHER ACCIDENTS	179,000
RESPIRATORY DISEASES AND LUNG CANCER	140,000
SUICIDE	69,000

---

development of CHD and Myocardial Infarction (M.I.). These studies indicate that a relationship exists between the presence of diabetes, hypertension, abnormalities in lipid metabolism and cigarette smoking and the development of CHD.

In studies conducted by the Health Insurance Plan of New York City [Shapiro, et al., 1969], in which the population represented approximately 120,000 people between the ages of 25 and 64, various risk factors were observed which relate to CHD. It was observed that the incidence of acute M.I. and death within 48 hours was twice as high in the smokers as compared to the non-smoking group. This was seen in both males and females, with cigar and pipe smokers representing an intermediate rate between the cigarette smokers and non-smokers. Physical activity was also an important factor in the study, with death within 48 hours being four times as great in the physically least active group as compared to the most active group. A combination of smoking and decreased physical activity was associated with the highest incidence of death within 48 hours, with an incidence of 5.8 per 1,000 in this group as compared to 0.69 per 1,000 in the non-smoking, physically active group. They also observed that in men who had discontinued smoking, their M.I. incidence after five years was similar to that of the men who had never smoked.

The Framingham data [Kannel et al., 1967] indicates that obesity is an important factor in the development of both angina pectoris and sudden death. In relation to this, both hypertension and elevated serum cholesterol produce an increased effect on the risk

of sudden death or angina if individuals are obese. Spain et al. [1973] looked at the relationship of sudden death to smoking in females, and observed that only 28 per cent of women dying suddenly from causes other than CHD were heavy smokers, whereas in those women dying suddenly of CHD, 62 per cent were heavy smokers. The mean age at the time of death was 19 years less for those who smoked heavily than that for the non-smokers. In two comparative study periods from 1949 to 1959 and between 1967 and 1971, there was a change in the ratio of male to female sudden deaths. In the first period there was a 12 to 1 CHD sudden death ratio for males to females as compared to 4 to 1 for the period of 1967 to 1971. They attributed this change to an increase in smoking by women.

Using the standard acceptable upper ranges of risk factors of serum cholesterol, blood pressure and smoking, Epstein [1973] states that 38 per cent of Americans would be defined as having all three risk factors abnormal. These 38 per cent generate 59 per cent of all subsequent heart attacks. The risk of having an acute heart attack is nine times higher in persons having all three risk factors than those in which all of these risk factors are within the lower range of normal. Epstein suggests, "the important point to realize is that there is a risk factor level at which failure to institute preventive action might be considered more serious than the risk of taking an action for which there is yet no scientific basis in terms of direct evidence." He suggests that although there may not be scientific data to indicate that change in risk factors would be important

for an individual patient's well being, it is worthwhile with the current information to treat these risk factors by community efforts.

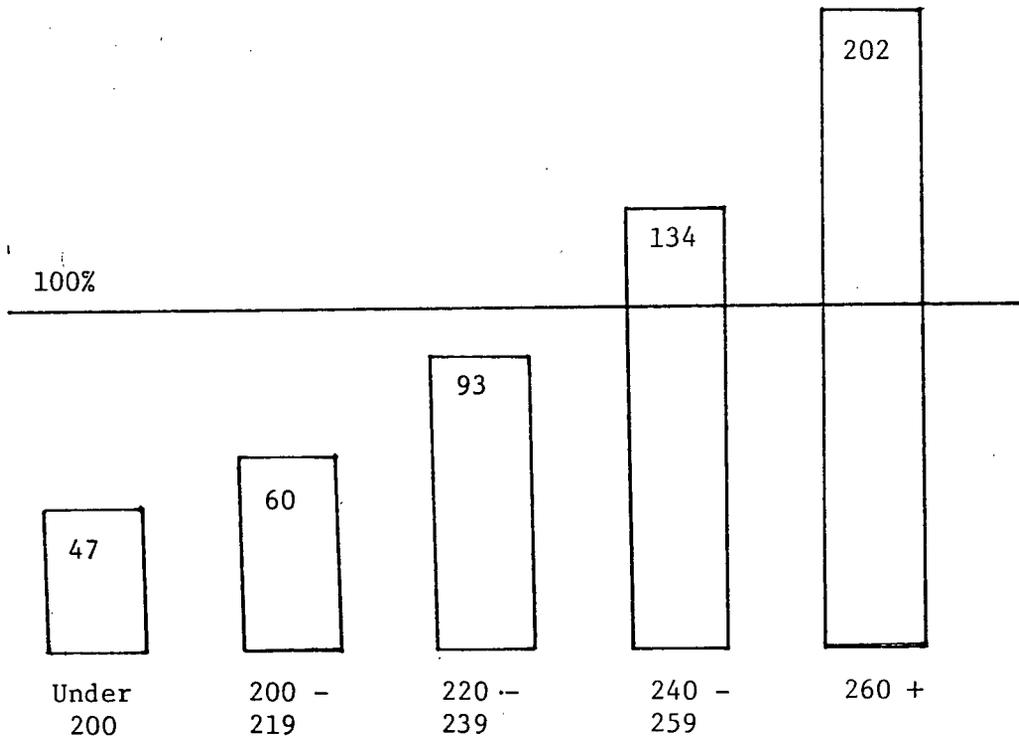
Keys [1971] states that diet unquestionably affects the concentration of lipids, especially cholesterol, in the blood serum of man. He maintains that these lipids are certainly involved in atherogenesis, although he notes that there is some argument about details and the sequence of events. However, he feels that there is general agreement on the fact that atherosclerosis is basic to coronary heart disease.

"So much attention to the effect of the diet on the cholesterol concentration in the serum is justified by the well-established fact that the incidence of Coronary Heart Disease is related to the cholesterol level. Figure I.1 summarizes data from follow-up studies on men in Framingham, Mass., in Albany, N.Y., and in Minneapolis-St. Paul, Minn. On the average, men with serum cholesterol values of 260 or more proved to be 4.3 times more susceptible to Coronary Heart Disease than men of the same age in the same community who had cholesterol values under 200."

Figure I.2 illustrates the increase in risk when more than one factor is present in the same individual.

FIGURE I.1

RELATIVE INCIDENCE RATE OF CORONARY HEART DISEASE

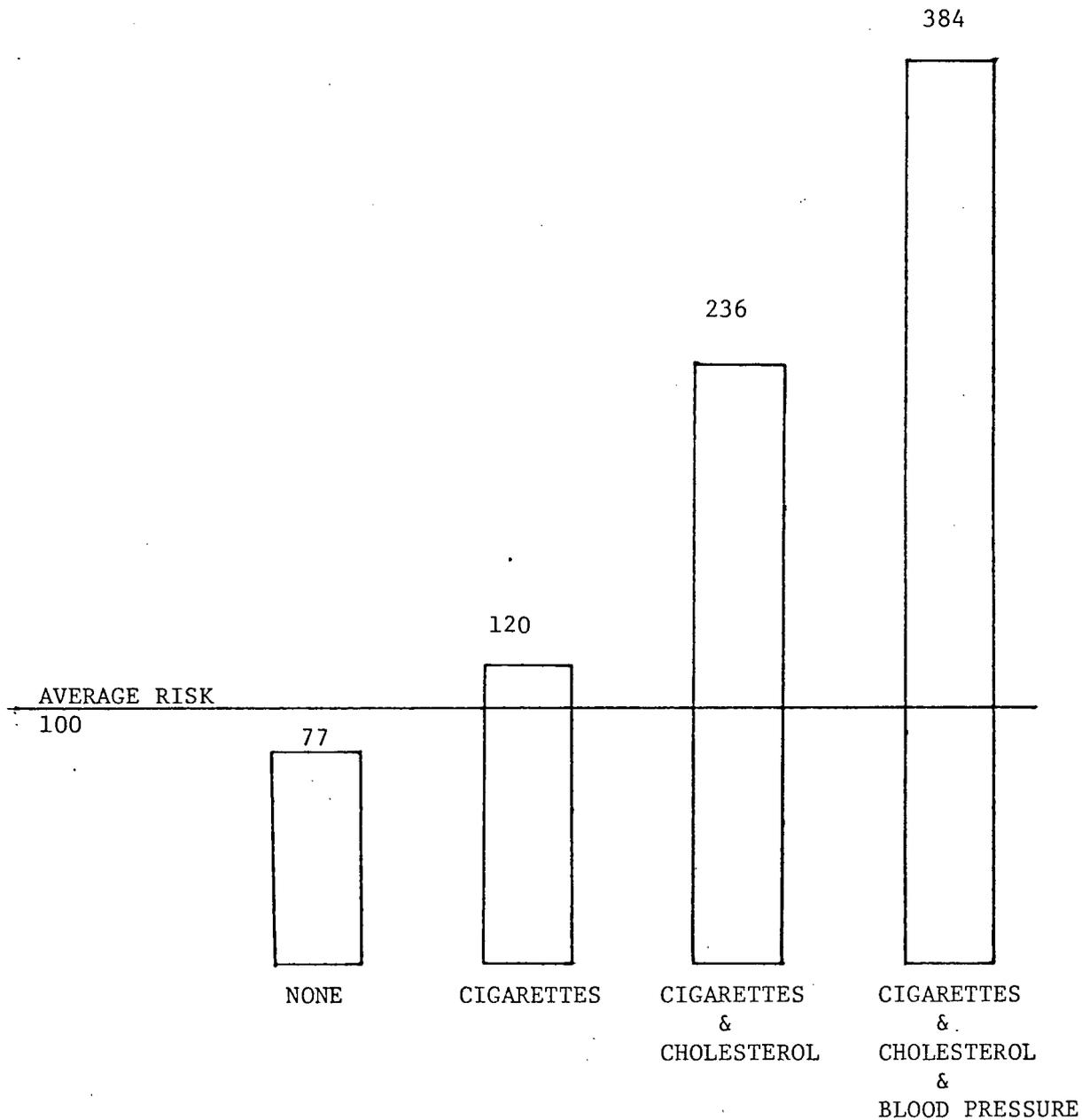


Relative incidence rate of Coronary Heart Disease among men classified according to entry level of serum cholesterol and followed thereafter for 31,197 man years during which 251 cases developed. Average of data from the Framingham Study (courtesy of Dr. T. R. Dawber), from the Albany Study (courtesy of Dr. J. T. Doyle) and from Minneapolis-St. Paul [Keys et al., 1971].

FIGURE I.2

THE INFLUENCE OF CIGARETTE SMOKING, HIGH CHOLESTEROL  
AND HIGH BLOOD PRESSURE ON THE LIKELIHOOD OF HEART ATTACK

(Adapted from Schroeder, The Sciences, September 1974)



Upon examining a group of younger coronary patients, Rosenman and Friedman [1971] became suspicious about the possible effects of socioeconomic stresses on the incidence of Coronary Heart Disease. They found that the substantial majority of these younger patients exhibited a particular personality structure and behaviour pattern which they later termed "pattern type A."

By their definition, pattern type A is characterized primarily by aggressiveness, ambition, drive, competitiveness and a profound sense of time urgency. Some or most of these traits are present in various degrees in most men, but according to Rosenman and Friedman, the man with pattern type A has them to an excessive and often inordinate degree. Although they designated the absence of the type A emotional interplay as the converse pattern type B, they felt it would be erroneous to think of this cleavage as being sharply defined. Apparently the man with pattern type A simply exhibits an excessive degree of certain specific emotional traits that may be variously present to a much lesser degree in a man with pattern type B. Thus, the authors liken the facets of type A to an elevated body temperature or blood pressure, both of which are normally present in lesser degree in all men. The results of their studies would appear to indicate that the personality and behaviour pattern of an individual are significantly and independently related to his prospective candidacy for Coronary Heart Disease.

#### 4. Pathogenesis

Coronary heart disease is a clinical disorder that results from damage to the coronary arteries, the latter being called Coronary Artery Disease or atherosclerosis [Friedberg, 1966]; a non-technical term for it is hardening of the arteries. Myocardial infarction is one of the most common forms of clinical coronary disease. The typical atherosclerotic lesions are small nodules in the wall of the blood vessels, which are visible as yellow fatty plaques. In recent years the etiologic importance of lipid infiltration in the atheromatous plaques has been strongly emphasized [Diosy, 1977].

So-called "fatty streaks" begin to appear in the intima of the aorta of man by six months of age in all populations studied [McGill, 1968; Strong and McGill, 1969]. A study of fatty streaks in human coronary arteries has shown a correlation between fatty streaks and the extent of raised lesions in young persons on the one hand, and the development of atherosclerotic heart disease in older subjects on the other [Tejada et al., 1968].

Despite the absence of clinical manifestations of coronary heart disease in children, Stamler et al. [1972] claim that the genesis of atherosclerosis lies in the childhood years. Autopsy studies of young American soldiers with traumatic war deaths have indicated that significant coronary atherosclerosis was present in 45 to 77 per cent of the cases [Glueck, 1980]. This opinion is shared by Lupien [1980] who states:

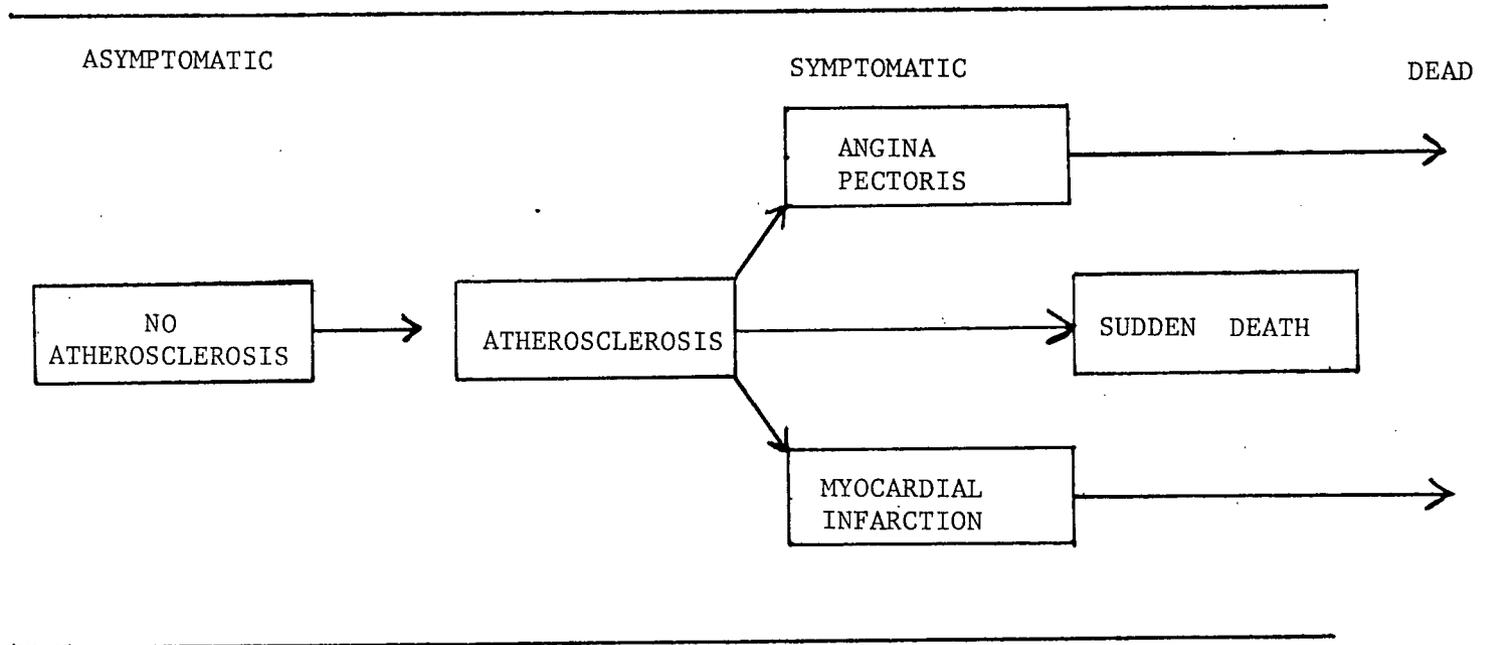
"Existing evidence indicates that atherosclerosis begins in childhood and that lesions progress through several stages before becoming clinically apparent in middle and late adult life. The atherosclerosis observed in adults cannot be dissociated from the many environmental and genetic factors which undoubtedly play a role in the development of atherosclerotic lesions at an early age."

It is recognized that hyperlipidemia is related to fat infiltration of arteries and atheroma formation. The natural consequence of atherosclerotic lesions in the coronary arteries is an impairment of blood flow, which in turn will lead to the clinical and pathological manifestations of coronary artery disease. Severe coronary atherosclerosis always leads to myocardial damage, but lesser degrees of arterial involvement may not cause a permanent damage in the heart muscle.

Coronary artery disease may remain asymptomatic for a long time and is a frequent cause of unexpected sudden death. In most cases the latent phase is followed by a symptomatic phase characterized by episodes of angina pectoris at one end of the scale and by myocardial infarction on the other. In this context, angina pectoris and myocardial infarction are the two extremes of the clinical spectrum. The natural history of coronary artery disease as outlined above is illustrated in Figure I.3. Once in the symptomatic phase, characterized either by angina or by myocardial infarction, the mortality rate remains relatively constant, approximately four per cent per year [Diosy, 1977].

FIGURE I.3

THE NATURAL HISTORY OF CORONARY ARTERY DISEASE



The chief manifestation of angina pectoris is pain in the chest. The intensity of pain can vary from mild to quite severe. It is a deep visceral sensation, dull, aching or heavy. The discomfort of angina is characteristically felt behind the breast bone. The pain may radiate widely, frequently to the left arm, shoulder or jaw. It is usually triggered by physical activity. Less frequent, but not uncommon, precipitating factors are a heavy meal, cold weather and emotions.

Typically, anginal pain persists for a short period of time, usually not more than three to five minutes. It is relieved by rest. In the diagnosis of angina pectoris the patient's description of the pain is most helpful. Physical examination is of only limited value, because abnormal physical findings in the heart are usually absent between attacks. Angina pectoris is frequently the first symptom of the presence of a marked degree of arteriosclerosis.\*

Cardiovascular disease of a degenerative kind is manifested by two principal changes that progress with age -- degeneration of the arterial walls and rising blood pressure [de Hass, 1968]. These two changes tend to occur together but need not do so. The underlying causal mechanisms may well be different in each case and so may the final lethal event. Kuller and Reisler [1971] have attempted to explain these interactions. High levels of arteriosclerosis combined with hypertension tend to produce a high incidence of both heart attacks and strokes (as in U.S. Negroes). Arteriosclerosis without hypertension tends to be associated with a high incidence of heart

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\*Arteriosclerosis is usually an early stage of atherosclerosis.

attacks and an intermediate level of strokes (as in U.S. whites). Hypertension unaccompanied by high levels of coronary arteriosclerosis tends to be associated with a high incidence of strokes but not heart attacks (as in Japan).

## B. GOVERNMENT RECOMMENDATIONS AND PROGRAMS

### 1. Lalonde Report

During the preparation of the Lalonde Report, a sort of map of the health territory, the Health Field Concept, was developed by Laframboise [1973]. It envisages that the health field can be broken up into four broad elements: Human Biology, Environment, Lifestyle and Health Care Organization.

Up to at least 1975, when the Lalonde Report was published, most of society's efforts to improve health, and the bulk of direct health expenditures, had been focused on the Health Care Organization, which consists of the quantity, quality, arrangement, nature and relationship of people and resources in the provision of health care [Lalonde, 1975]. Yet, when the present main causes of sickness and death in Canada are identified, e.g., coronary heart disease, cancer, we find that they are rooted in the other three elements of the Concept: Human Biology, Environment and Lifestyle. It is apparent, according to the Report, that vast sums are being spent treating diseases that could have been prevented in the first place. Therefore, greater attention to the first three conceptual elements is needed if disability and early death are to be reduced.

The Lifestyle category consists of the aggregation of decisions by individuals which affect their health and over which they have more or less control. Personal decisions and habits that are bad, from a health point of view, create self-imposed risks. When those risks result in illness or death, the victim's lifestyle can be said to have contributed to, or caused, his own illness or death.

The Lalonde Report goes on to point out that the Concept was designed with two aims in view: to provide a greater understanding of what contributes to sickness and death, and to facilitate the identification of courses of action that might be taken to improve health.

One of the issues arising from the use of the Health Field Concept is whether or not it is possible to divide external influences on health between the environment, about which the individual can do little, and lifestyle, in which he can make choices. Particularly cogent are arguments that personal choices are dictated by environmental factors, such as the peer-group pressures to start smoking cigarettes during the teens. Further, it is argued that some bad personal habits are so ingrained as to constitute addictions which, by definition, no longer permit a choice by a simple act of will. Smoking is one of the lifestyle problems referred to in this vein.

The Report points out that if the incidence of sickness can be reduced by prevention, then the cost of present services will go down, or at least the rate of increase will diminish. This will make money available to extend health insurance to more and more services

and to provide needed facilities, such as ambulatory care centres and extended care institutions.

In an attempt to discover those groups in the general population to which one must address one's self re modification of lifestyles, one should identify the specific population at risk. This is the population which is making the greatest adverse contribution to the average for Coronary Heart Disease, for example.

Populations at risk are obtained through an analytical process which matches up three kinds of information: causes of mortality and kinds of morbidity, underlying reasons for their occurrence, and susceptible segments of the population. For example, the process of identifying a population at risk would be as follows: mortality from coronary-artery disease, predisposing morbid condition: atherosclerosis; contributing factors: high serum lipids, hypertension and diabetes, obesity, high-fat diet, lack of exercise, stress, relative absence of estrogens, cigarette smoking; population at risk: males over 40 with foregoing conditions or habits.

It is suggested by the Report that traditional medicine will tend to concern itself with treating the mortality-morbidity end of the spectrum while the course of action suggested by the Health Field Concept would be to focus on reducing the contributing factors in the population at risk, once that population has been identified.

The identification of high-risk populations as targets for national risk-reduction programs depends on a number of factors including the gravity and incidence of various kinds of sickness and

death, the availability of practical measures, and the costs. Some high-risk populations, such as candidates for Coronary Heart Disease are readily identifiable.

In order to apply the Health Field Concept, answers to health problems will be sought in each of the four categories of Human Biology, Environment, Lifestyle and Health Care Organization. Although much has already been done, as will be seen later, some of the continuing burdens on research, are, for example:

- to determine and measure the effects of various environmental hazards to both mental and physical health;
- to identify the links between the living habits, or life-style, of individuals, and the levels of both mental and physical health;
- to undertake studies to find out how Canadians can be influenced to take more individual responsibility for the health of their minds and bodies, and for reducing the risks which they impose on themselves by neglecting important lifestyle health factors.

## 2. Operation Lifestyle

In the Health Field Concept category of Lifestyle the Department of National Health and Welfare now is active in the following areas:

Drug Abuse. The Department promotes, develops and implements measures to deal with the problems of the non-medical use of drugs including the promotion and evaluation of research and studies, the analysis and dissemination of data, the provision of analytical services and the promotion of innovative services.

Alcohol Abuse. The Department undertakes activities related to alcohol abuse. These include determining the nature, extent and implications of the problem of alcohol abuse.

Tobacco Smoking. The health hazards of cigarette smoking have been well documented and publicized through education and advertising activities. Research and control activities are also carried out.

Fitness and Recreation. The Department administered the Fitness and Amateur Sports Act and provided funds for the national Sport and Recreation Centre. Two directorates, Recreation Canada and Sport Canada, recommended grants and provided services in mass physical recreation and competitive sports respectively -- services were also provided to the National Advisory Council on Fitness and Amateur Sport.

Nutrition. The Department, through its Health Protection Branch, has recently carried out a national nutrition survey to assess the nutritional status and dietary intake of Canadians.

Reliable data were collected, identifying nutritional habits and deficiencies, their incidence and their relationship to age, sex, income and region.

Indian and Northern Health Services. The Department has undertaken some activities to encourage Indians and Northern residents to pursue lifestyles conducive to good health; health stations and centres have been engaged in teaching public health practices. Included are special programs for training native persons as health educators, for alcohol abuse and for fitness and recreation.

Personal Health. The Department has developed health standards and guides, promoted health education and provided information and consulting services in such fields of health as mental, dental, child and maternal, chronic illnesses, aging, rehabilitation and family planning.

Contagious Diseases. Of special importance has been the initiation of measures to control gonorrhoea and syphilis.

3. Participation. This is basically a publicity campaign by the Department of National Health and Welfare to make Canadians more conscious of the health hazards of overconsumption and the benefits of exercise. However, the impact of this program on actual behaviour seems to have been small.

C. TREATMENT OR PREVENTION

In a series of articles in The Financial Post, Bennett and Krasny [March 26 - May 7, 1977] point out that the cost of Canada's excellent system is proportionately higher than any other country, except for the United States and possibly Sweden and the Netherlands. In 1975, this country devoted to health care 7.2 per cent of the Gross National Product or approximately \$495 per capita.

Our extraordinary health-care system has been built over the past 15 to 20 years -- a building job that has carried a considerable price tag, reflected in the rapid and accelerating growth of health care spending. Since 1960, the total of public and private per capita expenditure has increased at an annual rate of more than 10 per cent. From a per capita base of \$100 in 1960, the annual growth was nine per cent in the 1960's, 10 per cent in the early 1970's. As far as can be determined, it approached 15 per cent in the years 1974 to 1976 inclusive, reaching approximately \$495 in 1975 and an estimated \$570 in 1976.

However, more important than the growth in per capita spending is the change expressed as a proportion of the Gross National Product. Bennett and Krasny indicate that the long-term trend was upward in the 1960's, from 5.5 per cent of GNP in 1960 to 7.3 per cent, one-third higher, in 1971. The percentage then dipped to 6.9 per cent in the next two boom years, returning to 7.2 per cent in 1975 as economic growth slowed and health care outlays continued to rise.

The decline in proportion of GNP from 1971 to 1975 suggests that Canada's health-care costs have not been "out of control". However, in 1975 and 1976, the growth of the bill at a 15 per cent rate, which translates into an increment of \$1.5 billion annually, has focused the attention of governments and the public on the cost of health care.

Is this concern with costs really justified? Given the precious nature of health, it could be argued that 7.2 per cent of the Gross National Product is small, and whatever additional proportion is spent is worthwhile, if it saves lives and results in improved health status for Canada. A Gallup poll conducted in the 1970's showed that 84 per cent of Canadians rated health care as good value for their tax dollars -- a higher score than that achieved by any other public service.

There is no doubt that many sufferers, such as those with kidney failure, have been helped by advances in sickness care, due to advances in technological medicine. But evidence is mounting that most potential gains for the overall population have now been achieved, and that further significant improvements in health lie outside the application of more of today's medical science. In common with other Western nations, Canada has been experiencing ever-diminishing health returns from the increasingly large sums that have been invested in care delivery. It is this fact that justifies policy makers' concern over the potential resources crunch.

In the three decades from 1931 to 1961, Canada increased its spending on health care by 1 3/4 percentage points of GNP and life expectancy increased by nearly eight years. In the following decade, when the proportion of GNP devoted to health care also grew by 1 3/4 points, life expectancy rose by only one year. And, while figures on nonfatal illness are difficult to come by, available data suggest that Canadians are not less sick now than they were previously.

While the causes of these diminishing health returns in Canada and other developed countries are many and complex, two stand out:

1. Nature of fatal illness has shifted. Early in the 1900's, influenza, tuberculosis, pneumonia, and intestinal diseases such as dysentery were the greatest causes of premature death. By 1940, with improvement in living conditions and advances in medical science, these diseases had lost much of their importance and by the 1960's they were largely eliminated. Canadians' life expectancy rose accordingly.

These diseases have now been replaced by degenerative illnesses, particularly heart disease and cancer, which are chronic and do not respond to the kind of medicine, for example, as treatment with penicillin, that was so successful in the first half of the Century. As a result, while resources that were invested in health care up to 1960 yielded substantial health dividends, today the further infusion of money helps treat illnesses that last for a long time and does not result in comparable gains.

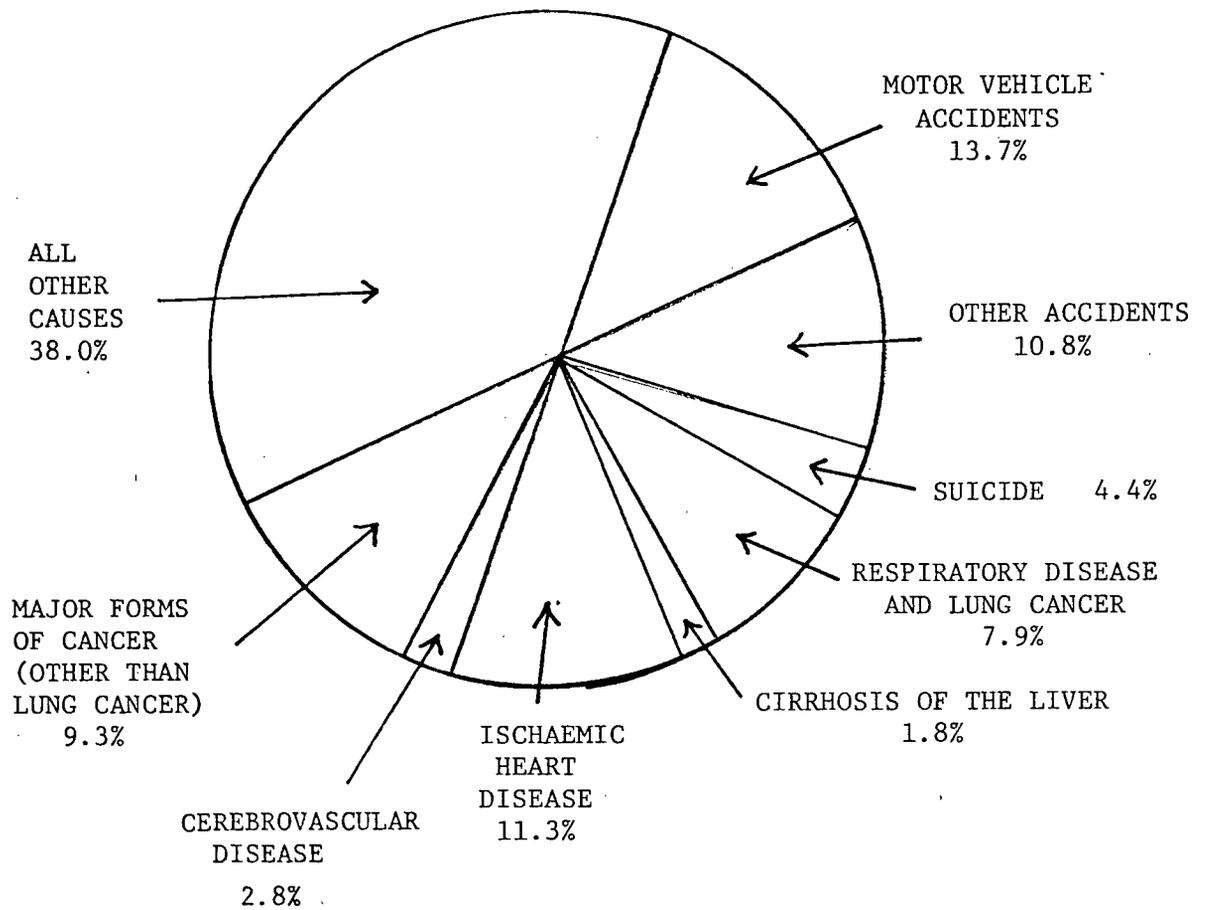
2. Major causes of death are life style related. As infectious illnesses have been conquered, accidents, heart disease, and similar life style related afflictions have taken a proportionately greater toll on Canadians' health (Figure I.4). It is estimated that smoking-induced disease alone kills 250 Canadians a day. Neither smoking-induced illness nor other life style-related maladies can be ameliorated by spending more on health care. Indeed, as Lalonde [1975] writes, "the organized health care system can do little more than serve as a catchment net for the victims."

Spending more on medical care will, therefore, not bring the life expectancy of middle-aged male Canadians to the level of their counterparts in Sweden, the leading country in most health indices. Rather, more exercise, less smoking, and a better diet will whittle down the 50 per cent greater heart disease rate of Canadian men.

Based on the current use of acute hospital facilities and on patient visits to their physician, there is a preoccupation with acute disease. Closely related to this preoccupation is the corresponding skewing of resources toward treatment of sickness and away from prevention. "Prevention" covers many actions, from promoting physical fitness, through regulation of unsafe practices, to undertaking public health measures. To be sure, the cost effectiveness of some of these, e.g., comprehensive annual physicals, is being increasingly challenged. Nevertheless, it seems fair to say that in the overall effort to improve Canadians' health, the potential impact of prevention is drastically underexploited.

FIGURE I.4

LIFESTYLE AND ENVIRONMENT ACCOUNT  
FOR TWO-THIRDS OF YEARS OF LIFE LOST BEFORE 70



Source: Health Field Indicators for Policy Planning,  
Health and Welfare Canada, 1974.

In the provinces, spending is as biased as it is at the Federal level. In Alberta, for example, more than 96 per cent of all health care spending by the province and municipalities in 1973 went on hospitals and medical care, less than four per cent on public health and preventive services. Similarly, the \$650,000 "Dialogue on Drinking" campaign undertaken in the 1970's by National Health and Welfare was fighting \$37 million spent annually on advertising by brewers and distillers in Canada.

Coronary bypass surgery was introduced in 1967 to combat coronary artery disease, the nation's Number 1 killer. In the operation, doctors graft portions of a leg vein around the clogged part of the artery, thus creating a detour or bypass for the blood. In 1978, according to an article in the Medicine section of TIME [May 28, 1979], more than 80,000 such operations were performed in the United States. The average cost: \$10,000 to \$15,000. Despite its growing use, the procedure is highly controversial. Though it relieves patients from severe pain, there is heated debate over whether it is better than less expensive and less risky medicinal treatments in prolonging life.

In a speech delivered to the National Health Forum, Chicago, Illinois [March 20, 1967] and entitled "National Health Goals and Objectives," the late J. Douglas Coleman, former head of New York's Blue Cross, observed:

"positive health is not something that one human can hand to or require of another. Positive health can be achieved only through intelligent effort on the part of each individual. Absent that effort, health professionals can only insulate the individual from the more catastrophic results of his ignorance, self-indulgence or lack of motivation."

So far, health promotion, or preventive medicine, has met with more talk than real success, largely because it has had little money in comparison with sickness treatment. Funds and administrative effort have been spread too thinly to have much impact. An effective strategy must increase the emphasis on health promotion, concentrating where it will do the most good.

#### D. RISK FACTOR REDUCTION TRIALS

Breslow [1978], writing in Preventive Medicine, maintains that there is a rapidly growing scientific and professional consensus that risk factor intervention should be intensively explored as a way of maintaining and improving health during the present era. This idea of risk factor intervention has emerged from three interrelated streams of study, and action against the cardio-vascular diseases, cancer, cirrhosis of the liver, accidents and chronic lung disease -- the major, current health problems in the industrialized nations of the world.

These three streams of interrelated studies, i.e., the identification of (a) bodily changes; (b) individual living habits as risk factors; and (c) reduction of individual risk factors and their

effects -- have led to the initiation of several studies of risk factor intervention.

1. MRFIT

Probably the best known study among American epidemiologists is the Multiple Risk Factor Intervention Trial [MRFIT]. Twenty United States centres, sponsored by the National Heart, Lung, and Blood Institute, are collaborating in a study of 12,866 men aged 35 to 57 years at high risk of CHD. These men were selected on the basis of the Framingham Risk score (serum cholesterol, diastolic B.P. and cigarette smoking) from 370,599 volunteers. The 20 centres are now conducting a randomized clinical trial involving group and individual instruction and extending over several years to determine whether a special intervention program directed simultaneously at the three risk factors will result in a reduction of incidence and mortality from CHD, cardiovascular and total mortality, and/or significant reduction of the risk factors [Journal of Chronic Diseases, 1977, DHEW Publ. No. (NIH) 77-1211, 1977].

2. Stanford Program

A field experiment in three northern California towns, known as the Stanford Heart Disease Prevention Program, focused on the same three risk factors but mainly with a campaign in the total community and with some special effort directed toward high risk individuals [Farquhar et al., 1977] and [Maccoby et al., 1977]. Baseline and subsequent annual surveys disclosed that, after two years

of a multimedia campaign in two communities and intensive instruction of a sample of high risk individuals in one of them, the risk for CHD declined 15 to 20 per cent among total participants and 30 per cent among the intensive instruction, high risk group.

### 3. North Karelia

In North Karelia, Finland, a largely rural area having a population of 180,000 with an extremely high CHD rate, a community-wide campaign has been underway since 1972 to reduce the cardiovascular disease morbidity and mortality, especially among the middle-aged male population. The campaign involves: mass public health information; training of professional personnel; organization of public health and related services; environmental changes such as encouragement of low-fat dairy products; and patient information services such as registries. It is also directed against the same three risk factors, i.e., high serum cholesterol levels, hypertension, and cigarette smoking, and promotes the early diagnosis, treatment, and rehabilitation of cardiovascular patients. After 4.5 years, findings included: decreased cigarette smoking, increased consumption of low-fat milk, increased proportion of the population under anti-hypertensive therapy, decreased blood pressure, a considerable reduction in the incidence of strokes -- from 3.6 per 1,000 males in 1972 to 1.9 in 1975, and from 2.8 to 1.8 per 1,000 females -- and a slight decline in the myocardial infarction rates [Koskela et al., 1976], [Puska, 1978] and [Puska et al., 1978].

While these three major controlled trials, MRFIT, Stanford, and North Karelia, are, or have been, underway, several other significant studies of risk factor intervention are being conducted in other population groups.

#### 4. "Know Your Body" Program

One of the most interesting is the American Health Foundation "Know Your Body" program, aimed at 10- to 15-year-old school children [Williams et al., 1977]. The program includes medical screening in school, delivery of a "Health Passport" to each participant, general health education in the classroom aimed at chronic disease prevention, and additional intervention directed at high risk groups. The presumption that risk factors for chronic disease would exist in a population of sixth to eighth grade American school children was confirmed: 1.7 per cent showed blood pressure exceeding either 140 mm. of mercury systolic or 90 mm. of mercury diastolic; 2.0 per cent scored "poor" on the modified Harvard Step Test; 8.0 per cent were current cigarette smokers; 15.6 per cent weighed 120 per cent or more of "ideal" weight; and 17.4 per cent had cholesterol levels of 180 mg. per cent or more. In all, 36 per cent of the children had at least one risk factor and seven per cent had two or more. Thus, it appears that attention to risk factors should not await adulthood, but should begin with school-age children.

E. CURRENT STATISTICAL TREND -- CHD

1. Are the Figures Real?

In their preface to the Proceedings of the Conference on the Decline in Coronary Heart Disease Mortality, Havlik and Feinleib [1979] note that although heart attacks are still the major cause of death and disability in the United States, a major decrease in Coronary Heart Disease mortality has occurred in that country during the last 15 years.

The purposes of the Conference were:

1. To consider whether the greater than 20 per cent decline in Coronary Heart Disease mortality since 1968 is real,
2. To discuss possible causes,
3. To recommend further studies to elucidate the causes.

The major conclusions reached were:

1. The decrease in Coronary Heart Disease mortality is real and not a result of artifacts or changes in death certificate coding,
2. Both primary and prevention through changes in risk factors and fundamental and clinical research leading to better medical care probably have contributed to, but do not fully explain, the decline,
3. A precise quantification of the causes requires further studies, especially those designed to document whether the frequency of non-fatal coronary events is changing.

If the total number of heart attacks is decreasing or the severity of clinical disease is lessening, this would favor risk factor reduction as being the probable cause of the decline in mortality. If the total CHD incidence is unchanged, it would support the conclusion that fundamental and clinical research leading to modern medical treatment is the probable cause of the decline in mortality.

It was emphasized that many other causes of death (except lung cancer, chronic lung disease, and suicide-homicide) are declining at almost the same rate as Coronary Heart Disease, suggesting a more general positive health force operating in the United States, such as higher income or better access to medical care.

U.S. figures on hospital discharges, with the diagnosis of Coronary Heart Disease, have not changed markedly during the period 1968 to 1977. In addition, the percentage of individuals dying in the hospital with a diagnosis of Coronary Heart Disease appears to have decreased only slightly. However, it is possible that the diagnostic categories used by the participating hospitals have changed, resulting in a distorted picture. Also admission practices have changed with more patients entering for coronary angiography and elective cardiac surgery.

One large prepaid health care plan in the United States found that the number of discharges with a diagnosis of Coronary Heart Disease has decreased each year since 1971, while the case fatality rate has not changed. In contrast, within a community with a compre-

hensive medical record system the incidence of new coronary events among those having no previous coronary disease has not changed over recent years, while the frequency of deaths among those with known coronary heart disease has decreased. Such limited and inconsistent observations cannot meaningfully be extrapolated to the United States as a whole and the question of trends in heart attack incidence remains unanswered. In addition, because of the lack of appropriate pathological and/or clinical studies, it is not known whether the frequency or severity of atherosclerotic lesions in the population has changed over time. A population decrease in the amount and severity of coronary artery narrowing would support the conclusion that a fundamental change in atherosclerotic risk factors is a likely cause for the decline in mortality.

## 2. Possible Causes for the Decline

Changes in Coronary Heart Disease care have probably had an impact on the decline, according to the Conference participants. Programs such as the NHLBI-sponsored Myocardial Infarction Research Units and Specialized Centres of Research on Ischemic Heart Disease have contributed to such changes. These programs have had an impact through support of extensive multidisciplinary, fundamental and clinical research on the diagnosis and treatment of ischemic heart disease. In 1963 the first coronary care unit was organized in the United States. Now specialized hospital care including monitoring, prevention, and treatment of cardiac arrhythmias has become the

standard form of treatment for individuals with acute myocardial infarction. The reported mortality occurring from acute coronary heart disease treated in hospitals fell from about 30 to 20 per cent; however, if a causal relationship between coronary care units and the continuing decline in coronary heart disease mortality exists, one must assume that each year more hospitals are adopting such treatment principles and therapy continues to improve. In addition, the impact will be limited by the reality that up to 70 per cent of coronary heart disease deaths occur out of the hospital.

Further, in their summary of the Conference proceedings, Havlik and Feinleib note that the contribution of improved general medical and cardiological care is difficult to ascertain. There is no doubt that there have been improvements in diagnosis and therapy, especially for patients with angina pectoris, but the specific impact of these advances on the decline in mortality cannot be estimated. The same is true of surgical care. The use of coronary by-pass surgery has increased exponentially in the United States. It is accepted that for some specific coronary artery lesions, longevity has increased; controversy exists on its effects on all lesions. However, the utilization of this surgical procedure has relatively recently been introduced, and, thus, could not account for the decline in mortality commencing in the 1960's.

Changes in risk factors for atherosclerosis provide an attractive hypothesis for explaining some of the decline; however, here, too, the data are limited. Although the percentage of smokers

and the amount of tar and nicotine in cigarettes have dropped in the United States since the release of the first Surgeon General's report in 1964, the frequency of individuals smoking two or more packs of cigarettes has not changed, according to at least one survey. In addition, women, who have enjoyed the greatest decline in mortality, have inconsistently changed their smoking habits. Consumption of cigarettes did increase during the post-World War II era, which may have affected the subsequent increase in coronary heart disease deaths.

There is substantial evidence, the Report goes on, that the awareness and effective treatment of hypertension have increased dramatically over the last few years. Improved therapy of hypertension is an appealing explanation of some of the decline in mortality since there has been a greater drop in mortality in women, especially black women. Presumably it is this group which has taken most advantage of treatment for hypertension. On the other hand, mortality from hypertensive heart disease and stroke began to decline some years before effective medical therapy for hypertension was available and during a time when coronary heart disease mortality was increasing.

There have been nutritional changes over recent years with decreases in consumption of cholesterol and saturated fats, especially in the form of less egg and butter consumption and increases in intake of polyunsaturated fats. However, overall meat consumption has increased as has total fat intake, and an increasing frequency

of obesity in certain groups suggests excess calorie consumption. The net effect on blood cholesterol levels cannot be determined accurately but it appears that there may have been an overall reduction in blood cholesterol levels of up to five per cent. This change is consistent with the overall effect of the observed dietary changes. Depending on the assumptions that are made, such a change could translate into some five per cent or greater decrease in coronary heart disease deaths in middle-aged men.

If reductions in blood pressure and reduced smoking are considered along with the cholesterol reduction in an appropriate mathematical equation, much of the decline in coronary heart disease mortality, at least in middle-aged men, could be explained, according to Havlik and Feinleib. Preliminary data from the World Health Organization and the Food and Agriculture Organization indicate that dietary and smoking changes opposite to those in the United States, i.e., increases, have been occurring in many foreign countries. The statistical relationship of these risk factor changes to coronary heart disease mortality trends shows an apparent association. Vickery [1978] is very positive about the correlation between the change in the use of certain products and the decline in death rate due to heart disease and stroke. He uses the following tables to make his point.

TABLE I.7

CHANGE (PER PERSON) IN USE OF CERTAIN PRODUCTS  
FROM 1963 to 1975

Product	Change
All tobacco products	22.4% decline
Fluid milk and cream	19.2% decline
Butter	31.9% decline
Eggs	12.6% decline
Animal Fats and Oils	56.7% decline
Vegetable Fats and Oils	44.1% increase

TABLE I.8

DECLINE IN DEATH RATE DUE TO HEART DISEASE AND STROKE  
FROM 1963 to 1975

Age	Decline %	
	Heart Disease	Stroke
35 - 44	27.2	19.1
45 - 54	27.4	31.7
55 - 64	23.5	34.1
65 - 74	25.3	33.2
75 - 84	12.8	21.9
85 +	19.3	29.4

In addition to the changes in these tables, he notes that the number of persons exercising regularly has increased dramatically.

Exercise as noted above by Vickery and, in particular, jogging, have increased in frequency in the United States, but this trend has been a recent development and has involved only certain groups. Its effect on a decline in mortality beginning in the mid-1960's must be minimal, although a greater future impact is possible.

### 3. Recommendations

Although there was general agreement among the participants at the Conference that the decline in coronary heart disease is real, the probable cause or causes could not be precisely identified. Further research is urgently needed to clarify these issues. The following recommendations were made for further relevant studies:

- (a) Change data collection systems to verify broad trends in mortality due to ischemic heart disease and to establish incidence rates by collecting data on morbidity from ischemic heart disease.
- (b) Evaluate contributions made and future opportunities for affecting morbidity and mortality by preventive and therapeutic patient management. It is apparent that preventive measures will have their major impact on the early manifestations of the disease process, and treatment on the last manifestations or complications of the disease. This evaluation is best accomplished by testing specific hypotheses, for example: do ingestion of contraceptive pills and cigarette smoking increase morbidity and mortality?; how effective are specific drugs, coronary care units and surgery?; are there differences in morbidity and mortality among socioeconomic classes?; etc.

(c) Continue to support basic research, both clinical and non-clinical, including studies of:

- (1) Lesion development;
- (2) Lesion detection;
- (3) Myocardial performance;
- (4) Clinical management;
- (5) Epidemiologically defined risk factors.

## CHAPTER II

### RISK FACTOR INTERVENTION

#### A. DIET AND GROWTH AND DEVELOPMENT

##### 1. Atherosclerosis as a "pediatric disease"

In the section on Pathogenesis found earlier in this thesis, it was noted that atherosclerosis begins early in childhood. Stamler [1972], Glueck [1980] and Lupien [1980] all cited evidence to substantiate this fact.

The concept that atherosclerosis begins in childhood and that clinical disease in the adult is its direct consequence, has led to the proposal that atherosclerosis is a "pediatric disease", and that measures to reduce the effects of known risk factors should be initiated early in life. Valuable information pertinent to assessing the potential beneficial effects of dietary modification in childhood on the subsequent development of atherosclerosis may be obtained by instituting appropriate preventive measures for those children at high risk for atherosclerotic vascular disease, such as children with primary or secondary hyperlipidemia, hypertension, or diabetes, and for the progeny of adults with hyperlipidemia, essential hypertension, diabetes or premature myocardial infarction. The results of instituting preventive measures in these groups should be assessed carefully. Such information may provide the critical evidence essential for deciding whether further alterations in national diet patterns for children are necessary or desirable [Filer, 1972].

2. Hypercholesterolemia. Preliminary data from the initial screening of the 3,000 children of ages 11 to 14 studied by Williams et al. [1977], indicate that hypercholesterolemia may be the most common risk factor for coronary heart disease identifiable among children. One-third of a sample of Wisconsin school children (age 5-14) had cholesterol levels over 200 mg.% (mean 186.5 mg.%) in a study by Golubjatnikov et al. [1972]. Kannel and Dawber [1972] recommend that all children with cholesterol levels over 160 mg.% be monitored on a periodic basis, based on the belief that U.S. cholesterol levels must be brought into the range of countries like Japan where coronary heart disease rates are low and cholesterol values do not reach 160 mg.% until middle age.

In his commentary on the cholesterol controversy Rapaport [1980] feels that if lowering of cholesterol and saturated fats in the diet is to prevent atherosclerosis, it should be initiated at a time when atherosclerosis is still in its formative stage, i.e., early in the natural history of the disease.

He finds himself in agreement with Adams [1980] who recommends a prudent diet, low in cholesterol and saturated fats, to the general population of children and adolescents. He feels that as long as the dietary recommendations are kept reasonable, reduction of cholesterol and saturated fats in the diet should not impose undue hardships on the population as a whole. The American Heart Association's current recommendation of less than 35 per cent of total calories in the diet as fat, with no more than one-third from saturated

fat and no more than 300 mg. of cholesterol per day, cannot be considered, in Rapaport's opinion, a stringent, nutritionally deficient, or unpalatable diet to thrust upon the pediatric or the adult population.

### 3. Lifestyle development

An additional argument for risk-factor modification in childhood has been that desirable patterns of lifestyle may be more readily established in childhood, and may persist throughout life. There is little data available concerning this question, and indeed, it has been suggested that the process of establishing good preventive health practices in childhood is at least as complex as the process of changing adult behaviour [Levanthal, 1973].

### 4. Diet Modification

A third reason for considering, in infancy and childhood, the effect of dietary modification on growth and development, is that modifications aimed at adults will change family eating practices, and hence those of children. In infants, there is no evidence that a modest increase in cholesterol intake and a modest increase in polyunsaturated fatty acid is detrimental. Human breast milk would seem to be the ideal food in infancy.

### 5. Weight Control

Obesity among school children in the United States is highly prevalent affecting from five to 15 per cent of children between the ages of eight to 15 years [Rogers and Reese, 1964] and [Wilmore and McNamara, 1974]. Body weight in childhood is correlated with sub-

sequent adult weight according to Heald and Hollander [1965]. It has been well established that obesity is an important risk factor associated with a reduction of lifespan, increased prevalence of diabetes mellitus, and heart disease [Kannel et al., 1967].

One of the recommendations of the Report of the Committee on Diet and Cardiovascular Disease is that excess body fat should be controlled at all ages. In children, relatively little is known about the effect of graded caloric restriction on optimal growth, and several studies have emphasized the difficulties of maintaining optimal growth and positive nitrogen balance in children during caloric restriction [Lowe, 1967]. Accordingly, general unsupervised restriction in this group may be ill-advised. Attention to the other end of the "energy equation", that is, an increase in physical activity through organized programs in schools and communities may help to reduce the incidence of childhood obesity, and subsequent adult obesity [Abraham and Nordsieck, 1960] without compromising normal growth and development.

#### 6. Physical Activity

According to the 1970 survey on National Physical Fitness (U.S.), 45 per cent of American adults do not engage in organized physical activity either individually or as part of a group. Preliminary data from the present school program in the United States indicate that 20 per cent scored fair or poor on the pulse recovery index of a modified Harvard Step Test.

7. School Assessment Weight and Diet

A 1975 national nutrition survey established that there were poor eating habits, such as breakfast skipping, late night snacking and low nutrient intakes [Nutrition Canada, 1975]. In a 1980 school assessment, above average body fat levels were reported in 83 to 93 per cent of B.C. school children [Ministry of Health, 1980]. Other nutrition related concerns include anorexia nervosa, diabetes, and hyperactivity.

School foods have come under close inspection, bringing to attention the need for improvement in safety of food handling and the nutritional quality of foods, particularly "accessory" foods available in concessions and vending machines. A recent study of accessory foods in Kelowna showed that in secondary schools, 48 per cent of available accessory foods were classified in the lowest category as to food value, i.e., foods low in iron, calcium, vitamins A, C, and D, and high in calories, sugar, fat and/or salt. Only 16 per cent of foods were in the most desirable category [School Food Survey Report, 1980].

As a result of the same survey, it was found that 27 of the schools had contracts with MacDonaldis restaurant for periodic "Big Mac Days." In some cases the schools initiated daily delivery of food to the school from MacDonaldis. This practice causes considerable concern as it also provides training in consumer choices which are not conducive to health, according to the Ministry of Health. Similar concern is raised by the sale of junk foods in concessions at sporting events, and for other fund-raising projects.

## 8. Factors Affecting Dietary Habits

Many factors affect the dietary habits of the population including social, cultural, psychological, religious and economic influences. Some examples of these are:

(a) Improved Transportation. A greater variety of foods is now available throughout the year, particularly fresh, out-of-season produce.

(b) Changes in Lifestyle. With more leisure time, and with more females employed outside the home, there is increased use of packaged convenience foods, take-out meals, meals-on-wheels, and the number of meals consumed outside the home.

(c) Urbanization has led to less self-sufficiency in family food production. Social influences create "status" or "prestige" foods [Lowenberg et al., 1968] for example, white flour and meat. Intensive advertising programs promote particular foods, some of which have little nutritional value and are in the "junk food" category.

(d) Increased immigration from many countries has introduced new foods and new cooking methods.

## 9. Recommendations

The Committee on Diet and Cardiovascular Disease [Health & Welfare Canada, 1976], after reviewing the information available on the relationship between diet and cardiovascular disease believes that there is an adequate basis for recommending changes in the Canadian diet. These are:

- (a) a reduction in fat-derived calories, to 30 to 35 per cent of total calories, mainly through a decrease in saturated fat;
- (b) a partial substitution of polyunsaturated for saturated fat;
- (c) a reduction in dietary cholesterol intake to 400 mg. daily or less;
- (d) a diet which contains less alcohol, salt and refined sugars, and more whole grain products, fruits and vegetables; and
- (e) the prevention and control of obesity through reducing excess calories and increasing physical activity. However, precautions should be taken that no deficiency of vitamins and minerals occurs when total calories are reduced.

In the Toronto Star, June 24, 1981, Michael McAteer reported that daily nutritional snacks or meals for thousands of inner-city elementary school children could be provided by October of this year, if the Toronto Board of Education plans are realized.

The meal program is one result of a four-year study of elementary education in nine inner-city schools that suggested a nutrition education program improved student attentiveness and behaviour. Thus when nutritious snacks were provided at pilot schools over a two-year period, students soon began to change eating habits, switching from junk food to nutritious food and even started influencing their families' eating habits by helping in grocery shopping and meal planning.

John Bates, the Board of Education's inner-city co-ordinator, said that he has discussed the program with several food companies and is confident that the private sector will provide the \$100,000

worth of food necessary for implementation of the program. This would only represent a portion of the estimated total cost of the program.

The proposal is to provide daily snacks for about 6,000 junior kindergarten to Grade 3 students in 40 schools, and daily meals for about 1,000 students in 12 schools. After the program's first two years, both federal and provincial ministries of health will be asked to finance the program so it can be expanded to Grade 6. The program is called SCORE -- School and Community Organizing to Revitalize Education.

## B. SMOKING

### 1. WHO Committee Recommendations

New adverse effects on health as a result of smoking were revealed at a WHO Expert Committee on Smoking Control meeting in Geneva in October 1978 [Burckhardt, 1979]. Besides confirming yet again what was already known about tobacco and heart disease, respiratory diseases, cancer of the lung and other forms of cancer, the experts brought out new evidence of the harm done by cigarettes, particularly to women and children. Women who smoke during pregnancy have lighter and therefore more fragile babies, whose very lives may be imperilled and who are most susceptible to bronchitis and pneumonia during their first two years of life.

The Committee adopted the following recommendations:

- (a) that non-smoking should be regarded as the normal social behaviour and that all action which can promote the development of this attitude be taken;
- (b) there should be a total prohibition of all forms of tobacco promotion;
- (c) promotion of the export of tobacco and tobacco products should be discouraged. Tobacco-growing and manufacturing industries should be progressively reduced in size as rapidly as possible;
- (d) governments should recognize the serious danger for smokers in certain industrial occupations, and develop special programs to eradicate smoking from these industries, utilizing legislation where necessary;
- (e) measures should be taken to establish upper limits for appropriate emission products of cigarettes; these limits should be progressively lowered as rapidly as is practicable; every tobacco packet should contain a health warning and information as to emission levels;
- (f) special educational techniques suitable to the sociocultural situation, particularly those where communication is difficult, should be developed.

## 2. Smoking Habits of Children

When the Surgeon General's 1964 Report on Smoking and Health was released, numerous individuals and organizations designed various activities to encourage people to quit smoking. As a result, attitudinal as well as behavioural change were considerably altered among adults. Yet the number of teenage smokers continued to increase [St. Pierre and Lawrence, 1975]. With 3,200 youngsters between the ages of 12 and 18 who take up smoking each day in the United States, we are witnessing presently an addition of one million new smokers each year [Albino and Davis, 1975].

Cigarette consumption among school children probably ranks second in prevalence as a risk factor for coronary heart disease as well as a for tobacco-related cancers and emphysema. Williams et al. [1977] found in their study that 10 per cent of their 11- to 14-year old students were already regular smokers. These findings are similar to national data which indicate an increase from this level to about 40 per cent by graduation from high school. They found that during the previous decade smoking among teenage girls had increased much more rapidly than for boys. While the cigarette habit does not produce a substantial threat to cardiovascular health in adolescence, nonetheless the toll is exacted later in life when continued dependence on tobacco enhances the cardiovascular system's vulnerability to atherosclerosis, ischemic heart disease, aortic aneurysm, and peripheral vascular disease.

The causes for this increase have been investigated extensively, according to a report by Heit [1979]. Educators have studied the relationship between numerous variables and adolescent smoking behaviour, yet there are no specific predeterminates which indicate a predisposition towards smoking. We do know that smoking initiation is a result of one's susceptibility to initiation within a social environment conducive to smoking [Mettlin, 1976]. Many promotional agents are suspected of promulgating adolescent cigarette smoking. Among these may be advertisements, peer group pressure, adult behaviour, smoking lounges in schools and cigarette vending machines in many public establishments.

In response to the continued rise in teenage smoking behaviour, health educators have become very concerned about the strategies and methods to be used for encouraging alteration in students' behaviour. The schools are often considered a first line of defence in promoting positive health behaviour. The teachers, as change agents can introduce various activities which can help students develop desirable health knowledge, attitudes and behaviour [Chen and Ralcip, 1975]. In this regard, numerous health professionals and health organizations support the proposition that education efforts during the elementary school years can serve as an impetus for the development of decision-making skills in relation to health attitudes and behaviour.

### 3. Public Beliefs -- CHD

Shekelle and Liu [1978] describe the results of a survey of public beliefs about causes and prevention of heart attacks. The survey was conducted from September 1976 through March 1977 in the population of persons who were 20 to 59 years of age and who were residents of Cook, Du Page, and Lake Counties, Illinois. This area includes Chicago and most of its suburbs. Random digit-dialing was used to select a random sample of households (Sudman, Applied Sampling), and Kish's method (Survey Sampling) was followed to select randomly one respondent from each household. Each respondent's answers were weighted by the number of eligible persons in that household since, with this method of sampling, the chance of selecting an individual is inversely proportional to the size of the household. The responses to various questions asked are shown in the

following tables (II.1 to II.4). Of particular interest in Table II.4 is that 30 per cent mentioned quitting smoking in answer to the question of what the respondent would recommend to someone close to them in order to help him or her prevent a heart attack.

TABLE II.1

WHAT DO YOU FEEL ARE THE MAJOR LIKELY CAUSES OF HEART ATTACKS  
IN PERSONS UNDER 60 YEARS OF AGE? \*

R E S P O N S E	E D U C A T I O N			TOTAL <sup>+</sup> %
	NOT HIGH SCHOOL GRADUATE %	HIGH SCHOOL GRADUATE %	FOUR-YEAR COLLEGE GRADUATE %	
Stress, Worry, Nervous Tension, Pressure	20	36	47	36
Overweight	27	29	34	30
Cigarette Smoking	24	28	32	28
High Blood Pressure	20	18	30	21
Not Enough Exercise	9	16	25	17
Don't Know	28	17	9	16
Cholesterol, Fat in Diet or Blood	12	12	15	13
Heredity, Family History	3	11	16	11
Not Enough Rest, Working Too Hard	10	12	8	11

\* Survey of Chicago-area adults 1976 to 1977. [Shekelle and Liu, 1978].

+ Percentages do not add up to 100% because each respondent could give several responses. Responses given by less than 10% of respondents have been omitted.

TABLE II.2

"YOU MENTIONED (REPEAT VERBATIM RESPONSES IN ORDER)  
WHICH ONE OF THESE DO YOU FEEL IS THE SINGLE MOST IMPORTANT CAUSE OF HEART ATTACKS  
IN PERSONS UNDER 60 YEARS OF AGE?"\*

R E S P O N S E	E D U C A T I O N			T O T A L %
	NOT HIGH SCHOOL GRADUATE %	HIGH SCHOOL GRADUATE %	FOUR-YEAR COLLEGE GRADUATE %	
Stress, Worry, Nervous Tension, Pressure	15	20	20	19
Overweight	17	14	14	14
High Blood Pressure	11	10	16	12
Cigarette Smoking	4	9	10	9
Not Enough Exercise	2	6	4	5
Not Enough Rest, Working Too Hard	2	5	2	4
Hereditiy, Family History	0	4	3	3
Cholesterol, Fat in Diet or Blood	5	2	3	3
Other	14	10	15	11
No Single Most Important Cause	1	1	2	2
Don't Know	1	2	2	2
No Response to Previous Question	28	17	9	16
TOTAL	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>

\* Survey of Chicago-area adults, 1976 to 1977. [Shekelle and Liu, 1978].

TABLE II.3

"FROM WHAT YOU HAVE HEARD OR READ  
CAN HEART ATTACKS IN PERSONS UNDER 60 BE PREVENTED  
OR IS THERE VERY LITTLE THAT CAN BE DONE TO PREVENT HEART ATTACKS?" \*

R E S P O N S E	E D U C A T I O N			T O T A L %
	NOT HIGH SCHOOL GRADUATE %	HIGH SCHOOL GRADUATE %	FOUR-YEAR COLLEGE GRADUATE %	
Can be Prevented	62	75	88	76
Very Little Can be Done	13	13	6	11
Unsure	25	12	6	13
TOTAL	<u>100</u>	<u>100</u>	<u>100</u>	<u>100</u>

\* Survey of Chicago-area adults, 1976 to 1977. [Shekelle and Liu, 1978].

TABLE II.4

"WHAT WOULD YOU RECOMMEND TO SOMEONE CLOSE TO YOU  
IN ORDER TO HELP HIM OR HER PREVENT A HEART ATTACK?"\*

R E S P O N S E	E D U C A T I O N			T O T A L % +
	NOT HIGH SCHOOL GRADUATE %	HIGH SCHOOL GRADUATE %	FOUR-YEAR COLLEGE GRADUATE %	
Eat Proper Diet (not otherwise specified)	21	31	34	30
Quit Smoking	33	28	35	30
Exercise	13	22	35	24
Get Medical Examination	9	20	29	20
Reduce Stress, Worry	14	16	23	17
Lose Weight	10	14	17	14
Avoid Fatty Foods	8	7	5	7
Check Blood Pressure	6	6	8	6
Get Enough Rest	6	6	5	6
Avoid Overexertion	6	6	5	6
Reduce Cholesterol Intake	4	4	8	5

\* Survey of Chicago-area Adults, 1976 to 1977. [Shekelle and Liu, 1978].

+ Percentages do not add up to 100% because each respondent could give several responses. Responses given by less than 5% of respondents have been omitted.

The authors caution that the generality of these results must be tempered by the nonresponse rate (27.6 per cent) and by the restriction to the Chicago area. However, Louis Harris and Associates obtained the following results to a question about major likely causes of "heart trouble" in a nationwide survey of adults published in 1973: 37 per cent named emotional pressure, worry, or anxiety; 33 per cent overweight; 29 per cent, smoking; 13 per cent, high blood pressure; and eight per cent, fatty foods or cholesterol. These results are similar to those obtained in the Chicago survey (Table II.1) and the similarity suggests that the Chicago findings may be broadly applicable.

A criticism sometimes leveled at public educational efforts is that while they may change knowledge, such programs do not change behaviour. This is an overly simplistic view, and the experience of the Stanford Heart Disease Prevention Program [Farquhar et al., 1977] has shown that educational programs directed at whole communities through the mass media may, in fact, be effective in reducing the prevalence of risk factors for cardiovascular disease. Large-scale, sustained programs of public education about primary prevention of coronary heart disease are clearly needed and might well lead to substantial reduction in the level of risk for atherosclerotic cardiovascular disease.

#### 4. Smoking and Risk

An article in the Toronto Star, Wednesday, June 24, 1981 stated that the risk of suffering a non-fatal re-infarction is less than half as great for people who quit cigarette smoking as it is for

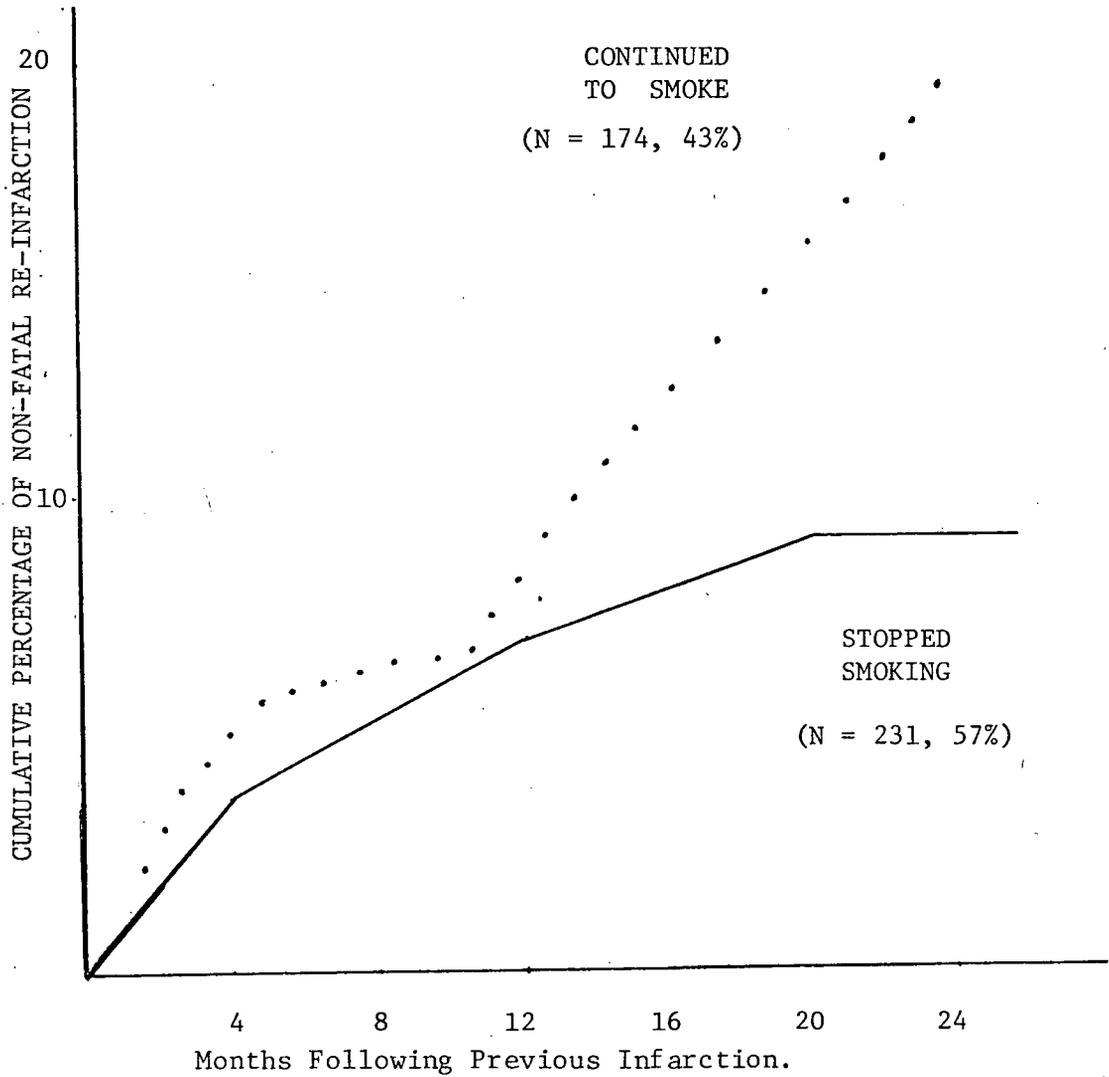
those who continue to smoke. This finding was from a survey conducted by a privately-run medical insurance organization in California and was based on records of tens of thousands of its clients. It concluded that "quitting smoking appears to result in a substantial reduction in coronary and total mortality." (Figure II.1)

The Kaiser-Permanente medical care organization said it checked the records of coronary check-ups given non-smokers, persistent smokers and those who had given up smoking, against the death records of the State of California. The survey results showed that the risk of dying from coronary heart disease was 2.22 times greater among people who persisted in smoking cigarettes than it was among those who quit. [Friedman, G.D. in Havlik & Feinleib, 109-14, 1979].

An article on the editorial page of the June 2, 1981 issue of Medical Post comments on a proposal currently before the British Agencies for Adoption and Fostering. If the proposal is passed, adoption agencies in the United Kingdom may soon automatically reject smokers as potential adopters of newborn babies. The article points out that adoption agencies do not knowingly hand over babies to parents known to drink to excess or those who live a reckless life. Yet smoking is associated with a shorter life expectancy. This may mean that parents cannot assure the same long-term care that non-smoking parents can be expected to give. Smoking fathers are known to die much younger of heart disease and cancer than non-smoking controls.

FIGURE II.1

EFFECT ON RE-INFARCTION FROM "QUITTING" SMOKING



From Wilhelmsson, C., Vedin, J.A., Elmfeldt, D., Tibblin, G., and Wilhelmsen, L., "Smoking and Myocardial Infarction," Lancet i, 415 (1975).

## 5. Passive Smoking

There is also the issue of passive smoking. Recently the Japanese found that non-smoking wives were at greater hazard from all kinds of diseases if their husbands smoked. Nothing was said about children in that study but it seems manifestly evident that if smoking affects adult women it must also affect growing children, at least as severely.

A recent bulletin from Health and Welfare Canada [1981] further discusses the health effects of second-hand smoke. Three recent studies [White and Froeb, 1980], [Hirayama, 1981] and [Trichopoulos et al., 1981] provide further evidence that exposure to second-hand smoke ("passive smoking") increases the risk of serious health effects. This new evidence complements earlier work which demonstrated increased risk of attacks of angina pectoris when susceptible persons were exposed to smoky rooms [Aronow, 1978] and impaired pulmonary function among the children of smokers [Tager et al., 1979].

Children brought up in houses which also contain smoking parents must face a higher risk of death or injury by household fires caused by accidents with cigarettes. And there is the greater risk that when the child grows he/she will smoke. Children largely emulate their parents.

## 6. Programs for Children

Finding out how to prevent children from ever starting to smoke is the object of a study being undertaken by Dr. Allen Best, Chairman of the Health Studies Department of the University of Waterloo [Homemakers', July-August 1981]. His research involves 24

schools in the Kitchener-Waterloo and Oxford County areas of Ontario.

Starting at the Grade 6 level, before most children have begun to smoke, he is attempting to provide a program that will keep them from smoking two or three years later in life when most children start to smoke. Traditional school-based programs have emphasized the long-range consequences of smoking, with fearful messages about its future effects. These, he has found, have little influence on either children or adults.

Considerations of death and dying and future ill health seem just not to be issues with kids. What influences them to start smoking is that they see their friends doing it, they see their parents doing it, and advertising creates the image that it's the smart thing to do. Their own self-esteem or lack of it, and going through a rebellious stage, may also influence them.

To counteract such strong social influences to smoke, Best is providing what he calls a "social inoculation" program similar to an inoculation program for a physical disease. The children are given a small dose of what may happen to them later on so that when they do get exposed to larger doses in the real world, they will be immune to it. They are shown, through discussion, videotapes and role playing, what situations they may encounter and how to cope with them. What is important says Best, is the fact that they recognize what is going on, and practice their reactions in advance. They also talk about the immediate effects of smoking on their heart rate, on how they

feel, and how well they do in sports. Then, in front of the class, each pupil makes a public commitment about what he or she will do about smoking. Most say that they will never smoke; a few say that they will only experiment. The process not only commits them, but starts to change the social norms in the class, observes Best, as the students realize that most of their classmates are not going to smoke.

After the initial "innoculation" in Grade 6, students are given "booster shots" in Grades 7 and 8 consisting of further discussion and role playing. No one can lie about whether they are smoking since students give saliva samples, which are tested for saliva thiocyanate, a byproduct of smoking. It works, and the fact that the kids believe in it works too.

At the end of this school year the test and control groups had completed Grade 7. At the time of this report few had experimented with smoking, which indicates short-range success. Perhaps the program will need to be continued through high school. Similar programs in the United States have reduced the students' expected smoking pattern by half.

British school children will be persuaded not to experiment with cigarettes through a novel campaign launched by the British Health Education Council built around the character of Superman (Medical Post, February 10, 1981). They will be asked to help in the fight against smoking, represented by an evil new opponent for Superman, Nick O'Teen.

The campaign with the over-all slogan of "never say yes to a cigarette" will cost \$1.25 million and is being mounted because research shows that one in three of Britain's adult smokers started before they were nine. Statistics also show that 80 per cent of children who smoke go on to be regular smokers when they grow up.

The fight between Superman and Nick O'Teen will be featured in advertisements during children's television programs, and will appear in children's comics. Children can individually receive a poster and eight-page comic by returning a special coupon, and primary-school teachers are being asked to participate in the campaign.

The campaign follows a pilot project in 1979 when children were offered a glossy poster of Superman with the message: "With my amazing X-ray vision, I can see the harm cigarettes do inside people's bodies. That's why I don't smoke." Over 70,000 requests were received for the poster. A follow-up study showed 94 per cent of children asking for the poster had kept it, and 68 per cent had displayed it on their bedroom walls.

However, the Health Education Council is aware the effect of the campaign is likely to be effaced by tobacco advertising. "The ubiquitous and attractive tobacco industry advertising around them is perpetuating the old, discredited 'glossy' smoking image. We must hope government action will continue to erode them," a spokesman said.

7. Insurance Premium Benefits for Non-Smokers

Insurance companies are now recognizing the health value of non-smoking, or of smoking cessation, and are using lower premiums as either "reward" or "incentive." For example, one large insurance company offers the following premium reductions to non-smokers, or those who have kicked the habit, on a \$100,000 level term policy:

INITIAL MONTHLY COST IN \$ -- MALE		
AGE	STANDARD RATE	NON-SMOKER
30	24.32	13.59
35	31.18	15.82
40	43.19	19.60
45	62.67	29.46
50	88.67	42.08
55	121.18	58.46
60	167.08	85.45
64	215.82	124.99

In the June 17, 1980 issue of Medical Post there appeared a report by David Beaumont that physicians in British Columbia want to reward restaurants that set aside areas for non-smoking diners. In a campaign featuring a mailing to 6,000 B.C. hotels and restaurants, the British Columbia Medical Association (B.C.M.A.) is offering qualifying restaurants a framed award from the President of the B.C.M.A. commending them for promoting a clean environment for customers.

## 8. Rights of Non-Smokers

"Inhaling second-hand smoke makes the heart beat faster, the blood pressure go up and increases the level of carbon monoxide in the blood," said B.C.M.A. past-president Mel Petreman of Nanaimo. "As doctors concerned with disease prevention as well as cure, we must take a leadership role in lowering the incidence of smoke-related emphysema, bronchitis, lung cancer and heart disease."

Increasingly, the protection of non-smokers' rights is an issue that stirs Canadians across the country [Health and Welfare Canada, 1980]. Most smokers and non-smokers, according to this article, are convinced that the latter are entitled to a smoke-free environment. When the arguments involved are considered from a rational, rather than emotional perspective, the outright legitimacy and necessity of protecting non-smokers become evident. Thus, cities such as Ottawa, Toronto, Halifax, Hamilton and others have passed non-smokers' relief by-laws.

On July 22, 1980 the Canadian Council on Smoking and Health submitted to the Minister of National Health and Welfare model legislation to protect the rights of non-smokers. Commonly known as "The Non-Smokers' Relief Act", the proposed bill would restrict smoking in public areas and buildings under federal jurisdiction.

Over the past two decades, Ministers of Health and Welfare have publicly stated that smoking was hazardous to Canadians' health, according to the bulletin, and that "tobacco smoke is the source of Canada's No. 1 preventable health hazard." Yet, to date, the only piece of legislation on smoking and health is the 1908 Tobacco Restraint Act!

The Council stressed that government intervention on this issue is not only imperative but legitimate. The Act, as submitted by the Council, cannot be seen as an infringement upon individual rights since it goes to great length to respect smokers by providing for smoking sections, while recognizing in fact that non-smoking is now the social norm.

### C. HYPERTENSION

Hypertension is a major cause of stroke, heart failure and kidney failure. It is also a "silent" health problem: many people with hypertension are unaware that they have it because they feel perfectly well. Hypertension literally means high blood pressure. It does not mean being irritable, excitable or highly tense. In all human beings, blood pressure varies from day to day and from moment to moment. It rises when we are excited, for example, and it falls when we rest or sleep. These changes are perfectly normal. However, when blood pressure rises above normal levels, and stays that way, it may cause the problems cited above or it may lead to heart attack.

In a small percentage of individuals, hypertension can be traced to a specific disease or condition. When this condition is cured, sometimes through surgery, the hypertension often disappears as well. However, the most common kind of hypertension is referred to as "essential" or "primary" hypertension, and at present its cause is unknown. This type of hypertension cannot be cured, but it can be controlled in most cases, thus reducing the risk of secondary problems, notably of heart attack.

Despite the lack of firm etiologic data on hypertension, it is clear that 20 per cent or more of American children, based on their negative lifestyle, are currently destined to become hypertensive adults with perhaps one-third undiagnosed. Preventive programs, encompassing what are known at present to be predisposing factors, as well as focusing on both detection and medical compliance, will be necessary to reduce morbidity and mortality from this disease.

According to statistics found in Health Highlights 1976-77 [DHEW 1978a], only one-fifth (21%) of the 23 million American hypertensives are taking medication on a regular basis. More than one-half (54.9%) have not been told by a physician that they have the disease, and the remainder either are not receiving proper treatment, or have stopped taking medication. Hypertension is more common among blacks than among whites. More than half of all blacks between the ages of 55 and 64 years have definite hypertension, compared with less than one-third of all whites.

Although the prevalence of hypertension increases with age, the problem is particularly serious for young black men. One in seven (13.7%) of the 25-34 age group and nearly one in three (32.0%) of those aged 35-44 years have definite hypertension. Up to age 54, hypertension is more prevalent among men than among women; at ages 55-74 it is more prevalent among women.

In a recent article on heart disease, TIME [June 1, 1981] states that one of the most important reasons for the drop in the U.S. death rate from strokes and heart attacks in the past decade may

be the aggressive campaign waged by the National Heart, Lung and Blood Institute and the American Heart Association to detect and treat hypertension. The disease can be diagnosed easily enough by taking multiple blood pressure readings. Normal is usually around 120/80 mm. of Mercury though the figure may vary widely, depending on the individual. The higher number is called systolic pressure and refers to the highest pressure reached as the blood pushes against artery walls when the heart contracts and pumps blood; the lower figure, the diastolic pressure, is the lower pressure which prevails between beats, when the heart is at rest. Persistent measurements over 140/90 mm. of Mercury are needed to establish that a person has hypertension.

In the MRFIT program mentioned earlier [1976] control of hypertension is carried out in a progressive manner. Basically, reduction of salt intake and weight loss are implemented first. If these hygienic measures alone fail to bring hypertension under control, a variety of anti-hypertensive drugs are used. Diastolic blood pressure fell in both groups -- 86.9 mm Hg (mm Hg or millimetres of mercury is the usual manner of expressing blood pressure readings) from 92.6 mm Hg in the usual-care group, compared to 82.3 mm Hg from 92.8 mm Hg in the special-intervention group of patients.

Six general recommendations for the detection, evaluation and treatment of high blood pressure in adults are given in the Report of the Joint National Committee [U.S. Dept. of HEW, 1978b].

1. Any group measuring blood pressure should have resources available for referral, confirmation, and follow-up.
2. Virtually all patients with a diastolic pressure of 105 mm Hg or greater should be treated with antihypertensive drug therapy.
3. For persons with diastolic pressures of 90-104 mm Hg, treatment should be individualized with consideration given to other risk factors.
4. The evaluation of patients with high blood pressure can be limited to a few baseline tests in most instances.
5. The stepped-care (medication) approach outlined in the report is advocated as a cost-effective method of treating most patients.
6. Treatment of patients with high blood pressure includes plans for facilitating long-term maintenance of blood pressure control.

#### D. EXERCISE

It is no secret that the general standard of physical fitness in Canada is shocking when compared to that seen in Northern European countries. There has been something of a re-awakening of interest in physical fitness, but it is mostly among young people and, if anything, is spotty, according to an editorial in Medical Post, [September 26, 1978].

Of course there are explanations. Television tends to make spectators of us all, including the young. The easy availability of the family car causes cries of pain at the prospect of a walk of even a block or two. And when school sports enter the picture they are

little more than extensions of the play-time recess. Many public schools have few facilities. Even when they do, requirements are often minimal. Ontario, for example, requires that two 30-minute periods of physical education be given a week between kindergarten and Grade 8 -- hardly a program to build sturdy bodies. After Grade 8 there is absolutely no requirement at all! Very often physical education policy is left to each school board and sometimes to the school principal.

The Canadian Medical Association and its provincial counterparts have taken it on themselves to press governments to provide more physical and health education. In Manitoba, for example, the Manitoba Medical Association (M.M.A.) is pressing for all children in that province to be provided with a daily 30-minute physical education and training period.

In an article in the Vancouver Sun (July 26, 1978), Dr. Eric Bannister, Chairman of the Department of Kinesiology at Simon Fraser University, states that corporations, business and industry must take direct responsibility for their employees' health. At the same time, federal and provincial governments must back the effort through tax write-offs for buildings and facilities provided for staff exercise programs. Bannister states, "this will cost less than the \$5.2 billion lost in 1977 through absenteeism and sick pay."

Dr. Roy Shephard of the University of Toronto has stated that moderate exercise training can set back the deterioration of physiological work capacity by almost nine years [Medical Post, March 24,

1981]. This contribution to longevity by exercise is achieved by increasing the cardiovascular reserve, decreasing hypertension, obesity, and serum lipids. Specifically, regular exercise can reduce the resting heart rate and increase the maximum oxygen capacity.

Some large corporations are already involved in the trend to industrial fitness programs. In the United States, General Motors has spent \$825 million on an employee health program, more than it spends each year to buy steel from its principal supplier. Xerox has a country fitness retreat. A few Canadian companies -- most notably Labatt's in London and James Richardson and Sons in Winnipeg -- have "whipped up" employee enthusiasm and given them a place to work it out. In Victoria, Gordie Stewart co-ordinates a program for government employees and attracts about 400 regulars. Finning Tractor's noonhour sessions attract about 50 of 350 employees who could possibly attend. B.C. Telephone has started a fitness centre at its Boundary Road headquarters, while I.C.B.C., the Royal Bank and a few other companies help pay for what it costs employees to join keep-fit classes at the YMCA.

In the United States, at least one insurance company, Occidental Life, offers substantial discounts to "serious runners." To apply, according to the advertisement, "You simply must not smoke and must have run a minimum of three times per week -- 20 minute durations -- over the last 12 months." They claim that the premium pricing recognizes "fitness age" rather than chronological age. Discounts range up to 15 per cent (or more) off all whole life insurance plans.

Exercise is one of the lifestyle factors that has become quite "popular" in the last few years. In spite of this, the controversy surrounding its benefits in decreasing the likelihood of developing CHD, still rages on. In the text by Rapaport [1980], there is a presentation by Albert Oberman, who takes the affirmative position, and one by Oglesby Paul, taking the negative. Noting good arguments by both authors, Rapaport, as editor, makes the following observations. First, he points out, there is no evidence that exercise among the general public without CHD is seriously detrimental to health. Although certain musculoskeletal problems have surfaced due to jogging programs, these have not been of life-threatening or serious consequence. Second, it is also clear that those who engage in repetitive exercise enjoy psychological benefits as well as improved physical conditioning. Thus, Rapaport maintains, it appears to be prudent advice to recommend exercise to the general public as part of a better, healthful way of life. He believes that everyone should be engaging in those kinds of exercise that each enjoys. A person should be encouraged to do the kinds of activities and sports that give him pleasure, help him relax and forget the mental stresses of daily life, and improve his physical conditioning. However, it does not seem justified, in his opinion, to coerce the public into this type of program based upon the assertion that participation in such a program will reduce the likelihood of subsequent CHD.

Other authors, however, have more definite opinions. Vickery [1978] maintains that exercise may well be the single most important thing one can do if one wants to live a long and healthy life. He says that while exercise has a wide variety of beneficial effects, the most remarkable are in the prevention of heart disease. To quote Vickery, "The message is clear: when it comes to protecting your heart, there is no substitute for exercise."

#### E. STRESS

According to Glass [1977], the interaction between psychological and physiological variables indicates that attempts by Type A individuals to master uncontrollable stressful events may be associated with coronary heart disease. Such events may include job dissatisfactions, economic frustration, and excessive work and responsibility.

It seems to be generally agreed that stress can contribute to coronary disease through the body's general reactions to aversive stimulation. Such stimulation leads to discharges in the sympathetic nervous system and to production of related hormones such as adrenalin and noradrenalin. These hormonal substances, called catecholamines, can accelerate the rate of arterial damage and induce myocardial lesions. Glass goes on to point out that these hormones can also potentiate the aggregation of blood platelets, and the release of platelet contents is considered to be an important factor in atherogenesis as well as in the genesis of thrombosis.

There is some evidence indicating that clinical and psychopharmacologic techniques may prove effective in depressing Type A behaviour. For example, Sigg [1974] suggests that the administration of psychotropic drugs of the sedative type might reduce emotional and muscular tension characteristic of Pattern A individuals. Sigg also proposes that beta-adrenergic receptor blocking agents may be useful in a program designed to alter ways in which coronary-prone persons cope with psychosocial stress. Since the catecholamines appear to figure in the Type A response to uncontrollable stressors, a specific blockade of beta receptors by propranolol-type drugs seems appropriate.

A number of non-drug methods of altering Type A have also been suggested. These include transcendental meditation, relaxation exercises, biofeedback, and behaviour modification and group therapy.

The controversy surrounding Type A behaviour as being an independent risk factor for coronary heart disease is highlighted in a recent text by Rapaport [1980]. The views of the proponent, Meyer Friedman, and the opponent, Jeremiah Stamler, are both presented in detail with a comment by the editor. Friedman admits that despite the widespread confirmation of most of the studies he conducted with Rosenman relating Type A behaviour to the prevalence and incidence of CHD, there still remain investigators who are reluctant to accept such a relationship. He quotes Klein who, in reviewing the 1974 Rosenman and Friedman book on Type A behaviour, wrote,

"When the history of the pandemic of ischemic heart disease is written. . .one fact will stand clear. The gap between medicine and psychiatry has hindered recognition and research of the behavioural and psychosomatic aspects of the disease."

He concluded that their work on Type A behaviour and its relationship to CHD will seem "like a voice crying in the wilderness."

Friedman asks if no attempt should be made to alter or modify Type A behaviour pattern until its causal role in clinical CHD is established beyond all possible criticism. Irrespective of the data accumulated in the future, it may still take a long time to convince all cardiologists of the pathogenic importance of the Type A behaviour pattern. In this connection Friedman reminds us of a comment by the distinguished physicist who once declared that new concepts rarely get accepted by rational persuasion of the opponents. He believed that sometimes one simply has to wait until the opponents die out.

Friedman, himself, has found it very difficult to alter Type A behaviour in any person who has not succumbed to the clinical onset (i.e., angina pectoris or infarction) of CHD. He believes, therefore, that behaviour modification might most profitably be confined to Type A behaviour persons who have already suffered from and survived a myocardial infarction. He claims that approximately 75 per cent of these persons are susceptible to behaviour modification.

Stamler, on the other hand, points out that although "modern stress" factors play some role in the pathogenicity of CHD along with other accepted factors, they are not "key" factors in the modern

epidemic. In his summary, Stamler [1980] makes the two following statements:

1. "The available data are sufficient to characterize Type A behaviour pattern as a possible or probable risk factor for epidemic CHD, but they are not yet sufficient to meet all the criteria necessary to designate it as a fully established major risk factor along with "rich" diet, hypercholesterolemia, hypertension, and cigarette smoking.
2. Any implication that Type A behaviour is the "key" factor in the genesis of the modern CHD epidemic is unfounded in data and fallacious in reasoning."

Rapaport, in his comments on the two presentations, agrees that cardiologists have been slow to accept Type A behaviour as a risk factor in the development of CHD. However, in defence of the cardiologist, he points out that it is hard to accept a concept that is difficult to measure quantitatively. He feels that the results of Friedman and Rosenman's efforts to modify Type A behaviour and, thus, affect CHD by risk factor intervention will be of paramount interest. He points out that the reduction of approximately 25 per cent in mortality from CHD over the past decade probably reflects improvements in the medical and surgical management of clinical CHD on the one hand, and the results of traditional risk-factor intervention on the other. However, although this intervention through public and professional education has been successful in contributing to a lowering of CHD mortality, its effect on the prevalence of CHD is, unfortunately, unknown. Rapaport feels that if the work of Friedman and

Rosenman is borne out with further study, and if behaviour can be successfully modified as well, then we can hopefully look forward to further exploitation of the inroads that have led to the recent, encouraging decline in CHD mortality. If not, Type A behaviour will be relegated to those unmodifiable categories such as age and family history.

#### F. FINDINGS AND RECOMMENDATIONS

##### 1. Improving Health -- General

The prospects for improving health through reducing risk factors have reached the point where it is possible to project a systematic approach, according to Breslow and Somers [1977] in their article on a lifetime health monitoring program. Such an approach involves selecting for each nodal period of human growth and decline -- pregnancy, infancy, childhood, adolescence, young and later adult periods -- the particular risk factors about which something can be done to improve the likelihood of present and future health. This is different from the "annual check-up" of an earlier day in that a serious effort is made to select the periods as well as the physical and counselling procedures which the evidence indicates carry the greatest potential. Similar approaches are known by a variety of terms: multiphasic health testing, health hazard appraisal, "Know Your Body" program. The common thread is recognition that prudent interpretation of available evidence creates the opportunity for a truly new thrust in preventive medicine. We need no longer rely exclusively on

immunization against certain communicable diseases but can now extend prevention to attack several forms of cardiovascular disease, cancer and other major diseases of our era. That is the significance of current prospects for improving health through reducing risk factors.

In the meantime, it is possible to assemble the present pertinent data and base immediate action on prudent interpretation of that data. With the growth of evidence about risk factors, and in the face of the tremendous premature mortality and morbidity involved, it has become a public health duty to seek systematic, rational application of available means for controlling risk factors. The fact that information is rapidly accumulating and that more is needed does not excuse us from doing what we already can do with reasonable effectiveness.

When top executives are under too much stress, it costs their companies billions of dollars a year, according to Gerald Fisher, President of the Centre for Organization Development in Rochester, New York [1978]. He cited a survey showing that heart attacks, many of them related to stress on the job, cost more than \$26 billion a year in disability payments and medical bills. Fisher also pointed out that this does not include the costs of poor decisions that might have been made before those attacks, nor the loss the company suffers when a key executive is absent.

## 2. Prevention for the Young

Preliminary data from the sample of 3,000 11- to 14-year old public school children in the study by Williams et al. [1977] indi-

cate that about 40 per cent have one or more risk factors for coronary heart disease (overweight, elevated cholesterol, current cigarette smoker, poor physical fitness, hypertension, or diabetes). Inclusion of family history as a risk factor increases this percentage. Morrison et al. [1980] consider family history to be a practical tool for identification of risk for coronary heart disease, hypertension, stroke, and diabetes. They feel that serial risk factor measurements in children from CHD-, hypertension-, stroke-, and diabetes-positive families should be useful in the early recognition and documentation of coronary heart disease factor levels which, in turn, should facilitate primary intervention designed to ameliorate or prevent the development of CHD.

It would appear that, in the view of these investigators, the roots of atherosclerosis, certain cancers, and stroke begin in childhood, and that in many cases these "roots" are related to our personal habits and style of living. Adult habits are usually much more difficult to change than the same habits in younger people, particularly those related to smoking [Botvin et al., 1980], overnutrition [Glanz, 1980], inactivity, and health maintenance in general. Preventive lifestyle patterns acquired early in childhood are the preferred alternative.

Because the family lives together, eats together, exercises together, and sometimes smokes together, primary prevention must also be family oriented. The most efficient vehicle for such a program may be the school system, since this involves almost all children,

their parents and educators, and can be geared to teach the healthy lifestyle concepts which are essential for prevention. Also it can take advantage of important peer pressure phenomena, which have been found to be effective in anti-smoking and obesity control programs based in the schools.

Elementary school children in California are the focus of a project aimed at preventing cardiovascular disease. The project, "Heartland" is, according to an article in the July 28, 1981 issue of Medical Post, a preventive health program designed to persuade youngsters to avoid the risk factors associated with cardiovascular disease -- poor nutrition, smoking, and lack of exercise.

Developed by the University of Southern California's Schools of Medicine and Education, and funded by the American Heart Association, the program is expected to help reduce cardiovascular disease rates. According to Dr. Eric Kosower, project director:

"Heartland provides students with the knowledge and decision-making skills necessary to reduce heart disease in their future. The curricula are designed not just to present facts about the importance of risk factors to heart disease, but, more importantly, to motivate students and their families to assume responsibility for their own health and well-being."

The project materials, which include filmstrips, activity sheets and cartoon-like characters, are divided into a kindergarten through third-grade program and a fourth-through-sixth grade program.

The early elementary students become comfortable with words like "capillaries" and "stethoscope", and participate in practical activities like listening to each others' heartbeat, counting pulse beats before and after exercise, and planning healthful menus.

The upper elementary program explains more complex aspects of cardiovascular health, including hypertension and blood pressure measurement, the theory behind a balanced diet, computation of ideal weight, heart structure and function, and the concept of cardio-pulmonary resuscitation. Another important part of the upper elementary program is a campaign against smoking. Students learn, for example, of the greater risk of death from heart disease that smokers carry. According to Dr. Kosower, the long-range goal of the project is to cut down on cardiovascular disease. The health professionals involved expect the Heartland project to reduce the rates.

Primary prevention of heart disease, certain cancers, and strokes has been demonstrated (KNOW YOUR BODY PROGRAM) to be an essential and readily adoptable component of a comprehensive school health program. By combining screening for disease risk factors, giving children their results in a Health Passport, and providing innovative learning activities in a health education curriculum, children can be motivated to assume responsibility for their own future health and modify their lifestyles so as to reduce risk of disease. The initial phase of a pilot program encompassing these concepts (the KNOW YOUR BODY PROGRAM) has demonstrated that this approach to primary prevention of chronic disease is welcomed enthusiastically by students, parents, and educators.

## CHAPTER III

### EDUCATIONAL PROGRAM PROPOSALS FOR THE PREVENTION OF CORONARY HEART DISEASE

"Tomorrow's solutions to cardiovascular diseases will be extensions of today's partial answers. Since many predisposing factors are known, the way is already open to prevention, particularly through early detection programmes and the wider application of health education. . . Prevention, therefore, will require an awareness of the problems, followed by a conscious choice on the part of the individual. To promote awareness, health education programmes in schools, factories, and other places of work, as well as via the mass media, will emphasize healthy nutrition and the active use of leisure time, including sport, not as an occasional means of escape but as an integral part of everyday life. The drive to reduce cigarette smoking will further help to prevent cardiovascular disease."

[Selby, 1974, p.6]

#### A. INTRODUCTION

With improvements in medical care and their wide diffusion under universal health insurance in Canada, we now have a situation where increases in medical care appear to contribute only marginally to health. There is no reason to believe that the current health problems of Canadians would be significantly alleviated by increases in the numbers of hospitals or physicians. Some provincial health reports, as well as the Lalonde Report, demonstrate growing governmental awareness of the fact that expenditures for personal health services contribute only small and decreasing marginal benefits to health.

Growing disenchantment with the escalating costs of personal health services would suggest the need for new programs of prevention, research, environmental control, health promotion, and health education. Unfortunately, the various provincial governments, as well as the Federal government, seem to be unwilling to spend more money on health. If the new programs suggested above are to be implemented, tradeoffs will probably have to be made, since new programs will inevitably require developmental and start-up funds.

Tradeoffs impose the need to deal with a number of politically charged areas. Changes, such as those suggested above, require a number of political decisions which may prove unpopular, and will probably be opposed by people in general as well as by pressure groups that may be oriented toward the present system of disease treatment. Governments find it extremely difficult to make political decisions in areas where they perceive the existence of resistance to change. However, it is possible to believe that the same forces that brought our present system of medical care into being could be channeled to bring about the necessary tradeoffs so that a comprehensive program of disease prevention could be developed. We could then move from a disease-oriented system of care to a health-oriented one. For example, instead of building new hospitals with acute beds, the same funds could be diverted into the educational system to train health educators.

Vayda [1977] feels that a growing disenchantment with the efficacy and cost of personal health services was one stimulus for

the Lalonde Report which suggests the need for new programs of prevention, research, environmental control and health promotion. If these new programs are proposed at the same time that limitations on additional expenditures are contemplated, it follows, according to Vayda, that new programs must be at the expense of old ones.

#### B. SCHOOL SYSTEMS

If our health care system is to emphasize disease prevention, a program of health education will have to be developed to educate people to be concerned about their health when they are well, and not, as is usually the case, only when they become ill. New attitudes are needed to encourage the public to participate actively in preventive programs. The task of health education is not merely to provide information but to cultivate people's sense of responsibility towards their own health and that of their community. Many people may find it difficult to change their attitudes or behaviour, and may even become confused or hostile when health education makes demands that seem incompatible with their chosen way of life. In order to resolve this conflict and get the message across, some changes are needed in the techniques and psychology of health education.

##### 1. Parental Influences

As children form an important target group for educational programs, parents should be taught to provide health education from the earliest age. Ideally, parents should enhance the opportunities for their children's health by fostering healthy personal habits.

Acquiring healthy eating and exercise habits in childhood may have lifelong benefits. An appropriate balance of food intake and physical activity promotes normal weight. Excessive intake of salt, sugar, and fats should be avoided. Parents can emphasize these points through personal example.

Preparing young children for peer group pressures with regard to smoking, alcohol use, drug use, and sexual activity can enhance their ability to deal with these pressures later. Parents are essential to the provision of comprehensive health education which can help children to acquire skills to cope with problems they will confront as teenagers.

## 2. School Influences

Compulsory and systematic programs of health education should be incorporated into school curricula, covering such topics as nutrition, smoking, dental hygiene, exercise, drugs, and sexual activities. Governments will inevitably be involved in health education, with the Ministry of Education being responsible for planning and co-ordination on a provincial, or ideally, a national level of teacher education and school programs. One of the first priorities will be to "create" health educators. The current situation seems to be a "chicken and egg" one where student teachers are not being taught health education, and at the same time, no provision is made in the schools for teaching health education. The present system splits the responsibility among several teachers, e.g., physical education, home economics, science, counsellors, school nurse, etc. However, nobody

is responsible for putting it all together into a comprehensive program.

With the emergence of health educators, programs will be developed for all levels of education, taking into account the attention span of the younger pupils as well as the level of comprehension of all students. Programs should take into account peer pressures at the different age levels, and should be tailored so that negative pressures are neutralized at least as much as possible. Every effort should be made to create interest and encourage participation in the programs. One of the more valuable ways to upgrade students' awareness and interest in positive health care is through the use of health promotion films. These films should help the student to empathize with the "characters" and situations shown in the films. The aim of this educational tool is to make the students react in a thoughtful and responsible way to the messages contained in the films.

Because there are bound to be geographic as well as financial constraints, elementary grades in larger schools, and even all grades in smaller rural schools could use teachers who have had health education training so that they would be better equipped to cover the subject.

Health education in the schools should start at the pre-school level, or kindergarten, and continue through elementary and high school. It should also be made available at the universities. The universities' Faculty of Education will have the ultimate

responsibility for training the health educators with input from the Faculties of Medicine, Dentistry, Physical Education, Nursing, Pharmacy, Home Economics, Social Work and possibly others.

### 3. Measurement and Evaluation

There is also a need to develop evaluation methods for determining the effectiveness of these programs, and to measure such variables as knowledge, attitudes, and behaviour change, in addition to determining the effect on morbidity and mortality from coronary heart disease.

According to Williams et al. [1980], evaluation of a health education program may be made on several levels. If knowledge change precedes attitude change which precedes behavioural change which, in turn, may result in clinically measurable physiologic changes, then one may evaluate educational effectiveness at all of these levels. While behaviour change may not be demonstrated within one or two years, if cognitive and attitudinal changes have occurred behavioural change may occur in the future.

In this study, the health habits survey of self-reported health behaviour, by means of a health knowledge questionnaire, initially focused only on cigarettes and alcohol. This has been expanded to include diet, exercise, stress, and family history in order to develop a more comprehensive and balanced appraisal. Preliminary validation of students' self-reported cigarette smoking behaviour by measuring plasma cotinine levels has shown a high degree (>95%) of agreement.

## C. THE MARKETPLACE

### 1. Occupational

As was indicated earlier in this thesis, some corporations have already made facilities available for those employees who desire to participate in exercise programs, in particular. However, to date, most corporate programs are not comprehensive and only offer a partial answer to those who wish to alter their lifestyles to the optimal extent. Ideally, the larger business organizations should employ a full-time health educator whose responsibilities would encompass program development as well as education.

Most corporations require employees to undergo a medical examination of some sort (usually superficial). If this is set up to uncover certain risk factors as well as to determine physical fitness, the prospective employee would at least have the knowledge necessary to make an informed decision re personal lifestyle modification. He/she could then enroll and participate in the appropriate company program.

An alternative to "in-house" programs would be the availability of similar programs in a facility such as the YMCA. As an employee benefit, the participating company would pay the annual membership fee. These programs should not only be available to top executives of the corporation, but to all employees. Participation should be voluntary, but incentives could be offered to those employees who participate on a regular basis.

Rapid advances will be seen in occupational health largely because economic considerations, such as greater efficiency and reduced costs of absenteeism, will motivate employees and governments to participate actively in preventive measures and in the improvement of working conditions. Where companies provide "in-house" facilities such as gymnasias, locker rooms, showers, etc., tax write-offs for the cost of building and maintaining these facilities should be allowed by Revenue Canada.

The work environment should make available all of those facilities necessary for the well-motivated employee to participate in positive lifestyle behaviour.

## 2. Consumer Aspects

Industry can be involved in preventive programs in other ways as well. The food processors, for example, could produce, promote and sell nutritious products as easily and as successfully as they now do with less desirable products. Reducing the salt, sugar, and/or animal fat content of many commercially available foods would certainly not render them inedible as less harmful agents could be substituted in many cases. Company-run cafeterias should offer nutritious and well-balanced meals at reasonable prices.

According to Wilbur et al. [1981], many health officials cite the use of vending machines as a contributor to food-related health problems like obesity. The authors are of the opinion that diet-related health promotion, therefore, requires greater co-operation between public health agencies and private industry. They des-

cribe a co-operative program which was undertaken by the National Heart, Lung, and Blood Institute with the National Automated Merchandisers Association. The primary objective was to investigate whether lower-calorie snacks would be attractive to customers.

The results strongly support the position that lower-calorie vending items can sell competitively with regular-calorie items. The most prominent finding is the tremendous impact of product availability. Where available, lower-calorie items assumed a large proportion of sales. This may reflect the fact that many lower-calorie items, per se, are not unappealing to most consumers. Product recognition, taste, and product satisfaction play a prominent role in guiding food selections in addition to good health considerations.

The study also showed that well-designed "point of purchase" nutrition materials will attract attention, a necessary prerequisite for any education endeavour. As nutrition education moves from the classroom into the mainstream where food decisions are made, pleasant, engaging, and upbeat materials become important vehicles for delivering nutrition information effectively.

### 3. Public Space

The Canadian Council on Smoking, Ministers of Health and Welfare, the Medical Associations, as well as numerous authors, have discussed the risks associated with cigarette smoking for the smoker. Of equal importance, according to more recent evidence, is the problem of second-hand smoke, or "passive smoking" as discussed earlier

in the thesis. Non-smokers in public places should at least have the right to be protected, by legislation if necessary, from the effects of this pollutant in view of the proven risk.

D. GOVERNMENT'S ROLE

1. As a Source of Information

"The Government's function in health education is to enable people to make sound decisions about their health, to equip them with the information and skills as well as other resources needed to translate these decisions into action, and to aid in the removal of legal, economic, physical, or other barriers that might prevent them from acting accordingly. It should be understood that as far as government actions are concerned the proposals are intended solely to provide opportunities and incentives for people to assume full responsibility for their own health."

[Cooper, 1977]

People have a right to know about the effects on their health of the kinds and amounts of food they eat, of overmedication, and the benefits of non-smoking, regular exercise, and moderation in alcohol consumption.

To fulfill these responsibilities a health education program must be comprehensive, within the limits of our knowledge of the links between behaviour and health, or disease, as the case may be. It must maintain the support of the entire population as well as the

affected groups, i.e., those "at risk", and it must ensure the active participation of the latter, at least, in program and policy design.

To be successful, health education strategies must incorporate what is now known about the "risk factor" determinants of coronary heart disease. They should also attempt to neutralize social and economic influences on people's lives which discourage healthful change.

Health education programs should be designed to encourage specific changes in health behaviour and to provide the individual with the opportunity to acquire the techniques or skills needed to bring about and maintain that change.

The task is to make it easier for people to follow healthful practices and less desirable to choose unhealthful behaviour. Even the most effective diet education message is blunted for the child growing up where junk foods are easily obtained, and where, in some cases, they are used as treats or rewards. Similarly, where smoking is made to appear culturally acceptable, either socially or by the media, the task of health education may be overwhelming unless the program design includes steps to counter these influences.

Since most unhealthful practices are not disease-specific, preventive education programs should concentrate on modifying those practices, such as smoking, overeating or excessive alcohol consumption, which lead to disease, rather than on any specific disease itself.

2. In Decision Making and Legislation

(a) Public Education. Each level of Government, not only constitutionally, but morally as well, has a responsibility to provide the means for the public to attain a "healthy state," rather than simply being relieved of symptoms of illness. Generally speaking, one could safely assume that most people have a desire to be physically and mentally healthy. However, in recent years, so many responsibilities for our welfare have been literally handed over to one level of government or another, that we have come to rely more and more on this source for guidance and provision.

Given these facts, a well-designed campaign to convince the decision-makers in Ottawa, as well as in our provincial and municipal governments, that they should support and promote programs in preventive medicine as well as research in this area, should meet with success. One of the stumbling blocks, as I see it, is the fact that results from programs designed to prevent coronary heart disease do not come rapidly. Perhaps it will take at least a generation to prove that a given program is effective. However, in view of the tremendous costs of the disease insofar as hospitalization and treatment are concerned, as well as costs in the form of absenteeism, loss of income to the patient and his family, and loss of potential years of life, it would certainly seem more profitable (or at least less costly) for the public, through the various levels of government, to support preventive approaches.

The governments, through their Ministries of Education, as well as local Boards of Education, should be actively involved in helping to design and implement health education programs in schools at all grade levels. Money should be made available to the Faculties of Education at the various universities to train special health educators, and school districts should have money available to hire these specialists.

(b) Use of the Media. Government should be the spark that fuels public education programs on television, on radio, in the press, and through other public vehicles for the dissemination of this type of program, e.g., pamphlets for physicians' offices and public health units. All such "advertising" should be part of a larger community program and not just used in isolation.

(c) In the Marketplace. Although the revenue from cigarette and alcohol sales represents a considerable portion of the government's budget, on the income side, this should not be permitted to create a conflict of interest situation when considering support of positive lifestyle programs by the health and education ministries. There should at least be positive direction and support from government for regulations governing non-smoking in public places as well as in public means of transportation. Although there are presently some government programs that caution the public on the overuse or abuse of alcohol, these are probably not used as continuously or frequently as they should be for maximum impact and do not seem to be linked to other community programs to form a "total package."

There should be some disincentive associated with the use of certain "junk" foods that have high sugar, salt, and/or animal fat content. For example, a special tax, such as the tax on cigarettes and alcohol, should be imposed on so-called non-nutritional foods. On the other hand, foods that are as readily available and meet the criteria of Nutrition Canada, should be sold without this special tax.

(d) Community Resources and Industry. There are many health-directed resources in our community that could benefit greatly from government support, and, given this support, that could provide even more positive lifestyle services than they now do. The cost to the individual of participating in a disease prevention program should be tax deductible. In addition, the cost of building and maintaining facilities for employees so that they can continue this participation in the work milieu, should also be tax deductible for the providers of the facilities.

It seems trite to even mention the governments' role in all areas related to disease and health, yet it is important to at least mention briefly some of the areas where government support is either essential or very helpful. There are, no doubt, many areas which have not been covered in this section of the thesis, such as the subsidies from government to tobacco growers. But if we could obtain a positive response in at least those areas already covered, this would be a huge step forward in the fight to prevent or significantly reduce both mortality and morbidity from coronary heart disease.

#### E. HEALTH PROFESSIONS

Our health care system at present is disease-oriented. If people are ill, physicians look after them and get paid. However, if they prevent illness, and thus save the government a great deal of money, they do not get paid. Although many physicians do counselling and are paid for it, the fee is relatively small.

Physicians are usually inadequately trained to cope with the new role of positive lifestyle counsellor. They are more comfortable dealing with illness because that is what medical schools and hospitals train them to do. Thus their education will have to change before a significant number of physicians will become involved in preventive health care services. Physicians, themselves, must be prepared to change from being the "providers of care" to becoming the "preventors of illness." Training should equip the physician to coordinate health care programs within the community, and to become the overseers of health care and education. [Bethesda Conference Report, 1981].

The public must be involved in convincing governments that preventive medicine, in the long run, can reduce the overall costs of health care. The various health ministers must realize that higher fees for preventive services will have to be paid in order to obtain these services from properly trained physicians. The preventive medicine clinics and private practices that currently exist, seem to draw mainly from those individuals who are well-motivated with respect to lifestyle modification, and who are prepared to pay for this

service. The number of these individuals would certainly increase if the educational program mentioned earlier was in effect and continuity was established with community and employer health programs.

Physicians and health agencies must mount a sustained effort to promote preventive measures against such "killers" as coronary heart disease. This transformation of medical care priorities will require a commitment from government, health agencies, medical schools, hospitals and physicians. This is not an easy task and will require mobilization of scientific, medical and public opinion.

In order to reduce health care costs, patients should be willing to accept certain levels of care from other health care personnel, e.g., nurse practitioners. These "physician extenders" could check blood pressure, perform screening for lipid abnormalities, particularly in high-risk patients, counsel these patients re diet as well as other preventive programs. For this type of practice to become a reality, acceptance by physicians and government, in addition to acceptance by patients, is essential.

It is important for all health professionals to set a good example for their patients. For example, few patients would accept as serious the advice of a physician re cessation of smoking if that advice were given while the physician himself/herself were smoking.

Neidhardt [1980] maintains that as a role model the medical profession has done a good job over the past 20 years. He claims that the percentage of smokers among physicians has dropped substantially to near 20 per cent. Physicians have co-operated to share

on-call services, thus providing time off as a way of decreasing their stress. He concludes that when the physician acts as a role model, both physician and patient enjoy the benefits.

Several years ago, the dental profession embarked on a program of preventive dentistry, and today well-developed education programs exist in most dental practices. The concern expressed by physicians that the size of their practice would be reduced if they prevented illness [Jenkins, 1978] does not seem to have affected dentists in the same way. By the same token, dentists are trained to counsel patients on preventive measures and they employ dental hygienists, the dental equivalent of the nurse practitioner, to perform certain procedures which do not require the high-priced time and skill of the dentist. Their fee structure also provides suitable remuneration for preventive dentistry.

As they now do in maternity and pediatric clinics, public health units should make available positive lifestyle education clinics. These should be available to those individuals who wish to participate because they are so motivated, as well as to those who are referred by their physicians because they are "at risk." In addition to having suitably-trained counsellors or health educators, these public health units should make available well-designed and well-written pamphlets, as well as interesting and motivating audiovisual material.

#### F. MEDIA

In order to achieve the widespread changes in lifestyle that are necessary for an effective public health attack on coronary heart disease, it will be necessary to direct programs at large groups of individuals. If such programs are directed at whole communities rather than at small groups or individuals, the cost of the programs will be reduced.

The programs and instructional methods to be used should be developed through the co-operation of various levels of government, who will provide most of the funds, physicians, health educators, dentists, media professionals, and other experts whose input could be expected to enhance these programs. All material should be pre-tested. It should be appropriate for all media channels, i.e., for newspapers, radio, television, and even popular periodicals. There should be some attempt to provide continuity with school, community and corporate health programs. The sources of the material used should be credible. Some method of measuring impact of the programs needs to be developed. For optimal effectiveness, the programs should be designed for prolonged exposure, since "one-shot" efforts are likely to be a waste of effort and money. Since education in a democratic society is based on persuasion rather than coercion, results will likely be produced slowly.

#### G. INSURANCE COMPANIES

As mentioned earlier, many insurance companies are now providing incentives, in the form of lower premiums, to policy holders who are non-smokers. These premiums, which are considerably lower than those for smokers, should provide the impetus, for young people in particular, to quit smoking. There is at least one insurance company in the United States that provides similar incentives for policy holders, or prospective policy holders, who are regular joggers.

It is gratifying for me to see profit-oriented organizations take the initiative in providing incentives to clients, or prospective clients, who are willing to demonstrate responsibility for their own health, by doing some of those things generally considered important in the prevention of chronic diseases such as coronary heart disease and certain respiratory diseases and cancers. It would seem logical that if insurance companies, with their actuarial tables, are willing to take a chance on those policyholders who develop or practice positive lifestyles, so should our various levels of government. Surely, the private sector is not recklessly throwing away potential profits.

#### H. AVAILABILITY OF COMMUNITY RESOURCES

##### 1. Health Promotion Service

The Health Promotion Service (HPS), another American Health

Foundation risk factor project, focuses on reducing morbidity and mortality from CHD, cancers and stroke, as well as absenteeism, hospitalization, and medical care costs among employee groups. The program consists of three phases -- pre-screen education, mini-examination, and follow-up -- and when applied in several companies has attracted about half of their employees. Forty per cent of the participants were found to have a single risk factor and 20 per cent multiple risk factors. At least moderate short-term success is being achieved in respect to intervention regarding cigarette smoking and cholesterol levels.

United States companies increasingly provide health education and screening examination programs as a means of disease prevention and health promotion. For example, the New York Telephone Company has offered its employees such a service for many years. The Ford Motor Company provides a cardiovascular risk intervention program for its corporate executives in Dearborn, Michigan. New York State makes available to its largely sedentary public employees a program of heart disease intervention, directed largely to physical fitness [Bjurstom and Alexiou, 1978]. Commissioned by Mount Sinai Hospital, a Louis Harris survey of a representative sample of the 92 companies headquartered in Chicago and Cook County which are listed in the Fortune Double 500 disclosed that 40 per cent of them provided some kind of health education or preventive health program for their employees. Among these, almost all included physical screening and alcohol abuse prevention or treatment; and about 50 per cent included smoking

cessation clinics, weight reduction classes, opportunities for physical exercise at work, and/or nutrition classes.

## 2. Health Hazard Appraisal

Another approach to control of disease precursors has been called Health Hazard Appraisal (HHA) or the Practice of Prospective Medicine by its advocates [Hall & Zwemer, 1979] and [Robbins and Hall, 1970]. The scheme essentially is to assist physicians in establishing risk profiles or appraisals for their patients using a manual for determination of 49 precursors, of which 16 lead to most of the preventable deaths in the community. Hsu and Milsum [1978] describe the HHA program at the University of British Columbia as follows:

"Health Hazard Appraisal (HHA) helps individuals to place their health status in broad perspective. The individual's risks associated with many common lifestyle factors are assessed and some significant ways of reducing these risks are offered in a comprehensive computer print-out. . .the objective of HHA is to improve the quality, and to avoid the foreshortening of individual lives through its stimulation of behavioural change. . ."

While these many pilot projects and a few controlled trials of multiple risk factor intervention are underway, evidence continues to accumulate concerning the association of particular risk factors with disease and mortality. For example, data from several studies [Morris et al., 1973] and [Paffenbarger and Hale, 1975] appear to be

steadily buttressing the idea that too little physical activity is a significant factor in cardiovascular disease.

#### I. RECOMMENDATIONS

Suggestions have been made in the preceding sections of this chapter with respect to various programs that could be developed to provide continuous education toward positive lifestyles. Some of these programs already exist, to a certain extent, in one or more of the areas suggested, but there seems to be no conscious "link" between these programs and what I feel is the most important one, namely, the school program.

It would be presumptuous of me to imply that this thesis contains all of the data required to reduce or abolish coronary heart disease. I have attempted to link some of the literature which discusses the recognized and accepted (not necessarily universally) "main" causes of CHD with that literature which discusses trials where some of these causes, or risk factors, have been modified in a positive manner. The positive results, in the form of reduced mortality from CHD, achieved in these trials, suggest that further intervention through education from childhood, availability of positive lifestyle programs to the entire community, government support for preventive education and programs, media and industry involvement, as well as a public that accepts responsibility for staying well rather than worrying about health when it is no longer present,

will go a long way toward affecting not only mortality from CHD but morbidity as well.

## CHAPTER IV

### C O N C L U S I O N S

1. Coronary Heart Disease continues to be one of the major causes of death in Canada in spite of a decline in mortality commencing in the 1960's.

2. The literature which has appeared in the last 20 years recognizes certain risk factors which are at least partially responsible for the development of Coronary Heart Disease.

3. Studies in various countries have demonstrated that the risk factors can be altered favorably by well-designed intervention programs.

4. Numerous authors now agree that Coronary Heart Disease is a "pediatric disease," i.e., atherosclerosis is found to begin early in childhood.

5. The data seem to indicate that a well-designed, comprehensive, lifetime program of health education would offer greater hope of reducing both the mortality and the morbidity from Coronary Heart Disease.

6. Health education should commence at least at the kindergarten level, and should be developed so that it aims at all ages and sectors of society simultaneously.

7. Various levels of government should be supportive, financially as well as verbally, of health education programs. Most people have a desire to remain healthy and have a right to expect government support in order to help them do so.

8. The cost of private excess is now a national responsibility in terms of taxes and insurance premiums. The individual, therefore, has at least a moral obligation to preserve his/her own health, and at the same time has a right to expect factual information on disease prevention and the availability of proper facilities to assist him/ her to make the transition to positive lifestyle behaviour. The individual can either remain the problem or become the solution to it.

#### RECOMMENDATIONS FOR FUTURE STUDY

Since the idea of health education from infancy and throughout life is a relatively new approach to the prevention of coronary heart disease, it would seem appropriate to investigate the long-term effects of such education programs at various levels of society. For

example, the effects of health education as they relate to non-smoking, exercise and proper diet in school children at all grade levels could be studied using "treatment" groups and control groups. These studies should continue for several years so that the study groups could be followed in an attempt to relate the development of certain lifestyles with "treatment" or with control.

Because I am of the opinion that proper health education holds the key to the prevention of Coronary Heart Disease, I would also recommend that a study or studies be conducted to determine the desirability and/or feasibility of "developing" a group of specialist health educators who would, in association with other teacher specialists, develop health education programs for schools at all grade levels. Some of these health educators could also be involved in developing programs for industry. It would be interesting, and probably valuable, to compare the results that these health educators would achieve with their programs in terms of the development of positive lifestyles in school children, with the results achieved using our current health education programs.

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GLOSSARY OF TERMS

AHD -- Arteriosclerotic Heart Disease (also referred to as IHD - ischemic heart disease, and CHD - coronary heart disease). Arteriosclerosis of the coronary arteries leading to a decrease in oxygen supply to the heart muscle.

ANGINA PECTORIS -- A disease marked by paroxysmal thoracic pain, with a feeling of suffocation and impending death, due, most often, to anoxia of the myocardium and precipitated by effort or excitement. "Pain in the chest."

ANOXIA -- Oxygen deficiency; a condition in which the cells of the body/organ do not have or cannot utilize sufficient oxygen to perform normal function.

AORTA -- Main artery leading from the heart and branching out to all parts of the body.

ARRHYTHMIA -- Any variation from the normal rhythm of the heart beat; absence of rhythm; irregularity.

ARTERIOSCLEROSIS -- A condition marked by loss of elasticity, thickening and hardening of the arteries. This usually leads to atherosclerosis.

ATHEROMA -- fatty degeneration or thickening of the wall of the larger arteries.

ATHEROSCLEROSIS -- A form of arteriosclerosis in which the lining of the blood vessel is chiefly involved, producing, in the lumen of the vessels, atheromatous masses which contain small drops of fat (lipids).

CHD -- Coronary Heart Disease; myocardial damage due to insufficient blood supply. (See AHD).

CHOLESTEROL -- A fatlike, pearly substance found in the blood as well as other tissues of the body. It occurs in atheroma of the arteries.

CORONARY -- Encircling, as the blood vessels that supply blood directly to the heart muscle.

- EMIA -- With reference to the blood, e.g., anemia.

HYPER -- Above normal; an excess of.

HYPERLIPEMIA -- Also referred to as hyperlipidemia. An excess of lipids in the blood.

HYPERTENSION -- Elevated blood pressure.

IHD -- Ischemic heart disease. (See AHD).

INFARCT -- An area of coagulation necrosis in a tissue due to local anemia resulting from obstruction of circulation to the area.

ISCHEMIA -- local and temporary anemia due to obstruction of the circulation to a part.

LESION -- A circumscribed area of pathologically altered tissue; an injury or wound.

MORBIDITY -- The condition of being diseased; the sick rate; the ratio of sick to well persons in a community.

MORTALITY -- The death rate; the ratio of total number of deaths to the total population.

MYOCARDIAL INFARCTION -- Death of heart muscle due to reduction or complete absence of oxygen supply to that area of muscle.

MYOCARDIUM -- The muscle substance of the heart; the middle layer of the walls of the heart, composed of cardiac muscle.

OBESITY -- Abnormal amount of fat on the body. The term is usually not employed unless the individual is from 20 to 30 per cent over average weight for his/her age, sex, and height.