

## ABSTRACT

STEVENS, Millicent. The relationship of a family history of heart disease to awareness of risk factors among high school students. M.S. in Adult Fitness/Cardiac Rehabilitation, 1986. 68 pp. (P. J. Buckenmeyer)

This study examined knowledge of heart disease, risk factors, and behaviors and physical conditions impacting on heart disease among four high school students with a family history of heart disease compared with four high school students serving as controls drawn from a sample size of 156 high school students. The students were compared on their Health Assessment Questionnaire (HAQ) scores, systolic blood pressures, diastolic blood pressures, dietary cholesterol intake, height/weight, cigarette smoking, sports participation, and exercise in their leisure time. The point-biserial and phi correlation coefficients were used to assess the relationships among the case and control groups on the variables measured. It was concluded that there were no significant relationships measured when comparing the two groups on their knowledge of heart disease, risk factors, and behaviors and physical conditions impacting on heart disease. Further, risk factors known to increase the chance of heart disease were present among the case and control high school students. Finally, the case students' HAQ scores indicated a need for more practical application of their knowledge to possibly decrease their risk of heart disease.

THE RELATIONSHIP OF A FAMILY HISTORY OF HEART DISEASE  
TO AWARENESS OF RISK FACTORS AMONG  
HIGH SCHOOL STUDENTS

---

A thesis Presented  
to  
The Graduate Faculty  
University of Wisconsin-La Crosse

---

In Partial Fulfillment  
of the Requirements for the  
Master of Science Degree

---

by  
Millicent Stevens  
December, 1986

UNIVERSITY OF WISCONSIN - LA CROSSE  
College of Health, Physical Education and Recreation  
La Crosse, Wisconsin 54601

Candidate: Millicent A. Stevens

We recommend acceptance of this thesis in partial fulfillment  
of this candidate's requirements for the degree:

Master of Science in Adult Fitness/Cardiac Rehabilitation

The candidate has completed her oral report.

Philip J. Buckenmeyer 5/20/86  
Thesis Committee Chairperson Date

Mark Kowalski 5/20/86  
Thesis Committee Member Date

[Signature] 5/20/86  
Thesis Committee Member Date

This thesis is approved for the College of Health, Physical Education  
and Recreation.

John C. Mitchem Sept. 12, 1986  
Dean, College of Health, Physical Education and Recreation Date

Jay C. [Signature] Sept. 15, 1986  
Dean of Graduate Studies Date

### Acknowledgements

A special thanks to my committee members, Phil Buckenmeyer, Mark Rowinski, and Gary Gilmore, for their help throughout this project; to Roger Puza for his willingness and enthusiasm to involve his students in this study; to my classmates who made this year in La Crosse special; and to my family who stood by me throughout it all.

## TABLE OF CONTENTS

LIST OF TABLES . . . . .	vi
CHAPTER	
I. INTRODUCTION . . . . .	1
Statement of the Problem . . . . .	2
Need for the Study . . . . .	2
Null-Hypotheses . . . . .	3
Assumptions . . . . .	3
Delimitations . . . . .	3
Definition of Terms . . . . .	4
II. REVIEW OF RELATED LITERATURE . . . . .	7
Risk Factors and Heart Disease . . . . .	7
Cigarette Smoking . . . . .	8
Hypertension . . . . .	9
Cholesterol . . . . .	9
Diabetes . . . . .	11
Obesity . . . . .	11
Lack of Exercise . . . . .	12
Stress . . . . .	13
Family History of Heart Disease . . . . .	14
The Need for Risk Factor Education . . . . .	18
Summary . . . . .	22
III. METHODOLOGY . . . . .	23
Subject Selection . . . . .	23
Initial Procedures . . . . .	23
Development of the Health Assessment	
Questionnaire . . . . .	24
HAQ Administration . . . . .	25
Statistical Analysis of the Data . . . . .	26
IV. ANALYSIS OF DATA . . . . .	29
Subject Characteristics . . . . .	29
Knowledge of Heart Disease and Risk Factors . . . . .	30
Health Habits Impacting on Heart Disease . . . . .	31
Discussion . . . . .	38

CHAPTER	PAGE
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS . . . . .	41
Summary . . . . .	41
Conclusions . . . . .	42
Recommendations . . . . .	43
REFERENCES . . . . .	44
APPENDICES	
A. Health Assessment Questionnaire . . . . .	48
B. Three-Day Food Record . . . . .	56
C. Parents' Letter Verifying Heart Disease . . . . .	60
D. Summary Letter to Students and Parents . . . . .	62
E. Summary Letter to the Research and Development Committee . . . . .	64
F. Students' Responses to Questions 1-38 of the HAQ . . . . .	66

LIST OF TABLES

TABLE	PAGE
1. HAQ Scores, Items 1-38 . . . . .	31
2. Systolic Blood Pressure Measurements . . . . .	32
3. Diastolic Blood Pressure Measurements . . . . .	33
4. Dietary Cholesterol Intake . . . . .	34
5. Height/Weight . . . . .	35
6. Incidence of Cigarette Smoking . . . . .	36
7. Participation in Sports . . . . .	37
8. Exercise in Leisure Time . . . . .	38

## CHAPTER I

### INTRODUCTION

The future incidence of cardiovascular disease lies with its prevention. Today, the rate of cardiovascular mortalities is declining, but heart attack still remains the leading cause of death in the United States (American Heart Association, 1985). As Brook (1981) stated:

If today's children follow their parents, 20-30% of them have hypertension as adults, 90% will develop significant atherosclerotic lesions, and more than 50% will die from the cardiovascular complications (p. 414).

Heart disease is known to be precipitated by a number of different factors, including smoking, high cholesterol levels in the blood, high blood pressure, obesity, lack of exercise, and a familial propensity for heart disease (ACSM Guidelines, 1986). "The greater the number of risk factors, the greater the likelihood that some form of cardiovascular disease will develop" (Briody, 1984, p. 388).

Some children are already known to be at a greater risk for heart disease than others (Aristimuno, Foster, Voors, Srinivasan, & Berenson, 1984). If these children were identified and informed to decrease some of their risk factors, it is assumed that their chance of developing heart disease could be reduced. Often though, such children are only introduced to the concept of risk factors after suffering a myocardial infarction as adults. Weinberg, Carbonari, and Laufman (1984) reported that in terms of primary prevention it may be what people do not know that places them at greatest risk.

### Statement of the Problem

This study investigated the awareness of heart disease and risk factors, along with behaviors, among high school students by comparing students with a family history of heart disease with high school students without a known family history of heart disease.

### Need for the Study

The Framingham Study (Dawber, 1980) identified the concept of risk factors and the potential to predict coronary heart disease in adults not yet showing significant symptoms. Current research is being done to determine how soon risk for coronary heart disease can be detected. It has been shown that hyperlipidemia and hypercholesterolemia can be identified and followed through childhood. The data collected by researchers suggest that risk factor reduction should begin as early as childhood, and at least adolescence (Aristimuno et al, 1984; Schrott, Clarke, Weibe, Connor, & Lauer, 1979).

A risk factor that cannot be altered is the inherited risk for coronary heart disease. Individuals with inherited heart disease may be at even greater risk due to the practice of poor health habits which can be modified.

The focus of this study was to assess the knowledge of heart disease, risk factors, and the practice of health habits among high school students, and especially to note how students with a family history of heart disease compared with their fellow students. If a lack of knowledge exists about heart disease and risk factors among

high school students in La Crosse, Wisconsin, a recommendation might be made to have community education focus on preventive measures in high school-aged youths.

#### Null-Hypotheses

1. High school students with a parental family history of heart disease will not demonstrate statistical significance on their knowledge of heart disease and risk factors when compared with high school students without a family history of known heart disease.

2. There will be no statistical significance among high school students with a parental family history of heart disease on measurements of their behaviors and physical conditions impacting on the development of heart disease when compared with high school students without a family history of known heart disease.

#### Assumptions

This study was based on the following assumptions:

1. The high school students would answer the Health Assessment Questionnaire (HAQ) to the best of their ability.

2. The subjects sampled were representative of typical high school students in La Crosse, Wisconsin.

#### Delimitations

1. This descriptive study was delimited to high school students in the La Crosse School District at Central High School enrolled in a Health Education class.

2. Students were classified as case or control subjects based on whether or not either of their parents had suffered a myocardial infarction (MI), coronary artery bypass graft surgery (CABG), and/or percutaneous transluminal coronary angioplasty (PTCA).

3. The sample group was drawn from one of two public high schools in a mainly white, middle-class community.

#### Definition of Terms

Coronary Risk Factors - measurable or observable factors with a known relationship to heart disease. In this study, the following will be identified as coronary risk factors:

Elevated plasma cholesterol - a total blood cholesterol measurement greater than 200-250 mg/dl. Dietary intake of cholesterol is recommended to be no higher than 250-300 mg per day (American Heart Association, 1983).

Cigarette smoking - the regular practice of smoking cigarettes whether at the present time or in the individual's past. Inhalation during cigar and pipe smoking are also considered a risk (Castelli, 1983).

Hypertension - abnormal elevation of pressure within the arteries either during the contraction (systole) or relaxation (diastole) phases of the heart pumping cycle. Significant hypertension is a blood pressure measurement at or above 160/95 mmHg. Borderline hypertension is a measurement at or above 140/90 mmHg (Kannel, 1975).

Diabetes mellitus - a decreased rate of insulin secretion resulting in decreased utilization of glucose by the body cells. This lack of utilization of glucose can increase the blood glucose concentration to 300 to 1200 mg/dl (Guyton, 1986).

Obesity - twenty percent or more above the average weight for a given sex, race, and height (Aristimuno et al, 1984).

Hereditary or familial propensity - the increased risk for heart disease among family members when an immediate family member develops diagnosed symptoms prior to the age of 60 years (Castelli, 1983).

Lack of physical exercise - when regular physical exercise is not performed for a duration of at least 15 minutes, for a frequency of at least three times a week, and with an intensity of at least 65% of maximum performance (ACSM Guidelines, 1986).

Stress - an inappropriate response by an individual to his/her environment based on the individual's perception. Stress responses by the body include increased sympathetic nervous system activity, increased metabolism, and increased muscle tension (Curtis & Detert, 1985).

Coronary Heart Disease (CHD) - narrowing and/or sclerosing of the coronary arteries leading to an imbalance of oxygen supply to oxygen demand with symptoms of chest pain (angina), and possible myocardial tissue necrosis and death (American Heart Association, 1985).

Myocardial Infarction (MI) - death of a portion of the myocardium resulting from inadequate blood flow through the coronary arteries to the myocardium (American Heart Association, 1985).

Coronary Artery Bypass Graft Surgery (CABG) - a surgical method of supplying increased oxygenated blood to the myocardium when a deficiency is present. A vein or an artery can be used to "bypass" the original circulation and provide a pathway for oxygen rich blood (American Heart Association, 1985).

Percutaneous Transluminal Coronary Angioplasty (PTCA) - a method of improving inadequate coronary artery circulation by inserting a balloon-tipped catheter into the diseased artery and compressing the plaque build-up against the artery walls (Bard, 1985).

Dietary recall - a method of assessing eating habits by recording food intake for a period of time and then evaluating this record for certain characteristics (American Heart Association, 1983).

Cholesterol - a sterol carried within lipoproteins in the blood which is deposited in artery walls and contributes to heart disease (American Heart Association, 1985).

Lipoproteins - carriers of plasma lipids in the blood due to the blood insolubility of cholesterol. Two major types of lipoproteins are: Low density lipoproteins (LDL) which are the main carriers for cholesterol and are related to an increased risk for heart disease, and high density lipoproteins (HDL) which are associated with a decreased risk for heart disease (American Heart Association, 1983).

CHAPTER II  
REVIEW OF RELATED LITERATURE

Risk factor modification appears to play an important role in the prevention of cardiovascular diseases. This chapter will review the most recent literature available related to risk factors. Categories covered are: 1) the relationship of risk factors to coronary heart disease, 2) the relationship of a positive family history to heart disease, and 3) the need for risk factor education.

Risk Factors and Heart Disease

The development of coronary heart disease can be foreseen years before the first symptoms occur. This finding was discovered early in the Framingham Heart Study and led to the concept of risk factors and to research designed to determine if altering risk could change the course of the disease (Castelli, 1983).

The American Heart Association (1985) reported the following as factors contributing to heart disease: cigarette smoking, hypertension, elevated blood cholesterol, diabetes, obesity, lack of exercise, and stress. Each factor has some influence on the disease process and is interrelated with others. Following is a brief outline of these risk factors.

### Cigarette Smoking

In 1964, the surgeon general's committee concluded the following about cigarette smoking:

...a significant relationship has been established between cigarette smoking and the incidence of myocardial infarction and sudden death in males, especially in middle life ... (Doyle, Dawber, Kannel, Kinch, and Kahn, 1964, p. 886).

Evidence has been gathered for greater than 20 years on the relationship between cigarette smoking and coronary heart disease.

Doyle and colleagues (1964) followed two prospective studies, the Framingham and Albany Heart Studies. The Framingham Study involved 5209 men and women, of which 2282 men were followed for 10 years by Doyle and associates. In the Albany Study, 1838 men were followed for eight years.

In both studies, a detailed smoking history was taken from each participant and used to correlate with coronary heart disease in the 8-10 year follow-up. Doyle and colleagues (1964) concluded, "... cigarette smokers die at a rate much higher than noncigarette smokers with much of the excess rate attributable to myocardial infarction" (p. 887). They also found among heavy cigarette smokers (greater than 20 cigarettes per day) a three-times increased risk of mortality when compared with nonsmokers.

Dawber (1980) concluded from the Framingham Study similar findings as reported by Doyle and associates (1964). He further expanded on the risk of coronary heart disease among smokers, and stated there was an increased risk for coronary heart disease, as much as three

times as great among younger smokers aged 30 to 49 years. No relationship was found between myocardial infarctions and cigar and pipe smoking in the Framingham Heart Study. Among women, no significant differences were found between smokers and nonsmokers for coronary heart disease risk.

### Hypertension

Kannel (1975) examined the effects of high blood pressure on the 5209 men and women involved for 20 years in the Framingham Study. He stated, "Of all the risk factors considered, hypertension emerges as the most common, most potent and universal contributor to cardiovascular mortality" (p. 1). Thirty-seven percent of the men and 51% of the women who died from coronary heart disease had suffered from hypertension of 160/95 or greater. Borderline hypertension of greater than 140/90 was found related to a 73% mortality rate among the men at Framingham, and 81% of the women. Risk of death was found to increase in proportion to the elevation of blood pressures, systolic or diastolic, at any age, in either sex.

Dawber (1980), in reviewing the Framingham Heart Study, agreed with Kannel (1975) that hypertension was a major risk factor in the development of coronary heart disease. He felt that elevated systolic blood pressure was an especially strong predictor of heart disease.

### Cholesterol

Dawber (1980) concluded from the 24-year follow-up of the Framingham Study that serum cholesterol does play a role in the incidence

of coronary heart disease. He found the higher the blood cholesterol level in men, the greater the incidence of coronary heart disease. Men 30 to 39 years of age, with cholesterol levels of 260 or more, were found to be at a four times greater risk for heart disease than men with blood cholesterol levels below 260 mg%. Women with cholesterol levels greater than 260 mg% were also found to be at higher risk for myocardial infarctions. The 24 years of observation also showed good predictability for coronary heart disease later in life from the initial blood cholesterol measurement.

In a 14-year follow-up of the Framingham Study, Kannel, Castelli, Gordon, and McNamara (1971) noted that the blood lipids were among the strongest factors associated with an increased incidence for coronary heart disease. They found that there was a greater incidence of coronary heart disease among 23 men and 169 women with higher serum lipids and lipoprotein levels than those who remained free of heart disease over the 14 year observation.

Castelli, Doyle, Gordon, Hames, Hjortland, Hulley, Kagan, and Zukel (1977) conducted a survey on the relationship between coronary heart disease and lipid levels in Albany, New York; Evans County, Georgia; Framingham, Massachusetts; Honolulu; and San Francisco. An important finding revealed that an inverse relationship exists between high density lipoproteins (HDL) and the incidence for coronary heart disease.

Further relationships have been noted between blood cholesterol levels and both systolic and diastolic blood pressure. An increased

serum cholesterol level was noted with blood pressure elevation among participants in the Framingham Heart Study (Dawber, 1980).

### Diabetes

Dawber (1980) concluded from the Framingham Study that diabetes contributes to the risk of occurrence of all atherosclerotic diseases. This includes the development of myocardial infarctions, angina, and sudden death.

Garcia, McNamara, Gordon and Kannel (1974) performed a 16-year follow-up of diabetics in the Framingham population and found a mortality rate almost three times as high as the general population. The excess risk of coronary disease was more pronounced in women than in male diabetics, especially insulin-treated women.

### Obesity

After 24 years of follow-up in the Framingham Study, an important relationship was found between obesity and the incidence of angina, myocardial infarctions, and sudden death. The higher the body weight, the greater the incidence of angina noted in both males and females. Earlier reports from Framingham did not demonstrate a relationship between obesity and myocardial infarctions. However, after 24 years, a correlation was found between obesity and risk of myocardial infarction in women of all age groups, and men in all age groups except the 30 to 39-year old age bracket. Also, a two-to four-fold increased risk of sudden death was discovered among men above their desirable body weight when compared with men at their correct weight (Dawber, 1980).

Obesity has also been linked to other risk factors, such as hypertension and increased serum cholesterol. For all age groups, in males and females, body weight was strongly related to systolic and diastolic blood pressure levels (Dawber, 1980).

#### Lack of Exercise

Dawber (1980), in summarizing the level of physical activity and its relationship to coronary heart disease in the Framingham Study, noted an increased risk among sedentary individuals, male or female. A three-fold increased risk was found among sedentary males compared with their most active counterparts. Among women, the risk was two and one-half times higher for coronary heart disease among sedentary individuals compared with those who were most active.

This inverse relationship between the level of physical activity and risk for coronary heart disease was also found by Paffenbarger and Hale (1975) in their 22 year follow-up of 6351 longshoremen, 35 to 75 years of age, working in the San Francisco Bay Area. The subjects' jobs were classified as heavy, moderate, or light work, based on the energy expenditure required per eight-hour work day. The most active longshoremen were found to have reduced relative risk for coronary heart disease, with a study of their work habits showing repeated bursts of peak effort rather than work output at a steady, slower pace. Paffenbarger and Hale (1975) summarized, "Their work habits approximated the intensive exercise now recommended to achieve conditioning and perhaps primary protection from coronary heart disease" (p. 549).

Paffenbarger, Wing, and Hyde (1978) further investigated the inverse relationship between physical activity and heart attack risk by examining 36,500 Harvard male alumni. They examined these alumni by questionnaire between 1962 and 1972 to look at previous history of athleticism in college, current physical activity levels, and this relationship to heart attack risk in middle age. The investigators concluded in each age group, ranging from 35 to 74 years of age, that there was a consistently lower rate of heart attack with an increase in energy expenditure. Also, Paffenbarger and associates (1978) concluded, "...only a physically active adulthood is associated with lower heart attack rates. Student athleticism per se is unrelated to heart attack risk later in life" (p. 170).

#### Stress

Haynes, Feinleib, Levine, Scotch, and Kannel (1978) studied 1822 randomly chosen men and women involved in the Framingham Study to evaluate psychosocial factors and their relationship to coronary heart disease. The subjects were administered a 300-item questionnaire from 1965 to 1967 to gather information from four different categories. The categories were: behavior type; stress in the individual's job, marriage, or daily life; stress from the environment; and mobility by the individual in his/her job, education, or social class.

It was found that those diagnosed with angina, myocardial infarction, or coronary heart disease on the questionnaire, scored consistently higher on the Type A behavior scale. Also, among women, those

who worked outside the home were consistently rated higher on the Type A scale when compared with housewives.

When evaluated on their situational stress, those with coronary heart disease showed greater concern over aging, personal problems, and more marital dissatisfaction and marital disagreement than those free of coronary heart disease. Situations in the work place did not differ between those with coronary heart disease and those without heart disease.

A higher level of stress in response to the environment was measured in those with coronary heart disease. This was particularly true in the 45 to 64 year age range, for both men and women.

No relationship was found by Haynes and associates (1978) when evaluating sociocultural mobility and the incidence of heart disease. This included examination of job changes and promotions.

#### Family History of Heart Disease

The incidence for heart disease has been noted to be greater in some families. Two factors associated with this increased risk are the inheritance of blood cholesterol and blood pressure measurements from parents to their offspring (Puska, Vartianinen, Pallonen, Ruotsalainen, Tuomilehto, Koskela, Lahtinen, & Norppa, 1981). A shared environment has also been associated with increased incidence for CHD in families. Environmental factors identified were common eating habits and an increased risk of smoking among family members (Feinleib & Kannel, 1976).

Snowden, McNamara, Garrison, Feinleib, Kannel, and Epstein (1982) studied 596 sibships for 26 years in the Framingham Heart Study. The sibships consisted of two or more siblings either brother-brother, sister-sister, or brother-sister pairs. Blood pressure, total blood cholesterol and height/weight were recorded for each individual. The relationship between brother-brother pairs was found significant for the incidence of CHD with a one and one-half times increased risk for CHD noted among brother-brother pairs. Initial systolic blood pressure and serum cholesterol measurements were found to be good predictors for coronary heart disease later in life.

Offspring of the Framingham Heart Study were examined for a relationship between their blood pressure measurements and those of their parents recorded 25 years previously (Havlik, Garrison, Feinleib, Kannel, Castelli, & McNamara, 1979). Blood pressure measurements were recorded for 2497 offspring, 20 to 49 years of age, from 1971 to 1975. The results indicated several variables were strong predictors of systolic and diastolic blood pressure measurements. These variables included weight, alcohol consumption, plasma triglycerides, cigarette smoking, and age. Overall, the offsprings' blood pressure measurements were lower than their parents' blood pressures recorded 25 years previously. Havlik and colleagues (1979) speculated that this was due to the use of antihypertensive drug therapy among the offspring. Relationships were significant between maternal blood pressure and prediction of systolic and diastolic blood pressure in both male and female offspring. Paternal systolic blood pressure measurements were

found significant only for predicting the male offsprings' systolic blood pressure.

Puska and colleagues (1981) discovered a similar relationship among the parents' blood pressure measurements and those of their offspring. Their investigation consisted of measurement of risk factor levels among 965 seventh graders and their parents in North Karelia, Finland. They stated, "Children whose parents had elevated blood pressure verified by a physician had higher blood pressure than the other children, even if parents used antihypertensive drugs" (p. 142).

Offspring from the Framingham Heart Study were also observed for a relationship between their blood cholesterol measurements and those of their parents recorded 25 years previous (Garrison, Castelli, Feinleib, Kannel, Havlik, Padgett, & McNamara, 1979). Total plasma cholesterol, triglycerides, HDL, and LDL measurements were recorded for 1705 males and 1883 females, aged 20 to 49 years, from 1971 to 1975. The study indicated that parents' cholesterol levels were among the best predictors of total plasma cholesterol in their offspring, with maternal cholesterol measurements being a slightly stronger predictor. Garrison and associates (1979) indicated that a stronger hereditary influence determined the offsprings' cholesterol levels rather than an environmental influence, as both the parents' and their offsprings' cholesterol levels were measured in adulthood, when they did not share the same environment.

Puska and associates (1981) concluded similar results from their findings with the North Karelia Youth Project. In this study of risk

factor levels in school children and their parents, higher cholesterol levels were noted among children whose parents had been identified as having elevated cholesterol levels.

A study was performed to compare school children's serum cholesterol levels with the incidence of coronary disease deaths in their families (Schrott et al, 1979). Known as the Muscatine Study, this investigation began in 1971 with measurements of students' blood cholesterol and triglyceride levels. Approximately 6000 students enrolled in kindergarten through grade 12 were evaluated from 1971 to 1973. The students were classified as high (above the 95th percentile), middle (between the 5th and 95th percentile), or low (less than the 5th percentile), based on their cholesterol measurements. Detailed family and medical histories were gathered from first- and second-degree relatives. The results indicated more deaths from MI and strokes among the high group's relatives (51.5%) than among the middle group (39.4%) or low group's relatives (42.5%). Hypertension and diabetes were also reported more frequently among the high group's relatives than among relatives from the middle or low groups. Schrott and colleagues (1979) concluded that elevated cholesterol in childhood appeared to be a good indicator of family incidence for CHD and possibly, a predictor of children who would be at an increased risk for heart disease in adulthood.

A similar study was performed to evaluate the degree of obesity in childhood and the incidence for increased risk over time (Aristimuno et al, 1984). Aristimuno and associates (1984) conducted the Bogalusa Heart Study with 4238 school children in Bogalusa, Louisiana. Blood

pressure, height/weight, triceps skinfold thickness, and blood lipoprotein cholesterol levels were measured in three surveys conducted from 1973 to 1979 with 2230 students. The results indicated that students who were classified as very obese throughout the three surveys, were heavier, with higher systolic and diastolic blood pressures, and greater mean serum triglyceride levels. Aristimuno and colleagues (1984) identified obese and very obese children as being at increased risk for elevated risk factor levels in adulthood. Thus, obesity was identified as a measurement that could be used to identify children who were at increased risk for coronary heart disease.

#### The Need for Risk Factor Education

Weinberg and colleagues (1984) conducted a survey of 3000 U.S. high school students nationwide to assess their knowledge of cardiovascular disease. They found that the students' knowledge was largely superficial and based on simple, factual information. The students were able to pick a symptom of a disease when given several alternatives, but were unable to apply their knowledge and identify a disease from several symptoms. They chose this age group to test due to the high school years being a time when: 1) the majority of the population takes its highest level of health education, 2) adolescents begin establishing their adult behaviors, and 3) youth are beginning to show signs of cardiovascular disease risk.

A similar investigation was conducted with 2675 sixth, seventh, and eighth grade Iowa students by White, Albanese, Anderson, and

Caplan (1977). They formulated a health knowledge test with the assistance of cardiovascular medical educators. The test was written to contain the minimum amount of knowledge on the cardiovascular system that a person should know to make decisions about his/her health. They found the average scores were quite low, 38% in the sixth grade, 41% in the seventh, and 44% in the eighth grade. There was an increase in cardiovascular health knowledge with an increase in age, but this was not significant when compared to the increased knowledge gained in other fields with increasing age.

Mroczek (1976) suggested the problem may be due to the lack of emphasis in the school health curriculum on cardiovascular diseases. He performed a survey of the metropolitan high schools in Washington D.C. and discovered that course-work devoted to heart disease and cancer was only 10 to 15%, despite the fact that cardiovascular disease, stroke, and cancer accounted for 70% of all deaths in the United States. Due to factors like these, the American Heart Association has made heart health education of the young a top priority (Brook, 1981).

The rationale for health education is that individuals can make appropriate decisions concerning their lifestyle when provided with the knowledge to do so. Hopefully, by education and through detection of risk factors at an earlier age, today's youth can modify their risk for cardiovascular disease.

A study designed to assess risk factors for chronic diseases among children and to stimulate interest in youth health education was performed by Wynder, Williams, Laakso, and Levenstein (1981). Known as

the International Know Your Body Program, the study involved 17,150 children, ages 10 to 15 years, from 15 different countries. The students completed a health knowledge questionnaire; a health habits survey; assessments of serum cholesterol, blood pressure, height/weight, and skinfolds; and a modified Harvard Step Test. Wynder and associates (1981) found that risk factors known to cause chronic diseases in adulthood were present to a significant extent among children from different countries. The degree of risk differed among countries, suggesting an environmental rather than a genetic influence. They also concluded that the method of providing health education programs in the schools, with student and parent participation, offered a good prospect of reducing risk factors in childhood.

A program to reduce cardiovascular disease in adults by decreasing risk factors and increasing awareness of cardiovascular health, was conducted by Puska, Tuomilehto, Salonen, Neittaanmaki, Maki, Virtamo, Nissinen, Koskela, and Takalo (1979). Known as the North Karelia Project, the program took place from 1972 to 1977 in North Karelia County, Finland. The project was initiated with a petition from the local population to the government for assistance in reducing the high cardiovascular disease rate. The program was designed to decrease heart disease by decreasing the risk factors of smoking, hypertension, and elevated blood cholesterol. Another goal of the project was to test the feasibility of the treatment program that would be used on a larger scale throughout the country.

Male and female subjects were selected randomly utilizing 6.6% of the population in North Karelia with a matched reference area, and

baseline data was gathered. The North Karelians then received the comprehensive program. This involved: 1) making the public aware of risk factors via newspapers, radio, posters, and public campaigns, 2) organizing services to carry out education, 3) training personnel for the program, and 4) changing the community to support the desired lifestyle.

It was found that there was a reduction in CHD risk in North Karelia over the five years of intervention. Men showed a 17.4% decrease and women an 11.5% decrease in CHD risk. The greatest changes were found in the lowered blood pressure and blood cholesterol levels with little change noted in the prevalence of smoking. There were also some favorable changes noted in the control area during the five years of intervention. Puska and associates (1979) speculated this was possibly representing changes in national trends. The investigators found the lowered CHD risk achieved over five years in North Karelia especially significant due to the characteristics of this community: a rural area with low socioeconomic standing, high unemployment, few medical resources, and with dairy farming being their main source of livelihood.

Puska, Vienola, Kottke, Salonen, and Neittaanmaki (1981) further evaluated the North Karelia Project to examine whether the project also increased knowledge while it lowered risk factor levels among the population. More than 10,000 subjects in North Karelia and a matched reference area responded to a health knowledge questionnaire and were given a physical examination in 1972 and 1977. The health questionnaire

consisted of 24 questions covering the categories of hypertension, cardiovascular disease, diet, serum cholesterol, smoking, and physical activity. In 1972, the North Karelians had a lower health knowledge than the reference area. Throughout the five year period, from 1972 to 1977, the North Karelians increased their health knowledge more than the reference area, eliminating the difference between the two groups. Puska and colleagues (1981) associated the decreased risk factor levels not with greater overall knowledge, but to the effort of facilitating changes people already knew they should make.

#### Summary

As evidenced in the literature, several different risk factors are known to influence the chance for heart disease, with a positive family history being one of these. High levels of certain risk factors have been measured in children and were found to have a positive correlation with heart disease in adult relatives. Research has shown lifestyles prone toward heart disease in youth, with these adolescents showing a low knowledge level of risk factors. Studies, such as those in North Karelia, Finland, have shown that community intervention programs can decrease risk factor levels. Because many adolescents are already at risk for heart disease and especially those with a positive family history, measurement of risk factor awareness could support the need for community intervention programs beginning with youth.

## CHAPTER III

### METHODOLOGY

Methodology of the study is discussed in the following sections:

- 1) subject selection, 2) initial procedures, 3) development of the Health Assessment Questionnaire (HAQ), 4) HAQ administration, and
- 5) statistical analyses of the data.

#### Subject Selection

High school students enrolled in a health education class at Central High School in La Crosse, Wisconsin were chosen as subjects. To remain in the study, the students needed to complete the HAQ, undergo the physical assessments of height/weight and blood pressure, and return a completed three-day dietary survey with their parents' verification of the incidence of heart disease in their immediate family. High school students were chosen to assess their awareness of heart disease because it has been noted that students in high school are establishing adult behaviors and are at an age where they are beginning to demonstrate cardiovascular disease risk (Weinberg et al, 1984).

#### Initial Procedures

Prior to beginning this study, approval was obtained to conduct research in the School District of La Crosse from the Research and Development Committee. The Research and Development Committee approved

the investigation with the revisions of limiting the study to one of the two public high schools in La Crosse and by eliminating the need for physician verification of documented heart disease. The Center for Education Professions Office at the University of Wisconsin-La Crosse also reviewed and approved the study.

#### Development of the Health Assessment Questionnaire

The tool for this study was a closed statement questionnaire which assessed students regarding their knowledge of heart disease, risk factors, and behaviors, while providing them with a sense of confidentiality. The HAQ included 17 multiple choice and 23 True/False questions concerning heart disease and risk factors. Self-reported data concerning cigarette smoking and exercise habits were collected in the final portion of the questionnaire by Yes/No and checklist responses (see Appendix A).

The HAQ was developed by reviewing the literature from similar studies where middle-school and high school students were evaluated on their knowledge of heart disease (Weinberg et al, 1984; White Albanese, Anderson, & Caplan, 1977; and Wolfgang & Dennison, 1982). Multiple choice questions were rewritten from these studies for the high school population in this study. The True/False questions were based on specific concepts of risk factors with which high school students had shown difficulty in these previous studies.

The questionnaire was pilot-tested at a local high school under the supervision of a high school health education teacher. Nine students completed the questionnaire evaluating it for clarity. The HAQ

was rewritten based on the students' responses of difficulty with sentence structure or subject content.

The HAQ was evaluated for content validity by a medical director of the patient education department of a local outpatient clinic and by a coronary rehabilitation nurse of the same facility. The questionnaire was revised based on the medical director's and nurse's suggestions on what they felt a high school student should know about heart disease. Thesis committee members consisting of an exercise physiologist, a physiologist, and a health educator served as sources for the formulation and revision of the questionnaire as well.

#### HAQ Administration

The actual testing consisted of 156 students from the Junior class at Central High School completing the HAQ during their health education class. The purpose of the study was briefly explained to the students as a method to assess the awareness of heart disease and risk factors among high school students. They were assured that all personal information would be kept confidential and that the data would only be reported as an overall score for the students involved in the study at Central High School.

Further data was collected from the students after completing the HAQ. Objective measurements of blood pressure were recorded for each individual by the investigator, while height and weight were measured and reported by each student during a health education physical assessment day.

In addition, the students completed a three-day food record to assess their average daily intake of dietary cholesterol (see Appendix B). The students were instructed to complete the dietary recall for three consecutive days while maintaining their normal eating habits. They were given one week to complete the food record. The health education instructor awarded five points for the completion of the food record to increase compliance. The deadline was extended to two weeks to increase the number of returns. One hundred thirty-four students completed the three-day dietary recall.

A letter was sent home with each student after collection of the data explaining the purpose of the investigation to the parents (see Appendix C). This was used to document which students had a family history of coronary heart disease within their immediate family. The parents' letter was sent home after the students had completed the HAQ, so as not to influence the students' responses on the HAQ. The parents' cooperation was requested to complete a five question checklist response regarding parental incidence of MI, CABG, and/or PTCA. The students were encouraged to return their parents' response letter in one week. The deadline was also extended to two weeks to increase the number of returns. Completed parents' response letters were received from 126 students.

#### Statistical Analyses of the Data

Following collection of the data, results were compared in three different categories. First, the students' demographic information

was evaluated by range, mean, and standard deviation. Second, the case and control groups were compared on their knowledge of heart disease and risk factor awareness. Range, mean, and standard deviation were computed and used to calculate the total distribution of scores within the groups at the .05 level of significance with the Mann-Whitney Test. A point-biserial correlation coefficient was used to assess the relationship between a family history of coronary heart disease and questionnaire scores on the HAQ.

The third section examined the case and control groups practice of health habits including systolic and diastolic blood pressure, computer analysis of dietary cholesterol intake, height/weight, cigarette smoking, sports participation, and regular exercise. Range, mean, and standard deviation were used to compile the data. The Mann-Whitney Test examined the distribution of scores within the groups at the .05 level of significance. The relationship between a family history of coronary heart disease and dietary cholesterol intake, systolic blood pressure, and diastolic blood pressure was assessed with the point-biserial correlation coefficient. The phi correlation coefficient was used to examine the relationship between a family history of heart disease and height/weight, cigarette smoking, sports participation, and report of regular exercise.

Following completion of this study, results were given to each student and his/her parents summarizing the outcome of the investigation. A letter summarizing the results of the study was presented in the health education classes. Ranges and means for all students

completing the study were used to compile the results. The students were instructed to share the result with their parents to thank them for their participation in the study (see Appendix D). Each student that completed a three-day food record received the results of his/her average dietary cholesterol intake. Members of the Research and Development Committee of the School District of La Crosse received the results for the case and control groups as well as the findings for all of the students completing the investigation (see Appendix E).

## CHAPTER IV

### ANALYSIS OF DATA

The statistical analyses of the raw data collected from the questionnaire, physical measurements, three-day food record, and parents' response letters will be presented in this chapter. The data will be evaluated through the use of ranges, means, standard deviations, percentages, distributions, and correlations. Analyses of the data is discussed in the following sections: 1) subject characteristics, 2) knowledge of heart disease and risk factors, 3) health habits impacting on heart disease, and 4) discussion.

#### Subject Characteristics

One hundred fifty-six high school students originally participated in this study. Four students' parents stated they did not wish to participate, and 50 students did not complete all of the required data, eliminating 54 students from the investigation. Of the 102 remaining subjects, two males' and two females' parents reported either the father and/or mother had suffered a myocardial infarction. These four case subjects were matched with four control students on the characteristics of age, gender, ethnic background, family size, and ages of siblings. The case and control groups consisted of two white males and females, 16 to 18 years old. The mean age for both groups was 17 years with a standard deviation of .82. All of the

case subjects had a father that had suffered a MI, with one of the male case subjects also having a mother that had suffered a MI.

#### Knowledge of Heart Disease and Risk Factors

The Health Assessment Questionnaire (HAQ) was utilized to assess knowledge of heart disease and risk factors among the high school students. Scores for the four case and control subjects were compared using ranges, means, and standard deviations for questions 1 to 38 of the HAQ.

The results indicated the control subjects had a slightly higher range of correct scores (61-84%) compared with the case subjects (55-82%). The mean of the control subjects was also greater (72%) compared with the case students (67%) (see Table 1). The Mann-Whitney Test for total distribution of scores within the groups indicated there was no significant difference ( $p < .05$ ) among the scores of the case and control subjects.

When comparing the case and control students on their scores for the HAQ, assessing the relationship between a history of heart disease in the family and the students' scores on the HAQ, no relationship was found. The point-biserial correlation coefficient was measured as  $-.21$ , indicating little if any correlation. This implied that the incidence of heart disease in the family did not influence the students' scores on the HAQ.

Table 1  
HAQ Scores  
Items 1-38

	Case (n=4)	Control (n=4)
Range (%)	55-82%	61-84%
Mean (%)	67%	72%
Standard Deviation	± 4.43	± 4.43
$\frac{s}{\bar{x}}$	± 2.22	± 2.22
Mann-Whitney ( $p < .05$ ) U=5.5		

#### Health Habits Impacting on Heart Disease

To assess a portion of the high school students' current health status, systolic blood pressure, diastolic blood pressure, dietary cholesterol intake, height/weight, cigarette smoking, sports participation, and regular exercise in their leisure time were measured among the case and control subjects.

Comparison on measurements of systolic blood pressure among case and control students indicated a wider range of scores among the control subjects (100-130 mmHg) compared with the case subjects (115-130 mmHg). The mean for both groups, though, was the same (120 mmHg) (see Table 2).

No significance was found when comparing the total distribution of scores within the groups on the Mann-Whitney Test ( $p < .05$ ).

The assessment of the relationship between a known history of heart disease among the immediate family and its influence on systolic blood pressure measurement yielded a 0.00 point-biserial correlation coefficient. This indicated little if any relationship when comparing case and control subjects' systolic blood pressure measurements and the incidence of heart disease in the family.

Table 2  
Systolic Blood Pressure Measurements

	Case (n=4)	Control (n=4)
Range	115-130 mmHg	100-130 mmHg
Mean	120 mmHg	120 mmHg
Standard Deviation	$\pm 9.13$	$\pm 14.14$
$\frac{s}{x}$	$\pm 4.57$	$\pm 7.07$
Mann-Whitney ( $p < .05$ )		
U=7		

Measurements of diastolic blood pressure were also used for comparison between case and control high school students. The range of diastolic blood pressure measurements was slightly greater among the case subjects (62-90 mmHg) compared to the control subjects (70-90 mmHg). The mean diastolic blood pressure among the case subjects was

found to be slightly lower (73 mmHg) compared to the control subjects (80 mmHg) (see Table 3). The Mann-Whitney Test indicated no significance for the total distribution of scores for the two groups ( $p < .05$ ).

A low negative correlation was found when comparing the case and control subjects on their diastolic blood pressure measurements. The lower mean diastolic blood pressure measurements among the high school students with a family history of heart disease led to a  $-.34$  point-biserial correlation coefficient when comparing the two groups. This indicated that the incidence of heart disease in the family had no significant relation to the students' diastolic blood pressure.

Table 3  
Diastolic Blood Pressure Measurements

	Case (n=4)	Control (n=4)
Range	62-90 mmHg	70-90 mmHg
Mean	73 mmHg	80 mmHg
Standard Deviation	$\pm 11.94$	$\pm 8.16$
$\frac{s}{x}$	$\pm 5.97$	$\pm 4.08$
Mann-Whitney ( $p < .05$ ) $U=4.5$		

The three-day average dietary cholesterol intake was used for assessment between the two groups for eating habits. A larger range of cholesterol intake (97-389 mg) with a lower mean (230.5 mg) was

found among the control subjects when compared to the case group's range (121-384 mg) and mean (260.8 mg) dietary cholesterol intake (see Table 4). No significant difference was found for the distribution of scores among the two groups on the Mann-Whitney Test ( $p < .05$ ).

The relationship between a family history of heart disease and the three-day average cholesterol intake yielded a .12 point-biserial correlation coefficient. This indicated little if any correlation when comparing the two groups. Thus, the eight students had similar levels of dietary cholesterol intake whether they had a family history of heart disease or not.

Table 4  
Dietary Cholesterol Intake

	Case (n=4)	Control (n=4)
Range	121-384 mg	97-389 mg
Mean	260.75 mg	230.5 mg
Standard Deviation	$\pm 133.76$	$\pm 140.71$
$\frac{s}{\bar{x}}$	$\pm 66.88$	$\pm 70.36$
Mann-Whitney ( $p < .05$ )		
U=7		

Body frame size and body weight among the case and control subjects were used to assess the relationship between obesity and the

incidence of heart disease in the immediate family. Fifty percent of the case subjects were classified as being overweight for their body frame size compared with 25% of the control subjects (see Table 5).

The phi correlation coefficient yielded  $-.26$ , indicating little if any correlation between the incidence of obesity and heart disease in the immediate family among the four case and control subjects. Thus, there was no significant difference among the case and control subjects on the incidence of obesity.

Table 5  
Height/Weight

	Case (n=4)	Control (n=4)
High (%)	50%	25%
Normal/Low (%)	50%	75%

The practice of cigarette smoking was assessed to see if high school students with a family history of heart disease were more or less prone to smoke cigarettes than their counterparts from the control group. Only one subject from the case group reported that he/she was currently a daily cigarette smoker out of the eight students studied.

The phi correlation coefficient was measured as  $-.09$ . This indicated little if any relationship between the incidence of heart disease in the family and the practice of cigarette smoking for the four case and control subjects studied (see Table 6).

The practice of future cigarette smoking by the four case and control subjects was also measured. A greater percentage of the control group reported they would not be cigarette smokers in five years (75%) compared with the case group (25%). Among the case group, 50% were not sure if they would be cigarette smokers in five years, and 25% felt that they would probably be cigarette smokers in five years (see Table 6).

Table 6  
Incidence of Cigarette Smoking

	Case (n=4)	Control (n=4)
Current smoker	25%	0
Daily smoker	25%	0
Smoke 2-3 times per week	0	0
Smoke occasionally	0	25%
Probably smoke in 5 years	25%	25%
Not sure if will smoke in 5 years	50%	0
Will not be smoking in 5 years	25%	75%

Sports participation in high school was used to assess differences and similarities among the case and control subjects. Seventy-five percent of the case and 100% of the control group of high school

students reported that they participated in sports at least once a week. Both the case and control subjects reported participating in sports more with friends, on a school team, or alone, rather than with family members or at a sports club (see Table 7).

Table 7  
Participation in Sports

	Case (n=4)	Control (n=4)
Participate at least once a week	75%	100%
Participate with family	0	25%
Participate with friends	75%	100%
Participate at a sports club	25%	25%
Participate on a school team	50%	50%
Participate alone	75%	100%

The relationship between case and control subjects on their participation in sports indicated a low positive correlation. A .38 phi correlation coefficient was found when comparing the two groups of students. Thus, the case and control students reported similar levels of participation in sports whether they had a family history of heart disease or not.

The regular practice of exercise in their leisure time was examined for both the case and control subjects. A greater percentage of the control group (50%) exercised at least two-to-three times a week compared to the case group (25%) (see Table 8).

Table 8  
Exercise In Leisure Time

	Case (n=4)	Control (n=4)
Participate in exercise	25%	50%
Daily	0	25%
2-3 times a week	25%	25%
1 time a week	0	0
Less than 1 time a week	25%	0

The phi correlation coefficient indicated little if any correlation when comparing the two groups on their participation in exercise. A .26 correlation was measured when comparing the case and control groups. This indicated no significant difference among the case and control groups for the reported level of exercise in their leisure time.

#### Discussion

No statistical significance was found when comparing four high school students with a family history of heart disease with four

students serving as controls on the variables of knowledge of heart disease, risk factors, and behaviors and physical conditions impacting on heart disease. This investigation and its results were limited by the small sample size of four high school students in the case group matched with four students in the control group. The study was delimited to students with parents that had suffered a MI, CABG, and/or PICA, and did not include those with history of angina, in order to decrease the number of false positives. By including parents with history of angina as verification of heart disease in the family, it was felt this would decrease the accuracy on this portion of the self-reported data.

Although no statistical significance was found between the case and control groups, students in both groups were found to have risk factors known to increase the chance of coronary heart disease. Wynder and associates (1981) discovered similar results from their investigation of risk factor measurements among 17,150 school children. They concluded that risk factors known to cause chronic diseases in adulthood were present to a significant extent among children. Among the two groups involved in this investigation, it was found that 50% of the case group were classified as overweight for their height and body frame size according to the Metropolitan Life Insurance standardized tables. An average daily intake of greater than 300 mg of cholesterol was noted among 50% of the case and control subjects. Lack of exercise was another risk factor noted among the case students, as only 25% reported exercising at least two-three times a week.

Students in the case group were found to score an average of 67% on the HAQ on the assessment of their knowledge of heart disease

and risk factors. This score was comparable to the average score for the control group. Aristimuno et al (1984) and Schrott et al (1979) concluded though, children with a familial propensity for CHD are already known to be at a greater risk for heart disease than others, indicating a need for risk factor awareness, especially among those with a family history of heart disease.

Results on the HAQ yielded some interesting results which agreed with Weinberg and associates (1984). In their investigation that tested knowledge of heart disease among high school students, they found that the students knew simple, factual information, but had difficulty applying their knowledge. In the present study, 100% of both groups were able to identify hypertension as a major risk factor, yet only 50% of the case subjects were able to identify a normal blood pressure measurement. Both groups identified vegetable oil and polyunsaturated fats as being preferable for the heart patient, but both groups had difficulty recognizing the liquid form of oil as containing more polyunsaturated fat. The case and control groups identified exercise as important to maintain/improve one's health as well as for heart patients, yet only 25% of the case and 50% of the control reported exercising themselves at least two-to-three times a week.

A summary is provided in Appendix F showing the results of the case group, control group, and the remaining 94 students on their responses to questions 1-38 of the HAQ. These results are grouped according to knowledge of CHD, risk factors, and cardiovascular anatomy and physiology.

CHAPTER V  
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study was designed to assess the relationship of a family history of heart disease with knowledge of CHD, risk factors, and behaviors and physical conditions impacting on heart disease among high school students. The case and control high school students were compared on their Health Assessment Questionnaire (HAQ) scores, systolic blood pressures, diastolic blood pressures, three-day dietary cholesterol intake, height/weight, cigarette smoking, sports participation, and regular exercise.

One hundred fifty-six students enrolled in a high school health education course completed the HAQ and measurements of systolic blood pressure, diastolic blood pressure, and height/weight during their class period. Each student was given a three-day food record and parents' letter to verify heart disease to complete on their own and return. From the 102 students completing all the data, it was found that four students had verification of a MI among a father and/or mother. These students served as the case group. These students were matched for age, gender, ethnic background, family size, and approximate ages of siblings with four control subjects.

The collected data from the case and control groups were analyzed for a comparison between the two groups. The point-biserial

and phi correlation coefficients were used to assess the relationship of heart disease among a parent and the students' HAQ scores, systolic blood pressures, diastolic blood pressures, dietary cholesterol intake, height/weight, cigarette smoking, sports participation, and regular physical exercise. No significant differences were observed when comparing the control group to the case group relative to the factors measured.

### Conclusions

Within the limitations of this study, the following conclusions can be drawn:

1. There was no significant difference when comparing the case and control groups on their knowledge of heart disease and risk factors.
2. There was no significant difference when comparing the case and control groups on their behaviors and physical conditions impacting on heart disease.
3. Risk factors known to increase the chance of coronary heart disease were present among the two groups of high school students evaluated.
4. The case groups' HAQ scores were similar to those scores for the control group and indicated a need, especially among the case group, for practical application of their knowledge of heart disease and risk factors.

### Recommendations

Based on the results of this study, the following recommendations are made:

1. In future investigations of this nature, it is recommended that the incidence of a MI, CABG, and/or PTCA before the age of 60 among the high school students' grandparents, as well as parents, be included as verification of a family history of heart disease.
2. In future investigations of this nature, adults in outpatient cardiac rehabilitation programs could be contacted for the involvement of their children or grandchildren in the investigation. These children then would be matched with a control group.
3. Further research is needed on the parents' smoking history and participation in exercise and this relationship to the data reported by the case and control subjects.
4. In future investigations of this nature, more objective measurements of the case and control groups' blood cholesterol and skinfolds would help verify dietary recall and height/weight measurements.
5. A community educational program that provided practical information on decreasing risk factors for students and parents, especially those with a family history of heart disease, would be helpful in alerting the public to CHD and its possible effects.

#### REFERENCES CITED

- American College of Sports Medicine. (1986). Guidelines for exercise testing and prescription (3rd ed.). Philadelphia: Lea & Febiger.
- American Heart Association. (1983). Eating for a healthy heart. Dallas: Author.
- American Heart Association. (1985). Heart facts. Dallas: Author.
- Aristimuno, G., Foster, T., Voors, A., Srinivasan, S., & Berenson, G. (1984). Influence of persistent obesity in children on cardiovascular risk factors: The Bogalusa heart study. Circulation, 69(5), 895-904.
- C. R. Bard, Inc. (1985). A patient's guide to PTCA. Billerica, M. A. Author.
- Briody, M. (1984). The role of the nurse in modification of cardiac risk factors. Nursing Clinics of North America, 19(3), 387-396.
- Brook, C. (1981). Cardiovascular risk factors in childhood. Archives of Disease in Childhood, 56(6), 412-415.
- Castelli, W. (1983). Cardiovascular disease and multifactorial risk: Challenge of the 1980s. American Heart Journal, 106(5), 1191-1200.
- Castelli, W., Doyle, J., Gordon, T., Hames, C., Hjortland, M., Hulley, S., Kagan, A., & Zukel, W. (1977). HDL cholesterol and other lipids in coronary heart disease. Circulation, 55(5), 767-772.
- Curtis, J., & Detert, R. (1985). Learn to relax: A 14-day program. La Crosse, WI: Coulee Press.
- Dawber, T. (1980). The Framingham study: The epidemiology of atherosclerotic disease. Cambridge, MA: Harvard University Press.
- Doyle, J., Dawber, T., Kannel, W., Kinch, S., & Kahn, H. (1964). The relationship of cigarette smoking to coronary heart disease. Journal of the American Medical Association, 190(10), 886-890.
- Feinleib, M., & Kannel, W. (1976). Relation of parental history of coronary heart disease to risk factors in young adults, the Framingham offspring study. Circulation, 54(Supp II), 52.

- Garcia, M., McNamara, P., Gordon, T., & Kannel, W. (1974). Morbidity and mortality in diabetics in the Framingham population. Diabetes, 23(2), 105-111.
- Garrison, R., Castelli, W., Feinleib, M., Kannel, W., Havlik, R., Padgett, S., & McNamara, P. (1979). The association of total cholesterol, triglycerides and plasma lipoprotein cholesterol levels in first degree relatives and spouse pairs. American Journal of Epidemiology, 110(3), 313-321.
- Guyton, A. C. (1986). Textbook of medical physiology (7th ed.). Philadelphia: W. B. Saunders Company.
- Havlik, R., Garrison, R., Feinleib, M., Kannel, W., Castelli, W., & McNamara, P. (1979). Blood pressure aggregation in families. American Journal of Epidemiology, 110(3), 304-312.
- Haynes, S., Feinleib, M., Levine, S., Scotch, N., & Kannel, W. (1978). The relationship of psychosocial factors to coronary heart disease in the Framingham study. American Journal of Epidemiology, 107, 384-402.
- Kannel, W. B. (1975). Role of blood pressure in cardiovascular disease: The Framingham study. Angiology, 26(1), 1-14.
- Kannel, W., Castelli, W., Gordon, T., & McNamara, P. (1971). Serum cholesterol, lipoproteins, and the risk of coronary heart disease. Annals of Internal Medicine, 74(1), 1-12.
- Mroczek, W. (1976). High school health curricula: A neglected medical resource. American Heart Journal, 92(3), 271-273.
- Paffenbarger, R., Jr., & Hale, W. (1975). Work activity and coronary heart mortality. The New England Journal of Medicine, 292(11), 545-550.
- Paffenbarger, R., Jr., Wing, A., & Hyde, R. (1978). Physical activity as an index of heart attack risk in college alumni. American Journal of Epidemiology, 108(3), 161-175.
- Puska, P., Tuomilehto, J., Salonen, J., Neittaanmaki, L., Maki, J., Virtamo, J., Nissinen, A., Koskela, K., & Takalo, T. (1979). Changes in coronary risk factors during comprehensive five-year community programme to control cardiovascular diseases (North Karelia project). British Medical Journal, 2, 1173-1178.
- Puska, P., Vartianinen, E., Pallonen, U., Ruotsalainen, P., Tuomilehto, J., Koskela, K., Lahtinen, A., & Norppa, J. (1981). The North Karelia youth project. Preventive Medicine, 10, 133-148.

- Puska, P., Vienola, P., Kottke, T., Salonen, J., & Neittaanmaki, L. (1981). Health knowledge and community prevention of coronary heart disease. International Journal of Health Education, 24(2), 1-11.
- Schrott, H., Clarke, W., Weibe, D., Conner, W., & Lauer, R. (1979). Increased coronary mortality in relatives of hypercholesterolemic school children: The Muscatine study. Circulation, 59(2), 320-326.
- Snowden, C., McNamara, P., Garrison, R., Feinleib, M., Kannel, W., & Epstein, F. (1982). Predicting coronary heart disease in siblings - a multivariate assessment, the Framingham heart study. American Journal of Epidemiology, 115(2), 217-222.
- Weinberg, A., Carbonari, J., & Laufman, L. (1984). What high school students don't know about cardiovascular disease. Journal of School Health, 54(3), 112-117.
- White, C., Albanese, M., Anderson, E., & Caplan, R. (1977). The status of cardiovascular health knowledge among sixth, seventh, and eighth grade children. Circulation, 56(3), 480-484.
- Wynder, E., Williams, C., Laakso, K., & Levenstein, M. (1981). Screening for risk factors for chronic disease in children from fifteen countries. Preventive Medicine, 10, 121-132.

APPENDIX A

HEALTH ASSESSMENT QUESTIONNAIRE

## HEALTH ASSESSMENT QUESTIONNAIRE

NAME \_\_\_\_\_

AGE \_\_\_\_\_

GENDER (CIRCLE ONE)      M      F

GRADE IN HIGH SCHOOL (CIRCLE ONE)      FR      SO      JR      SR

NUMBER OF BROTHERS \_\_\_\_\_ AGES \_\_\_\_\_

NUMBER OF SISTERS \_\_\_\_\_ AGES \_\_\_\_\_

ETHNIC BACKGROUND (ANSWERING THIS QUESTION IS OPTIONAL)

\_\_\_\_\_ WHITE

\_\_\_\_\_ HISPANIC

\_\_\_\_\_ BLACK

\_\_\_\_\_ ORIENTAL

\_\_\_\_\_ OTHER

8. People with high blood pressure have an increased chance of developing \_\_\_\_\_ than those with normal blood pressure
  - A) Infection of the heart lining
  - B) Blockage of the arteries on the outside surface of the heart
  - C) Inflammation of the heart lining
  - D) Heart disease present since birth
9. Coronary arteries take blood
  - A) To the heart
  - B) To the lungs
  - C) From the heart
  - D) From the lungs
10. A heart attack results when
  - A) The venous blood is carrying a low level of oxygen
  - B) Too much arterial blood reaches the heart
  - C) The heart suffers from electrical build-up
  - D) Not enough arterial blood reaches the heart
11. Long term heavy intake of alcohol may cause
  - A) Brain disease
  - B) Heart disease
  - C) Liver disease
  - D) All of the above
12. What occurs as the direct result of a heart attack?
  - A) An area of the heart dies
  - B) A portion of the brain dies
  - C) The blood pressure increases
  - D) The blood begins to decompose
13. During exercise the heart needs
  - A) More oxygen than at rest
  - B) Less oxygen than at rest
  - C) More carbon dioxide than at rest
  - D) The same amount of oxygen and carbon dioxide
14. When the heart is unable to pump blood efficiently around the body, we say the patient has
  - A) Had a stroke
  - B) Hypertension
  - C) Heart failure
  - D) Heart flutter
15. Coronary artery disease is
  - A) Blockage of the arteries on the outside surface of the heart
  - B) Blockage of the arteries inside the heart
  - C) The gradual build-up of calcium with aging
  - D) Slowing of the circulation of blood through the heart

16. A blood pressure of 120/80 means
- A) The pressure within the heart is 120 during contraction and 80 during relaxation
  - B) The pressure within the heart is 120 during relaxation and 80 during contraction
  - C) A force of 120 is exerted against the arteries while the heart contracts and a force of 80 when the heart relaxes
  - D) A force of 120 is exerted against the arteries while the heart relaxes and 80 when the heart contracts
17. Sudden unexplained death in a previously healthy person usually results from
- A) Swelling of the heart lining
  - B) Symptoms of dizziness and nausea
  - C) A heart rate less than 60 beats per minute
  - D) Irregular and fast heart beating

## TRUE AND FALSE

CHOOSE THE ONE BEST ANSWER AND MARK THIS ON YOUR ANSWER SHEET

18. A normal response to both smoking and exercise is an increase in heart rate.
- A) True
  - B) False
19. A person's blood pressure would be considered within normal limits if it was 120/80 mmHg.
- A) True
  - B) False
20. At age 30, men and women are at an equal risk to suffer a heart attack.
- A) True
  - B) False
21. Obesity is not considered a major risk factor for heart disease.
- A) True
  - B) False
22. Being 10 pounds overweight causes your heart to perform more work.
- A) True
  - B) False
23. By increasing the heart rate, smoking allows a person to perform more work.
- A) True
  - B) False

24. If concerned about one's health, it is preferable to use oils for cooking that originate from vegetable sources rather than animal sources.  
A) True  
B) False
25. High blood pressure is not a major risk factor for heart disease.  
A) True  
B) False
26. If a person wanted to decrease his/her cholesterol levels, he/she should increase the amount of polyunsaturated fats in his/her diet.  
A) True  
B) False
27. As a general rule, people who have suffered a heart attack should not exercise.  
A) True  
B) False
28. A risk factor for heart disease is related to the inability to handle stress.  
A) True  
B) False
29. A normal resting heart rate for most males or females is between 60-80 beats per minute.  
A) True  
B) False
30. Persons who have diabetes are at no greater risk than others for developing heart disease.  
A) True  
B) False
31. It is important to exercise at least three times per week to maintain/improve your health status.  
A) True  
B) False
32. A normal blood cholesterol level would be between 300-350 mg/dl.  
A) True  
B) False
33. The smoking of cigarettes is a major risk factor for heart disease  
A) True  
B) False

34. Black males are known to have higher blood pressure than the rest of the population.  
A) True  
B) False
35. An overweight person has more miles of blood vessels to push the blood through, making the heart work harder.  
A) True  
B) False
36. Hypertension is a disease that can be detected early in its course due to its variety of symptoms.  
A) True  
B) False
37. It is preferable to use oils for cooking that are solid at room temperature rather than liquid oils, as the solid oils contain more polyunsaturated fat.  
A) True  
B) False
38. Hypertension and emotional tension both refer to the inability to handle stress.  
A) True  
B) False

#### PERSONAL HISTORY

CHOOSE THE ONE BEST ANSWER FOR EACH QUESTION AND MARK THIS ON YOUR ANSWER SHEET

39. Do you practice sports at least once a week?  
A) Yes  
B) No
40. If you answered Yes to question #39, do you practice sports with your family?  
A) Yes  
B) No
41. If you answered Yes to question #39, do you practice sports with friends?  
A) Yes  
B) No
42. If you answered Yes to question #39, do you practice sports in sports club?  
A) Yes  
B) No

43. If you answered Yes to question #39, do you practice sports on a school team?  
A) Yes  
B) No
44. If you answered Yes to question #39, do you practice sports alone?  
A) Yes  
B) No
45. Do you often exercise in your leisure time, at least half an hour, so you become breathless and sweaty?  
A) Yes  
B) No
46. If Yes, how often?  
A) Daily  
B) Two to three times a week  
C) Once a week  
D) Less than once a week
47. Are you currently a cigarette smoker?  
A) Yes  
B) No
48. If Yes, how often do you smoke cigarettes?  
A) Daily or almost everyday  
B) Two to three times a week  
C) Occasionally
49. Do you think you will be a cigarette smoker 5 years from now?  
A) Probably  
B) Not sure  
C) No
50. Have you ever had a health education course in school on the heart or circulation?  
A) Yes  
B) No

APPENDIX B

THREE-DAY FOOD RECORD

## INSTRUCTIONS FOR KEEPING A FOOD RECORD

Please record everything you eat and drink from the time you get up in the morning until you go to bed for three days. Be sure to mention everything you eat or drink at home, at school, or away from home. Include snacks and beverages. You can write amounts in pieces (1 slice bread, 1 small banana, 1 egg), or approximate serving sizes in household measures ( $\frac{1}{2}$  cup cooked carrots).

PLEASE DO NOT ATTEMPT TO CHANGE YOUR USUAL PREFERENCES OR DIETARY HABITS FOR THE BENEFIT OF THIS STUDY.

## DAY 1

Day of the week, Monday, Tuesday, etc.)

BREAKFAST (Indicate approximate time of day)

LUNCH (Indicate approximate time of day)

DINNER (Indicate approximate time of day)

SNACKS (Indicate approximate time of day)

DAY 2  
(Day of the week, Monday, Tuesday, etc.)

BREAKFAST (Indicate approximate time of day)

LUNCH (Indicate approximate time of day)

DINNER (Indicate approximate time of day)

SNACKS (Indicate approximate time of day)

DAY 3  
(Day of the week, Monday, Tuesday, etc.)

BREAKFAST (Indicate approximate time of day)

LUNCH (Indicate approximate time of day)

DINNER (Indicate approximate time of day)

SNACKS (Indicate approximate time of day)

APPENDIX C

PARENTS' LETTER VERIFYING HEART DISEASE

Dear Parents:

Recently a survey was conducted in your high school student's Health Education class to evaluate his/her knowledge of heart disease. This study is being conducted in cooperation with the School District of La Crosse for my Masters Thesis to evaluate if heart health education is sufficient as presented in the high school.

High school students are an important group to assess regarding their awareness of heart disease because they will probably complete their final instruction in health education during their high school years. Also, during high school, they begin to establish adult behaviors, and are at an age where they begin to show cardiovascular disease risk.

Your cooperation is needed to verify if heart disease tends to be inherited in your family. Please complete the five questions below requesting your verification about heart disease among the high school student's parents. PLEASE HAVE THE STUDENT RETURN THIS TO HIS/HER HEALTH CLASS INSTRUCTOR (MR. PUZA).

At the conclusion of the study, the results for all the students involved in the Health Education classes at Central High School will be made available to you.

Thanks for your cooperation.

Sincerely,

Millicent Stevens  
Registered Physical Therapist

1. The student's mother and/or father has suffered a heart attack.
2. The student's mother and/or father has undergone heart bypass surgery.
3. The student's mother and/or father has undergone percutaneous transluminal coronary angioplasty.
4. There is no history of heart disease in our immediate family.
5. I prefer not to participate in this study.

Student's Name \_\_\_\_\_

Parent's Signature \_\_\_\_\_

APPENDIX D

SUMMARY LETTER TO STUDENTS AND PARENTS

Dear Students and Parents,

Early in March, I asked for your cooperation on my investigation in which I was looking at risk for heart disease among high school students. Thank you for your participation! Over 100 students completed all of the information. Following, I would like to review my results.

For the 50 female students studied, the average systolic blood pressure was 114 mmHg, with pressures ranging from 90-150 mmHg. Diastolic blood pressures among the female students averaged 74 mmHg, with values ranging from 50-100 mmHg. A "normal" blood pressure is considered 120/80 mmHg with slight variations expected above and below this value. A slightly lower blood pressure is considered beneficial healthwise. Among the females, an average cholesterol intake over three days was 231 mg with values ranging from 57-628 mg of cholesterol. It is recommended not to exceed 250-300 mg of cholesterol per day. Other values measured were: height compared to weight where 28% of the females were measured as overweight; 12% of the females reported they were currently cigarette smokers; and 54% answered they did not engage in vigorous exercise at least two-to-three times a week. The students completed a questionnaire during their health class which assessed their knowledge of heart disease and risk factors for heart disease. The average score for the female students was 72% correct.

Among the 52 male students studied, systolic blood pressure averaged 120 mmHg with a range of 90-145 mmHg, diastolic blood pressure averaged 78 mmHg with a range of 60-95 mmHg, and dietary cholesterol intake averaged 281 mg with a range of 113-676 mg cholesterol. Forty-two percent of the males were measured as overweight, 14% reported they were current cigarette smokers, and 38% reported they did not exercise vigorously at least two-to-three times a week. The average score for the male students on the health questionnaire was 72%.

The reasons why I chose high school students to study was because they are probably completing their last required course in Health Education during high school and are beginning to show signs of risk for development of heart disease.

Among the 102 total students studied, 7% demonstrated borderline systolic hypertension with blood pressure measurements of 140 mmHg or greater, 11% demonstrated borderline diastolic hypertension with blood pressure measurements of 90 mmHg or greater, and 28% had an average daily intake of cholesterol of 300 mg or greater. Also, 35% were overweight, 13% were current cigarette smokers, and 46% reported they did not engage in vigorous exercise at least two-to-three times a week. All of these variables were studied because they have a known relationship for the development of heart disease.

Again I would like to thank you for your cooperation which allowed me to complete this interesting study.

Sincerely,

Millicent Stevens, RPT

APPENDIX E

SUMMARY LETTER TO THE RESEARCH AND DEVELOPMENT COMMITTEE

To the Research and Development Committee Members:

I would like to report the results of my investigation titled, "The Relationship of a Family History of Heart Disease to Awareness of Risk Factors Among High School Students", which I presented to you in early January. From the eight Health Education classes studied at Central High School, only four students reported a history of heart disease in their family. These students were matched with four control students on their age, gender, ethnic background, and ages of siblings. No significant difference was found between the two groups when comparing their questionnaire test scores, blood pressures, dietary cholesterol intake, height/weight, practice of cigarette smoking, sports participation, and exercise levels.

The data for the 102 students completing all of the measurements was also compiled and summarized. Following are these results, which were given to each student to share with his/her parents.

For the 50 female students studied, the average systolic blood pressure was 114 mmHg, with pressures ranging from 90-150 mmHg. Diastolic blood pressures among the female students averaged 74 mmHg, with values ranging from 50-100 mmHg. A "normal" blood pressure is considered 120/80 mmHg with slight variations expected around this value. A slightly lower blood pressure is considered beneficial healthwise. Among the females, an average cholesterol intake over three days was 231 mg with values ranging from 57-628 mg of cholesterol. It is recommended not to exceed 250-300 mg of cholesterol per day. Other values measured were: height compared to weight where 28% of the females were measured as overweight; 12% of the females reported they were currently cigarette smokers; and 54% answered they did not engage in vigorous exercise at least two-to-three times a week. The students completed a questionnaire during their health class which assessed their knowledge of heart disease and risk factors for heart disease. The average score for the female students was 72% correct.

Among the 52 male students studied, systolic blood pressure averaged 120 mmHg with a range of 90-145 mmHg, diastolic blood pressure averaged 78 mmHg with a range of 60-95 mmHg, and dietary cholesterol intake averaged 281 mg with a range of 113-676 mg cholesterol. Forty-two percent of the males were measured as overweight, 14% reported they were current cigarette smokers, and 38% reported they did not exercise vigorously at least two-to-three times a week. The average score for the male students on the health questionnaire was 72%.

Among the 102 total students studied, 7% demonstrated borderline systolic hypertension with blood pressure measurements of 140 mmHg or greater, 11% demonstrated borderline diastolic hypertension with blood pressure measurements of 90 mmHg or greater, and 28% had an average daily intake of cholesterol of 300 mg or greater. Also, 35% were overweight, 13% were current cigarette smokers, and 46% reported they did not engage in vigorous exercise at least two-to-three times a week.

Again I would like to thank you for your cooperation which allowed me to complete this interesting study.

Sincerely,

Millicent Stevens

APPENDIX F

STUDENTS' RESPONSES TO QUESTIONS 1-38 OF THE HAQ

## I) Responses to questions pertaining to the process of CHD.

<u>Correct Response</u>	<u>Case</u>	<u>Control</u>	<u>94 Students</u>
1) B	50%	50%	53.2%
7) D	100%	100%	87.2%
8) B	25%	50%	71.3%
10) D	75%	50%	59.6%
12) A	25%	50%	48.9%
14) C	25%	50%	47.9%
15) A	25%	75%	53.2%
17) D	50%	50%	48.9%

## II) Responses to questions pertaining to cardiovascular anatomy and physiology

<u>Correct Responses</u>	<u>Case</u>	<u>Control</u>	<u>94 Students</u>
3) B	50%	75%	71.3%
5) D	75%	75%	75.5%
9) A	75%	50%	46.2%
13) A	100%	75%	89.4%
16) C	0%	50%	38.7%
18) A	75%	100%	76.6%
19) A	25%	75%	84.0%
29) A	100%	75%	91.5%

## III) Responses to questions pertaining to risk factors

<u>Correct Responses</u>	<u>Case</u>	<u>Control</u>	<u>94 Students</u>
<u>Cholesterol</u>			
4) A	100%	50%	78.7%
24) A	50%	100%	88.3%
26) A	75%	100%	60.6%
32) B	100%	50%	57.4%
37) B	25%	50%	71.3%
<u>Diabetes</u>			
30) B	75%	50%	72.3%
<u>Exercise</u>			
27) B	100%	100%	95.7%
31) A	100%	100%	96.8%
<u>Gender</u>			
20) B	50%	75%	79.6%
<u>General</u>			
6) C	100%	50%	86.2%
11) D	75%	100%	71.3%
<u>Hypertension</u>			
25) B	100%	100%	93.6%
36) B	75%	50%	61.7%
<u>Obesity</u>			
21) B	100%	75%	91.5%
22) A	75%	100%	83.0%
35) A	50%	100%	58.5%
<u>Race</u>			
34) A	75%	75%	76.6%

## III) Risk factor responses (continued)

<u>Correct Response</u>	<u>Case</u>	<u>Control</u>	<u>94 Students</u>
<u>Smoking</u>			
2) D	75%	100%	87.2%
23) B	100%	75%	94.7%
33) A	75%	100%	91.5%
<u>Stress</u>			
28) A	100%	75%	94.7%
38) B	0%	0%	21.3%