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SOCIOECONIMIC STATUS AND MODIFABLE RISK FACTORS
FOR CORONARY HEART DISEASE FOR WOMEN
IN NORTHERN MICHIGAN

presented by

Jane M. Denay

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SOCIOECONOMIC STATUS AND MODIFIABLE RISK FACTORS FOR CORONARY HEART DISEASE FOR WOMEN IN NORTHERN MICHIGAN

By

Jane M. Denay

A THESIS

Submitted to
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ABSTRACT

SOCIOECONOMIC STATUS AND MODIFIABLE RISK FACTORS FOR CORONARY HEART DISEASE FOR WOMEN IN NORTHERN MICHIGAN

By

Jane M. Denay

Cardiovascular disease is the leading cause of death in women in the United States. Half of these deaths are due to coronary heart disease. Socioeconomic status has been demonstrated to be a powerful predictor of the development of coronary heart disease. Also, the individual risk factors which predispose women to coronary heart disease have been found to be correlated with socioeconomic status.

This cross-sectional study of women's coronary heart disease risk explores two research questions: (a) what is the extent of the correlation between the individual risk factors for coronary heart disease in women, and (b) what is the impact of socioeconomic status on women's individual risk factors for coronary heart disease. The "web of causation" is the framework through which socioeconomic status will be explored as an antecedent to the more immediate individual risk factors of CHD.

The results of this study found a higher prevalence of individual risk factors for CHD with lower levels of education, lower income, advanced age, and being unmarried. Multiple risk factors were associated with being overweight and having hypertension. Advanced practice nurse implications for community level interventions, directed at ameliorating the impact of socioeconomic status on individual risk factors for coronary heart disease, are discussed.

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This work is dedicated to my family

who have lovingly and faithfully shared my journey.

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Chapter 1

Many women believe cancer is a bigger threat to their health than heart disease (American Heart Association, 1996). However, coronary heart disease (CHD) is the leading cause of death in women in the United States. Annually, 250,000 women die from CHD, while breast cancer claims 43,100 each year, lung cancer 55,900 each year, and all forms of cancer 246,000 each year (American Heart Association). Not surprisingly, coronary heart disease in women has been labeled a "silent epidemic" by the American Heart Association (1992). Beyond mortality, the disability related to CHD affects the quality of life and independence of women in their later years.

The risk factors that predict which women are likely to develop CHD can be categorized into those that can be modified and those which cannot. The latter category includes advanced age and race (American Heart Association, 1996). With increasing age, women have a greater chance of developing CHD; but there is a ten year lag in the onset of CHD in women as compared to men. Thus, while being female is a protective factor until menopause, this benefit diminishes with menopause as well as with the comorbidity of diabetes (Haan, 1996). Race also influences risk of CHD. Black women have a greater risk of CHD than white women, and Native American men and women under 35 years of age have a heart disease death rate twice as high as all other ethnic groups, though this risk for mortality increases less after age 44 (Harris-Hooker &

Sanford, 1994).

Individually based risk factors for CHD that are, at least in principle, amenable to modification include having high cholesterol, being overweight and physically inactive, having diabetes mellitus and hypertension, being a cigarette smoker, and being depressed (Judelson, 1994). Given that these factors are amenable to modification, they need to be a focus of the Advanced Practice Nurse (APN) primary care provider in the prevention of CHD. Prevention of CHD can be approached at three levels: (a) primary prevention to reduce exposure to risks of CHD; (b) secondary prevention to identify early clinical presence of CHD and minimize its progression; and (c) tertiary prevention to reduce morbidity and mortality secondary to CHD. As the individual risk factors have a cumulative effect and precede the clinical presence of CHD by many years, the preponderance of prevention needs to be at the primary level. To further affect primary prevention, the APN will need to appreciate the impact of socioeconomic status (SES) on the individual risk factors for CHD.

SES has long been recognized for its effect on health. In general, lower SES has been linked an increased risk of disease and poorer health outcomes. However, in the case of CHD, the relationship with regard to SES has been changing. Early studies of CHD conducted on men in the 1930's demonstrated that higher SES tended to increase the likelihood of developing CHD in developed countries; in more recent studies this tendency has reversed, with lower SES men having higher rates of CHD (Luepker et al., 1993). For women, excluded from the early studies, there has always been this inverse relationship between CHD and SES (Kaplan & Keil, 1993). Potentially this reflects healthier lifestyles as a result of information based on studies of men.

Thus for APNs, the identification of individuals and populations at high risk for CHD is crucial. With an increased understanding of the variation in individual risk factors for CHD in women based on their SES, interventions, particularly community-based interventions, should be enhanced for primary prevention.

Research Problem

In this study, the researcher examines the impact of socioeconomic status on the individual risk factors for coronary heart disease in women. This research evaluates two research questions: (a) what is the extent of the correlation between the individual risk factors for coronary heart disease in women, and (b) what is the impact of socioeconomic status on women's individual risk factors for coronary heart disease.

Theoretical Framework

The "web of causation," an epidemiological model, provides the framework for this study which examines the relationship of SES to individual risk factors for CHD. The utility of the epidemiological model to this study is twofold: first, it identifies the risk factors for deviation from health, and, second, through the resultant knowledge it offers support for targeted interventions for primary, secondary, and tertiary prevention of CHD. The epidemiological characteristics of a disease include its natural history, the patterns of occurrence, and the risk factors associated with developing the disease. The "web of causation" is a diagrammatic approach which depicts the occurance of disease, and reflects the interrelationship between multiple factors which result in pathogenesis. These factors include: (a) a susceptible host with intrinsic, physical, psychological, and immunity factors; (b) a conducive environment whether social, physical, or biological; and, (c) causative agents which can be either physical, chemical, nutrient, biological,

genetic, or psychological. Additionally, it has been found in diseases which are multifactorial, such as CHD, that synergism, the combined effects of two or more agents, increases the likelihood of onset of the disease (Shortridge & Valanis, 1992). Thus, this model fosters a view of disease as a complex interrelationship with multiple risk factors and not the result of isolated individual factors (Anderson & McFarlane, 1988).

The "web of causation" was first proposed by MacMahon (MacMahon & Pugh, 1970) in response to the emphasis on the oversimplication of epidemiology reflected by the "chain of causation". It was his belief that the "chain" failed to take into account the complex genealogy of disease. In this view, the metaphor of a spider's web captured the complex causal pathways for disease. With an epidemiological emphasis on the direct, individually-based and biologically plausible risk factors of CHD, the utilization of the "web of causation" recognizes conditions which precede these individual risks factors. Thus, by contextualizing these risk factors, the "web of causation" framework can foster an understanding of what factors predispose women to adopt lifestyles which contribute to the development of CHD. The diagrammatic depiction of these relationships, adapted from MacMahon and Pugh, and shown in Figure 1, provides a visual representation of the potential relationships of the risk factors for CHD within the "web of causation" framework and is based on the relationships found in the review of the literature. In this diagram, SES, the independent variable, has non-modifiable and modifiable risk factors. Non-modifiable risk factors are gender, age, and race. Potentially modifiable risk factors are educational achievement, employment status, marital status and household income. The "web of causation" then maps the interplay between the modifiable SES risk factors and the more direct causes of CHD, the modifiable individual risk factors. The individual

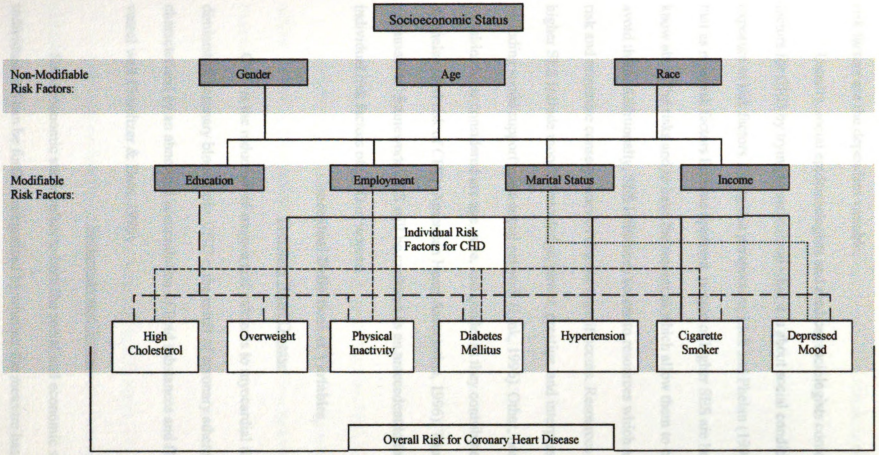

Figure 1 - The "web of causation" for coronary heart disease, demonstrating the relationship between socioeconomic status and individual risk factors

risk factors are the dependent variable.

Usually, social epidemiologists and medical sociologists contextualize risk factors for CHD by trying to understand what it is about social conditions that influence exposure to risk factors. Using this perspective, Link and Phelan (1995) propose that as new risk factors become apparent, people of higher SES are better situated to know about the risks and to have the resources which allow them to engage in efforts to avoid them. Additionally, SES influences access to resources which are used to avoid risk and minimize consequences of disease once it occurs. Resources associated with higher SES include money, knowledge, power, prestige, and interpersonal resources, including social support and a social network (Link, 1996). Other, non-modifiable, variables to be considered are age, race, and gender as they contribute to both SES (Link & Phelan) and risk of CHD (American Heart Association, 1996). Thus, through the "web of causation" framework, SES will be explored as an antecedent to the more immediate individual risk factors of CHD in women.

Conceptual Definitions of Variables

Coronary Heart Disease

CHD is the reduction of oxygen and nutrients to myocardial tissue due to a diminished coronary blood flow. CHD is the result of coronary atherosclerosis which is characterized by an abnormal accumulation of lipid substances and fibrous tissue in the vessel wall (Smeltzer & Bare, 1996).

Socioeconomic Status

Socioeconomic status refers to both the social and economic standing of an individual and can be further categorized by whether the measure has the potential to be

altered or changed. As such socioeconomic status will be treated as either an non-modifiable or modifiable risk for CHD.

Non-modifiable Socioeconomic Risk Factors for CHD

The SES risk factors for CHD which cannot be altered or changed are the unmodifiable risk factors for CHD. These variables include gender, age, and race.

Modifiable Socioeconomic Risk Factors for CHD

The SES risk factors for CHD which can be altered or changed, at least theoretically, are the modifiable risk factors for CHD. These variables, which are commonly used measures to evaluate SES in the epidemiological literature, include education, income, employment status and marital status (Kaplan & Keil, 1993).

Education. Education refers to the number of years of schooling a person has attained.

Employment Status. Employment status refers to "the state of being engaged in services for hire," as defined by Funk and Wagnalls (Landau, 1993, p. 208).

Marital Status. Marital status pertains to the state of being married, which is defined in Funk and Wagnall as "a legal contract, entered into by a man and a women, to live together as husband and wife" (Landau, 1993, p. 397).

Household Income. Household income refers to all taxable income of all household members in one calendar year as filed on a federal income tax return.

Modifiable Individual Risk Factors

Additional modifiable risk factors that can be altered or changed are the individual risk factors for CHD. The individual risk factors considered here are high cholesterol, overweight, physical inactivity, diabetes mellitus, hypertension, cigarette

smoking, and depression.

Cigarette Smoking

The exposure to tobacco smoke through the act of smoking cigarettes.

Hypertension

A higher than normal blood pressure primarily due to an increase in peripheral resistance resulting from vasoconstriction or a narrowing of peripheral blood vessels (Thomas, 1997).

High Cholesterol

An excessive amount of lipoproteins in the blood which infers an increased risk of atherosclerotic plaques in the arterial lumen (American Heart Association, 1997).

Diabetes Mellitus

A chronic disorder of carbohydrate metabolism, marked by hyperglycemia and glycosuria and resulting from inadequate production or use of insulin (Thomas, 1997).

Overweight

According to Healthy People 2000 (U. S. Department of Health and Human Services, 1990) overweight has been defined, for women, as a body mass index of 27.3 kilograms/meters squared or greater.

Physical Inactivity

Healthy People 2000 (U. S. Department of Health and Human Services, 1990) defined physical inactivity as less than three days per week with 30 minutes of moderate exercise.

Depression

The DSM-IV (American Psychiatric Association, 1994) describes "major depressive disorder" as "loss of interest or pleasure in nearly all activities with at least four additional symptoms which include changes in appetite or weight, sleep, and psychomotor activity; decreased energy; feelings of worthlessness or guilt; difficulty thinking, concentrating, or making decisions; or recurrent thought of death or suicide."

Chapter 2

Literature Review

Socioeconomic status has long been identified as a strong determinant of health. Its effect is so strong that it is routinely treated as an independent variable or a control variable in health research. Furthermore, Adler et al (1994) found an inverse, graded relationship between health and all levels of SES from lowest to highest. Thus, at every subsequent higher level on the SES hierarchy, there is an improved health status. These authors propose three possible explanations for this relationship. First, it may be a spurious relationship that is, in fact, rooted in genetically based factors. However, the evidence does not support a biologically driven relationship between SES and health. A second explanation is called the "drift hypothesis" which proposes that poor health results in a lower SES. Though there are examples of this association, such as the individual with schizophrenia whose SES has a declining trajectory as the disease evolves, overall this phenomenon has a limited role in explaining the SES and health relationship. The third explanation is that SES has an effect on the causative agents of disease, which then determines health status. The latter explanation supports application of the "web of causation" framework for explaining the interplay between SES, health, the physical and social environment a person is exposed to, and the health behaviors

which are practiced.

Numerous studies from the United States, Canada and Europe have linked multiple measures of SES with individual risk factors for CHD. One of the early and frequently referenced studies of this relationship is the Whitehall Study by Rose and Marmot (1981). They studied 17,530 male, civil servants in London between ages 40-64 for symptoms, signs, and risk factors related to cardiovascular disease. When men in the lowest employment grade were compared with those in the highest grade, men in the lower grades had more CHD as well as CHD risk factors. They smoked more, exercised less, were shorter and more overweight, had higher blood pressures, and had lower levels of glucose tolerance.

Additional studies done in the United States support the finding of the Whitehall study. In the Hypertension and Detection Follow-up Program (1977), 158,906 black and white adults age 30-69 in 14 communities in the United States were evaluated on blood pressure, weight, and socioeconomic status. This study found education to be inversely related to hypertension for each race and sex group. When overweight was taken into account, the education effect was diminished. Thus, the effect of education operates in part through such factors as weight and dietary choices. Another potential confounder in this study is the variability in quality of education from public to private, from urban to suburban or rural, and from segregated to desegregated. The Minnesota Heart Survey (Luepker et al., 1993) showed that overall CHD risk was strongly related to education in women, with predicted 10-year CHD mortality highest in the least-educated and least-affluent groups. When adjustments were made for effects of education on income and income on education, the strongest association was between education and CHD risks.

Focusing on risk factors for CHD, this study found: (a) strong inverse relationships for both education and income with smoking and hypertension, (b) an inverse relationship between total cholesterol and education but no significant association with income level, and (c) an inverse relationship between education as well as income and women's body mass index.

In the Stanford Five-City Project, Winkleby, Jatulis, Frank, and Fortmann (1992) examined the independent contributions of education, income, and occupation to cardiovascular disease and its risk factors of cigarette smoking, systolic and diastolic blood pressure, total cholesterol and high-density lipoprotein cholesterol. They found that the relationship between the SES measures and these risk factors was strongest and most consistent for education, showing higher risk associated with lower levels of education. Similarly, in a rural New York cross-sectional study of 1,063 persons over age 16, which included 541 women, those women with the least education reported the most atherogenic risk factor profile with elevated blood pressure, total cholesterol, body mass index, and low, high density lipids. The least educated women smoked more, got little physical exercise, and were more angry and depressed (Gold & Franks, 1990).

Women of higher SES were found by Ford et al (1991), in an urban community sample, to spend 26% more time than lower SES counterparts in total daily physical activity which included leisure time, job-related, and household physical activity. Matthews, Kelsey, Meilahn, Kuller, and Wing (1989), found that middle-aged women who had an advanced degree expended 56% more energy per week in nonoccupational physical activities than women with a high school education or less. Reasons for these differences in physical activity among groups must be examined. Are the differences due

to variation in available leisure time, discretionary income, social support, facilities, or psychological variables? Without understanding the cause of less physical activity, it will be difficult to provide appropriate interventions.

In Allegheny County, Pennsylvania, Matthews et al. (1989), conducted a community study of 541 healthy, middle-aged women between the ages of 42-50. To be eligible, women had to be premenopausal and not on medication which would influence CHD risk factors. The researchers found that lower educational levels were significantly associated with an increase in glucose intolerance and higher serum insulin levels. Of the ineligible women, the number taking insulin medication was significantly higher for those women with less education. For those with a high school education or less, 3.9% used insulin medication as compared to 2.8% with some college, none with college degrees, and 1.3% with an advanced degree. These findings are corroborated in data from the National Health Interview Study (Adams & Benson, 1989), which found lower family incomes were associated with increased rates of diabetes.

A prospective, epidemiologic, Canadian study found the rate for major depression was 1.9%, 4.5%, and 12.4% respectively in high, average, and low SES groups (Murphy et al, 1991). These findings were substantiated by Kaplan, Roberts, Camacho, and Coyne (1987) who found higher rates of depressive symptoms among those with lower income and education, as well as Matthews et al. (1989) who found those with the least education scored highest on the Beck Depression Inventory. These studies are contradicted by the DSM-IV (American Psychiatric Association, 1994) which states that "the prevalence rates for Major Depressive Disorder appear to be unrelated to ethnicity, education, income, or marital status."

The Saskatchewan Heart Health Survey, a cross-sectional study conducted in Canada, found that women with the least education, lowest household income, having a nonskilled work classification, and who were unemployed, had the highest prevalence of cardiovascular disease (Reeder, Lui, & Horlick, 1996). Additionally, this study compared urban to rural environment for incidence of cardiovascular disease. It found no significant difference with angina, but women in a rural environment were at greater risk for possible infarction. This difference between urban and rural women could also be a SES effect, a function of education, income, or employment which provides access to resources and health care.

Further studies conducted in Europe also support the inverse relationship between SES and CHD and risk factors for CHD. A prospective study of middle-aged, married, Swedish women found that those with low education had a significantly increased incidence of angina (Lapidus & Bengtsson, 1986). The cross-sectional Tromso Heart Study found higher educated women were less overweight, smoked less, were more physically active and had less atherogenic food habits than the least educated ones. Furthermore, these women had a serum total cholesterol and systolic blood pressure which were negatively associated with educational level (Jacobsen & Thelle, 1986). A Finnish study by Luoto, Pekkanen, Uutela, and Tuomilehto (1994) of cardiovascular risk factors and socioeconomic status found that lower levels of education, occupation, and income were all significantly associated with an unfavorable risk factor profile in women.

Two additional European studies discussed the correlation of multiple risk factors for CHD to lower SES in their reports. The Netherlands Monitoring Project on

Cardiovascular Risk Factors (Hoeymans, Smit, Verkleij, & Kromhout, 1996) found that concurrent risk factors were more prevalent in lower educated groups than in higher educated groups. Similarly, Connolly and Kesson (1996) found a clustering of cardiovascular risk factors for diabetics from lowest SES in Glasgow, Scotland. The proportion of patients with no cardiac risk factors fell by 30.6% from the highest SES to the lowest SES categories, and the proportion of patients with three or more risk factors rose from 8.6% in the highest SES category to 20.2% in the lowest SES category. Specifically, of the highest SES, 30% had a body mass index greater than 30 kg/metered squared compared with 47% in the lowest SES categories; and with regard to smoking, 13% of the highest SES smoked, compared with 33% in the lowest SES.

The effects of the extensive cardiovascular health promotion campaigns, implemented in the United States in the 1980s to improve knowledge on how to reduce the risks of cardiovascular disease, demonstrate the relevance of SES. Davis, Winkleby, and Farquhar (1995) analyzed the changes from 1980 to 1990 in knowledge of acquired cardiovascular risk factors, knowledge of risk-reduction strategies, and interest in risk modification by socioeconomic status using level of education as a measure of SES. Residents of two northern California cities were studied, and participants demonstrated a significant baseline difference in knowledge based on educational level that widened over the 10-year study period. From 1980 to 1990, individuals with less than 12 years of education showed only slight improvement in their knowledge of cardiovascular risk factors whereas those with 16 years or more of education demonstrated twice the improvement in knowledge. Similar differences were found in knowledge of risk-reduction strategies. These findings were contrasted by a high interest in risk

modification at all educational levels that remained uniform across time. This indicates a need to investigate appropriate educational interventions for populations with less than a high school education.

Employment status was considered in two studies of women and CHD. The cross-sectional San Antonio Heart Study found that employed women had significantly higher levels of high density lipids, lower triglycerides, and ate a less atherogenic diet than full-time housewives (Hazuda et al., 1986). These differences were not explained by age, SES, or behavioral mediators (i.e., exercise, caloric imbalance, cigarette smoking, alcohol consumption, or estrogen use). Excluded from this study were full-time students, retired, disabled, or not working but looking for work in the last four weeks. As the sample was selected from three socioculturally distinct neighborhoods including Mexican-American and non-Hispanic white women, it provides important information on the impact of employment on Hispanic women but is limited in its generalizability. Another limitation is that education was not controlled in the analysis, though it may be teased out in the SES measure based on their, or their spouse's, occupational prestige.

The Rancho Bernardo study of 242 women, aged 40-59 years, found employed women were less likely to smoke cigarettes, drank less alcohol and exercised more than unemployed women, and, after adjustment for possible confounders (i.e., age, BMI, estrogen use, alcohol consumption, cigarette smoking, exercise, marital status, education, and social class) employed women had significantly lower total cholesterol and fasting plasma glucose levels than housewives (Kritz-Liverstein, Wingard, Barrett-Connor, 1992). This study is limited by lack of clarification on the variable "unemployment". A woman who is "not employed" implies this status was voluntary whereas "unemployed"

implies this status was involuntary; therefore two very different profiles of "unemployment" may be presented under one variable. A strength of both employment studies is that an analysis was conducted to assure a self-selection bias known as "healthy worker effect" had not occurred.

Marital status has been infrequently discussed in the studies of SES and CHD in women. Hu and Goldman (1990), investigating the relationship between mortality and marital status in 16 developed countries, found that single women have higher death rates than married women, and in the United States, widowed and divorced women have a slightly higher risk of dying than single women. The results of this study may be confounded by a selection bias where the healthier women are more apt to be married. A further limitation is the lack of inclusion of other SES indicators such as income, occupation, and education which may also impact mortality rates. In another study which considered marital status, Luoto et al (1994) discovered that in Finland marital status was not significantly associated with a cardiovascular risk score. The risk factor score included cholesterol, blood pressure, body mass index, cigarette smoking and leisure time activity. In this study the other SES indicators utilized were education, family income, and occupation. Further, women were classified according to their current or previous occupation if they were or ever had been working (most women, 91%) thus limiting employment comparisons with other studies which are generally based on current employment status. The contradiction in the impact of marital status on health between these studies indicates a need to evaluate more carefully the effect of marital status especially in light of sociological changes in the social and economic value of marriage as women are increasingly working outside of the home, providing them with

additional social roles and economic independence.

Critical Discussion

The literature, as reviewed, only partially addresses the major issues in this study in that some of the original research on SES and risk factors for CHD was conducted primarily on males. Though more recent research has included women, these works can be augmented by additional population studies. Strength is shown in the geographic breadth of the literature in North America and Northern Europe, though it is limited in the impact of ethnic and cultural influence, providing mixed generalizability within the cultural diversity found in the United States. Furthermore, the comparative impact of SES on individual risk factors for CHD when evaluated within any nation's health care delivery system and economic paradigm, remain unexplored. This could be especially important as the SES disparity between the lowest and highest levels increases in the United States.

Another limitation in the research on risk factors related to lifestyle is the possible bias in such data due to under-reporting related to the stigmatization of the behavior or its outcome. This under reporting may be further confounded by SES. Women of higher SES, who are found to be better informed about risk factors for CHD, may be more inclined to report their risk factors conservatively. Thus, the self-report data on smoking, weight, and physical inactivity must be viewed as conservative estimates of the actual behavior or its outcome, especially among higher SES strata.

The preponderance of research on the relationship of SES to CHD risk factors is focused on four measures of SES - education, employment, occupation, and income. Of these, education had the strongest relationship to all the individual risk factors for CHD

in women. Marital status, which demonstrated an impact on mortality but failed to impact individual risk factors, needs to be evaluated for an interaction effect; the effect on individual risk factors may present differently when marital status is combined with age, education, employment, and income for analysis.

Though the literature is replete in identifying the negative impact of lower SES on individual risk factors for CHD it is inadequate in offering interventions for primary, secondary, and tertiary interventions which go beyond the focus of the simplistic "chain of causation" to the multifactorial "web of causation".

Chapter 3

Methods

Research Design

This study represents a non-experimental, cross-sectional, correlational design. The goal of the study is to develop a CHD risk profile for women with different SES in Northern Michigan in order to facilitate the planning of preventive interventions; thus, manipulation would be inappropriate. The correlational design is necessary since the research has been conducted after the variation in the independent variable has occurred without manipulation, in the natural setting. Thus, a causal relationship cannot be definitely established using a correlational design. Rather, an interrelationship may be identified between two variables, meaning, as one variable varies there is a tendency for the other variable to vary.

The data is cross-sectional as it was collected at one point in time throughout the 21 counties of the Northern Lower Peninsula of Michigan. Polit and Hungler (1995) propose that cross-sectional designs are valued for their practicality. Cross-sectional designs are also relatively economical and easy to manage. They are well suited for describing the status of a phenomenon or the relationship among phenomena at a fixed point in time. However, the disadvantage of the cross-sectional design is the limited

ability to make causal inferences.

Sample

The Northern Michigan Community Health Assessment survey involved a stratified random sample. The sampling design used was Survey Sampling's equal probability of selection method (EPSEM) (Information Transfer Systems, Inc., 1995). This design allowed for equal probability of selection within each county, but not across counties, and thus resulted in the completion of 300 interviews within each of the 21 counties, for a total of 6,300 interviews. The total number of interviews completed with women was 3,746.

The sample frame was all residential telephone numbers ringing into households in the 21 counties of interest that fell into known banks of working residential numbers. Within each sample household, the adult respondent was randomly chosen from all resident adults 18 years of age or older. Exclusion criteria included households occupied by short-term vacationers (staying fewer than 3 weeks per year at the household reached).

When a residential number was successfully contacted, the household members 18 years of age or older were listed: men were listed from oldest to youngest, and women were then listed in the same way. A random number was then generated based upon the total number of adults living in the household, and this number was used to choose one adult from the list to be interviewed. This in effect created a second layer of stratification within the sample.

Data Collection and Recording

Data was collected from mid-July, 1995, through the beginning of September, 1995. Information Transfer Systems, Inc. of Ann Arbor, Michigan, conducted this survey

for the Northern Michigan Community Health Assessment Survey. Data was collected using computerized telephone survey software and data entry. The portion of the survey used in this study is included as Appendix A.

Ethics

No individual identifying characteristics were included in the data coding process. Approval for secondary data analysis for this study by this researcher was obtained from Michigan State University's University Committee on Research Involving Human Subjects and from Northern Michigan Hospital-Burns Clinic Foundation before obtaining the data set and conducting the research (see Appendix B).

Operational Definition of Variables

The operational definition of the variables in this study reflect the survey instrument used to gather the data for the Northern Michigan Community Health Assessment Survey and the recoding of the original data in preparation for data analysis.

Non-modifiable Risk Factors

The non-modifiable socioeconomic risk factors were operationalized as follows:

1. Sex was self-reported as male or female. Only female participants were included.

2. Age was self-reported as age in years.

3. Race was self-defined and coded as: 1- White, 2 - Black or African American, 3 - Asian, 4 - Native American Indian, and 5 - Other. Because of the lopsided distribution, race has been recoded into: 0 - Black or African American, Asian, Native American Indian, or Other, and 1- White.

Modifiable Socioeconomic Risk Factors

The modifiable socioeconomic risk factors were operationalized as follows:

1. Education was coded in two ways. For a frequency count, education was coded: 1- sixth grade or less, 2 - eleventh grade or less, 3 - high school graduate or GED, 4 - some college, 5 - college graduate, 6 - some graduate school, masters, or doctorate. For the regression analysis, educational achievement was coded as number of years of formal education.

2. Employment status for frequency was coded: 1 - Employed for wages, 2 - Self-employed, 3 - Out of work for more than one year, 4 - Out of work for less than one year, 5 - Homemaker, 6 - Student, 7 - Retired, 8 - Unable to work. For the multivariate analysis, employment status was coded: 0 - not employed, not in the labor market, 1 - employed for wages, self-employed.

3. Marital status was coded: 0 - divorced, widowed, separated, never married, or member of an unmarried couple, 1 - married.

4. Household income was the stated annual household income or 999,997 if greater than $999,999 from all sources before taxes in 1994.

Modifiable Individual Risk Factors

The individual risk factors were operationalized as follows:

1. Cigarette smoking was defined as smokes cigarettes now or has smoked daily within the last three years and is coded: 0- nonsmoker or has not smoked within the last three years or 1- smoker.

2. Hypertension was defined as having been told by a doctor, nurse, or other health professional within the past two years that they have high blood pressure and was

coded: 0 - without hypertension, or 1- has hypertension.

3. High cholesterol was defined as having been told by a doctor, nurse or other health professional within the past two years that their blood cholesterol is too high and was coded: 0 - without high cholesterol, or 1 - high cholesterol.

4. Diabetes mellitus was defined as having been told by a doctor, nurse or other health professional within the past three years that they have diabetes, not including gestational diabetes, and was coded: 0 without diabetes, or 1 - diabetes.

5. Overweight, which was calculated from self-reported current weight and height and coded as: 0 - body mass index less than 27.3 kilograms/meters squared or 1 - body mass index greater than or equal to 27.3 kilograms/meters squared.

6. Physical inactivity was coded: 0 - gets at least 30 minutes of moderate exercise three or more days per week, or 1- gets 30 minutes of exercise less than three days per week.

7. Depressed mood was coded: 0 - "not depressed" if a respondent answers "some of the time or little of the time" to has been downhearted and blue and "all of the time, most of the time, a good bit of the time, some of the time" to has been a happy person in the past four weeks, or 1- "depressed" if a respondent answers "all of the time, most of the time, or a good bit of the time" to has been downhearted and blue and "a little of the time or none of the time" has been a happy person in the past four weeks.

8. Risk factor profile a simple count of all identified individual risk factors (high cholesterol, overweight, physical inactivity, diabetes mellitus, hypertension, cigarette smoker, or depressed mood) resulting in a possible score of 0 to 7.

9. High risk for CHD based on the risk factor profile, a dichotomous variable

constructed by dividing the sample into high risk and low risk groups as determined by the risk factor profile. High risk for CHD was coded: 0 - none or one individual risk factor for CHD, or 1 - two or more individual risk factors for CHD.

Data Analysis Procedures

Statistical data analysis was performed using the statistical analysis program SPSS for Windows 7.0 (Norusis, 1996). To evaluate the first research question concerning the extent of the correlation between the individual risk factors for coronary heart disease in women the Pearson's r was utilized. Pearson's r is typically used for interval level data or higher; however, in the case of dichotomous variables, its use is also acceptable as it is mathematically identical with phi or the point bisectional correlation coefficients.

To answer the second research question regarding the impact of SES on the individual risk factors, multiple logistic regression models were employed. The multivariate analysis teases out the effect of the SES variables on individual risk factors and the overall risk for CHD. This offers a fuller explanation of the variation in the occurrence of each individual risk factor (the outcome variable) and allows for the examination of independent effects of several simultaneous independent variables. The independent variables to be entered into the logistic regression equation are the non-modifiable SES variables of gender, age, and race as well as the modifiable SES variables of education, employment, marital status and income with each dependent variable. The dependent variables are the individual risk factors for CHD (high cholesterol, overweight, physical inactivity, diabetes mellitus, hypertension, cigarette smoker, and depressed mood) and the overall risk for CHD. The logistic regression

model allows an examination of the extent to which each SES variable acts and interacts through the individual risk factors to affect risk of CHD.

Chapter 4

Results

Demographics

The 21 counties surveyed represent a rural area with the largest city being Traverse City, with a population of 15,040, C. Schlueter of Northwest Michigan Council of Governments (personal communication, February 20, 1998). Unique to this rural area is the influence of a resort economy based on summer and winter recreational activities, as well as the characteristics of the residents from resort communities where there can be a significant population of retired and higher SES individuals, especially during the summer months when the survey was conducted.

Socioeconomics

The sample for this study consisted of 3,746 women age 18-97; the mean age was 51 years. The race distribution of the sample was 97.9 % white, 0.1% black, 0.3% Asian, and 1.2% American Indian. The demographics for the SES variables included education, employment status, marital status, and annual household income are as follows. The highest educational achievement of the sample respondents was: 1.0% had a grade school education, 12.8% some high school, 42.9% a high school education, 26.4% had some college, 10.4% a bachelors degree, and 6.6% a graduate education.

Employment status found 40.4% employed for wages, 7.1% self-employed, 2.9% out of work, 16.6% homemakers, 1.6% students, 26.7% retired, and 4.6% unable to work. When this variable was recoded to "employed" and "not employed", these were 47.5% and 52.5% respectively. Of the not employed, 50.94% were retired. Marital status showed 60.4% were married and 39.4% were unmarried. Unmarried were, not surprisingly, heavily concentrated at either end of the age spectrum with those under age 24 and those over age 72 least likely to be married. The median annual household income was $26,000. The reported range of income was none to greater than $999,997. The above demographics are shown in Tables 1 and 2.

Table 1 - Demographics/Socioeconomic Information About Sample Respondents

Demographics		Valid%
Age N = 3746	18-29 years	12.0
	30-39 years	18.3
	40-49 years	17.8
	50-59 years	15.7
	60-69 years	16.6
	70-79 years	13.7
	80-89 years	4.9
	90-99 years	1.0
Race N = 3658	White	97.9
	Black	0.1
	Asian	0.3
	American Indian	1.2

Table 2 - Demographic/Socioeconomic Information About Sample Respondents

Demographics		Valid %
Education N = 3741	Grade School	1.0
	Some High School	12.7
	High School	42.9
	Some College	26.4
	Bachelors Degree	10.4
	Graduate Education	6.6
Employment Status N = 3743	Employed for Wages	40.4
	Self-Employed	7.1
	Homemaker	16.6
	Student	1.6
	Retired	26.7
	Out of work	2.9
	Unable to work	4.6
Marital Status N = 3740	Married	60.4
	Unmarried	39.4
Annual Household Income N = 2829	≤ $9,999	9.8
	$10,000 - $19,999	15.8
	$20,000 - $29,999	14.4
	$30,000 - $39,999	11.5
	$40,000 - $49,999	8.0
	$50,000 - $69,999	9.7
	$70,000 - $89,999	3.3
	≥ $90,000	3.0

Individual Risk Factor

The frequencies for the individual risk factors are based on the valid data for each risk factor and which include having high cholesterol, being overweight and physically inactive, having diabetes mellitus and hypertension, being a cigarette smoker, and having

a depressed mood. High cholesterol was reported in 39.1% of the respondents with a valid response; however, there was a large amount of missing data as 39.4% of the sample did not have a valid response to the cholesterol question. The BMI ranged from 12.2 - 76.8 kg/meters squared for the sample, with the mean BMI being 25.99 kg/meters squared; 33.6% of the sample were overweight with a BMI of 27.3 kg/meters squared or greater. Physical inactivity was found in 17.8% of the sample who got less than 30 minutes of exercise a day fewer than 3 days of the week. Diabetes mellitus was found in 7.7% of the respondents, while 92.3% had not been told they had diabetes. Those who had been told they had diabetes may be too few as the standards for checking glucose and the serum glucose level for the diagnosis of diabetes have become more conservative since this data was collected. Hypertension was reported by 32.1%. Of the respondents 56.9% were current cigarette smokers or had smoked in the last three years while non-smokers accounted for 43.1%; however, 50.6% of the sample did not respond to this question. A depressed mood was reported by 5.6% of the sample. The frequencies for the individual risk factors are shown in Table 3.

Table 3 - Frequencies for Individual Risk Factors

Individual Risk Factors	Valid N	% Yes	% No
High Cholesterol	2271	39.1	60.9
Overweight	3650	33.6	66.4
Physically Inactive	3700	17.8	82.2
Diabetic	3352	7.7	92.3
Hypertensive	3448	32.1	67.9
Smoker	1852	56.9	43.1
Depressed Mood	3725	5.6	94.4

Research Questions

Due to the large amount of missing data on high cholesterol and cigarette smoking, a subset of selected cases was used to answer the research questions. Of the 3,746 respondents only 996 responded to all individual risk factors. Thus a subset of 996 cases with no missing data on any one of the seven individual risk factors for CHD was created.

In answering the first research question, "what is the extent of the correlation between the individual risk factors for coronary heart disease in women," Pearson's correlations were computed on the subset of 996 women for whom data was available on all risk factors. There were significant ($p \leq 0.01$), though weak, correlations among several individual risk factors (see Table 4). The strongest correlations were between overweight and hypertension ($r = .172$), overweight and diabetes mellitus ($r = .196$), and hypertension and high cholesterol ($r = .183$). The greatest number of positive and significant ($p \leq 0.01$) correlations were found with being overweight and having hypertension. Being overweight was correlated with having high cholesterol ($r = .100$), being physically inactive ($r = .108$), having diabetes mellitus ($r = .196$), having hypertension ($r = .172$) and being depressed ($r = .092$). Having hypertension was correlated with having high cholesterol ($r = .183$), being overweight ($r = .172$), having diabetes mellitus ($r = .131$), and being depressed ($r = .097$). Still, overall, these correlations were weak and suggest that these individual risk factors occur quite independently from each other. At least within this population, they do not form strong clusters.

Table 4 - Pearson Correlations and Significance Levels of the Relationships Between All Pairs of Individual Risk Factors for CHD

Pearson Correlation Sig. (2-tailed)	High Cholesterol	Overweight	Physically Inactive	Diabetes Mellitus	Hypertension	Cigarette Smoker	Depressed Mood
High Cholesterol	r = 1.000 P = .						
Overweight	r = .100** P = .001	r = 1.000 P = .					
Physically Inactive	r = .076* P = .016	r = .108** P = .001	r = 1.000 P = .				
Diabetes Mellitus	r = .066* P = .037	r = .196** P = .000	r = .098** P = .002	r = 1.000 P = .			
Hypertension	r = .183** P = .000	r = .172** P = .000	r = .023 P = .460	r = .131** P = .000	r = 1.000 P = .		
Cigarette Smoker	r = -.108** P = .001	r = -.073 P = .021	r = .011 P = .740	r = -.055 P = .080	r = -.121** P = .000	r = 1.000 P = .	
Depressed Mood	r = .076* P = .017	r = .092** P = .004	r = .079* P = .012	r = .037 P = .243	r = .097** P = .002	r = .122** P = .000	r = 1.000 P = .

N = 996

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

In testing the second research question "what is the impact of socioeconomic status on women's individual risk factors for CHD," the subset used in the first research question was again utilized and logistic regression models were run twice for each dependent variable. The first logistic regression was computed with all socioeconomic variables entered - age, race, education, employment status, marital status and income. Then a second logistic regression model was established without income entered, increasing the number of selected cases from 756 to 996. This was done because 240 of the 996 cases in the subset had missing data on income. The results are reported in Tables 5-11, for each dependent variable, both with and without annual household income as an independent variable.

High cholesterol, shown in Table 5, was best predicted by age with a 2.8% reported increase in the odds of having high cholesterol with each additional year. When income was excluded, higher education decreased the risk of high cholesterol with the odds declining by more than 6% for each additional year of schooling.

Table 5 - Logistic Regression: Socioeconomic Predictors of High Cholesterol

High Cholesterol	Wald	Significance	Adjusted Odds Ratio	Wald	Significance	Adjusted Odds Ratio
Age	19.5346	.0000	1.0276	23.2290	.0000	1.0263
Race	.2048	.6509	.7792	1.3599	.2436	.5675
Education	3.2837	.0700	.9358	4.8419	.0278	.9366
Employment	.2460	.6199	.9120	.6501	.4201	.8772
Marital Status	1.6799	.1949	1.2492	2.3311	.1268	1.2382
Income	1.2185	.2696	.9592			

N = 756
Chi-Square Significance .0000
Predicted Correct 60.32%

N = 983
Chi-Square Significance .0000
Predicted Correct 59.61%

Overweight, shown in Table 6, was significantly predicted by income with the odds decreasing more than 18% for each additional $1000 of household income. However, with income excluded, each additional year of schooling decreases the risk of being overweight by 7.5%.

Table 6 - Logistic Regression: Socioeconomic Predictors of Overweight

Overweight	Wald	Significance	Adjusted Odds Ratio	Wald	Significance	Adjusted Odds Ratio
Age	1.8142	.1780	1.0083	.4836	.4868	1.0037
Race	.6204	.4309	.6517	1.1605	.2814	.6018
Education	.2009	.6540	.9832	6.5310	.0106	.9248
Employment	.0166	.8974	1.0254	.8456	.3578	.8582
Marital Status	2.9300	.0869	1.3579	.4627	.4963	.9084
Income	20.5751	.0000	.8149			
	N = 756			N = 983		
	Chi-Square Significance .0000			Chi-Square Significance .0138		
	Predicted Correct 65.08%			Predicted Correct 66.43%		

Physical inactivity, shown in Table 7, was predicted most strongly by education with the odds of physical inactivity decreasing by 11% for each additional year of schooling, then income, which decreases the risk of inactivity 12% for each additional $1,000 of household income, and age, which increases the odds of inactivity by 1.6% for each additional year. When income was excluded, physical inactivity was predicted by education alone with lower education predicting greater physical inactivity.

Table 7 - Logistic Regression: Socioeconomic Predictors of Physical Inactivity

Physical Inactivity	Wald	Significance	Adjusted Odds Ratio	Wald	Significance	Adjusted Odds Ratio
Age	4.2601	.0390	1.0159	3.0684	.0798	1.0118
Race	.0123	.9119	1.0779	.0252	.8738	.9112
Education	6.3076	.0120	.8905	10.1560	.0014	.8874
Employment	.0356	.8504	1.0464	1.0902	.2964	.8016
Marital Status	1.0973	.2948	1.2540	.3076	.5791	.9079
Income	5.2459	.0220	.8824			

N = 756
Chi-Square Significance .0000
Predicted Correct 81.35%

N = 983
Chi-Square Significance .0001
Predicted Correct 81.89%

Diabetes mellitus, shown in Table 8, was also best predicted by advanced age with the odds increasing 3.3% for each additional year. Income lowered the odds of diabetes with a 15% decrease in risk for each additional $1,000 of income. When income was excluded, the risks of diabetes mellitus decreased 11% for each additional year of schooling.

Table 8 - Logistic Regression: Socioeconomic Predictors of Diabetes Mellitus

Diabetes Mellitus	Wald	Significance	Adjusted Odds Ratio	Wald	Significance	Adjusted Odds Ratio
Age	8.5374	.0035	1.0327	6.3276	.0119	1.0244
Race	.2509	.6165	1.7078	.4517	.5015	2.0367
Education	1.2495	.2636	.9361	6.2166	.0127	.8880
Employment	.1925	.6608	.8593	3.5305	.0603	.5509
Marital Status	.8344	.3610	1.3023	.2359	.6272	.8924
Income	4.1185	.0424	.8512			

N = 756
Chi-Square Significance .0000
Predicted Correct 90.48%

N = 983
Chi-Square Significance .0000
Predicted Correct 90.84%

Hypertension, shown in Table 9, was best predicted by age with the odds of having hypertension increasing by 3% with each additional year. When income was excluded, both higher education and being married decreased the risk of hypertension.

Table 9 - Logistic Regression: Socioeconomic Predictors of Hypertension

Hypertension	Wald	Significance	Adjusted Odds Ratio	Wald	Significance	Adjusted Odds Ratio
Age	22.4561	.0000	1.0313	33.4176	.0000	1.0338
Race	.0115	.9145	1.0646	.0626	.8025	1.1411
Education	.0573	.8108	1.0090	3.9658	.0464	.9404
Employment	1.6161	.2036	.7790	1.1936	.2746	.8280
Marital Status	.3994	.5274	.8940	3.8345	.0502	.7543
Income	3.4275	.0641	.9273			

N = 756
Chi-Square Significance .0000
Predicted Correct 65.08%

N = 983
Chi-Square Significance .0000
Predicted Correct 65.01%

Cigarette smoking, shown in Table 10, was most strongly predicted by age. The odds of smoking declined by almost 5% for each additional year of age. Income, the second strongest predictor of smoking status, lowered the odds of smoking by 14% for each additional $1,000 of household income. Similarly, each additional year of education decreased the odds of smoking by almost 12%. And, finally, marital status affects smoking status with being married reducing the odds of smoking by 29%. In the logistic regression without income as a predictor, age and education of the respondent remain predictors of similar strength and magnitude. However, with income excluded, marital status reduces the odds of smoking by 46%. Typically the household income of married couples tends to be higher than that of single or widowed persons, thus marital status seems to "absorb" the income effect.

Table 10 - Logistic Regression: Socioeconomic Predictors of Cigarette Smoking

Cigarette Smoker	Wald	Significance	Adjusted Odds Ratio	Wald	Significance	Adjusted Odds Ratio
Age	50.2369	.0000	.9543	73.8127	.0000	.9512
Race	.1795	.6718	1.2762	.2666	.6056	1.3108
Education	10.6028	.0011	.8823	32.3572	.0000	.8313
Employment	1.2488	.2638	1.2381	.9576	.3278	1.1771
Marital Status	3.8255	.0505	.7072	17.1037	.0000	.5442
Income	14.1664	.0002	.8607			

N = 756
Chi-Square Significance .0000
Predicted Correct 65.08%

N = 983
Chi-Square Significance .0000
Predicted Correct 65.51%

Depressed mood, shown in Table 11, is predicted by age when income is included with a more than 2% decline in the odds of reported depressed mood for each year older. However, when income is excluded, depression is predicted by education with a 14% decrease in the odds for each additional year of schooling.

Table 11 - Logistical Regression: Socioeconomic Predictors of Depressed Mood

Depressed Mood	Wald	Significance	Adjusted Odds Ratio	Wald	Significance	Adjusted Odds Ratio
Age	4.0066	.0453	.9796	2.6790	.1017	.9847
Race	.2384	.6254	1.6819	.4200	.5169	1.9789
Education	2.4927	.1144	.8971	7.6927	.0055	.8580
Employment	.0073	.9319	1.0293	.0667	.7962	.9245
Marital Status	.6790	.4099	.7736	3.0233	.0821	.6422
Income	3.6643	.0556	.8483			

N = 756
Chi-Square Significance .0137
Predicted Correct 92.46%

N=983
Chi-Square Significance .0277
Predicted Correct 92.98%

Comparing the effects of socio-demographic characteristics on the seven individual CHD risk factors, certain patterns stand out: (a) education has a consistent negative effect on the risk factors, i.e., respondents with more formal education experience generally lower odds of having any of the seven CHD risk factors, (b) while advanced age raises the odds of hypertension, high cholesterol, diabetes mellitus, and physical inactivity, it lowers the odds of being a smoker, (c) the income effect is consistently negative - higher income leads to lower CHD risks. The other SES characteristics - race, employment status, and marital status, by and large, did not predict CHD risks in this study population..

When overall CHD risk was regressed on SES, shown in Table 12, lower income was the most significant predictor, followed by advanced age and lower education. When income was excluded, lower education was the most significant predictor of high risk for CHD, followed by advanced age and being unmarried. Thus, the odds of having two or more individual risk factors decline with younger age, higher education, and higher household income but remain unaffected by race, employment, and marital status.

Table 12 - Logistic Regression: Socioeconomic Predictors of High Risk for CHD

High Risk for CHD	Wald	Significance	Adjusted Odds Ratio	Wald	Significance	Adjusted Odds Ratio
Age	5.9088	.0151	1.0151	4.9543	.0260	1.0116
Race	.7882	.3747	.5739	1.3954	.2375	.5294
Education	4.0131	.0451	.9273	26.0593	.0000	.8536
Employment	.0084	.9272	1.0173	.4096	.5222	.9030
Marital Status	.2005	.6544	1.0814	4.0056	.0453	.7575
Income	24.9004	.0000	.8242			

N = 756
Chi-Square Significance .0000
Predicted Correct 64.29%

N = 983
Chi-Square Significance .0000
Predicted Correct 62.26%

Relationship of the Results to the Review of the Literature

The findings of this study support most strongly the findings found in the review of the literature in relationship to the second research question. The results of the first research question, "to what extent are multiple risk factors for coronary heart disease in women correlated with each other," provided limited support for the findings reported in the literature. Whereas the literature generally reports individual risk factors for CHD, such as diabetes, overweight, and smoking to be correlated, the analysis found only weak correlations among diabetes, overweight, and hypertension. Though overall the literature was lacking in studies pertaining to the correlation of individual risk factors for CHD, this void was supported by this analysis which found only weak correlations among individual risk factors implying that the individual risk factors vary independently. These results suggest that individual risk factors for CHD need to be independently assessed.

However, when comparing the literature and the results of this study on the second research question, "impact of socioeconomic status on women's individual risk

factors for coronary heart disease," the similarities were numerous and, generally, the findings concurred with the literature. Education and income were the strongest determinants of individual risk factors for CHD. Of interest in this study, employment status did not have any significant relationship with individual risk factors for CHD. In contrast, the review of the literature found unemployment to be related to lower high density lipids, higher triglycerides, higher total cholesterol, more atherogenic diets, and higher plasma glucose levels. One possible explanation for this discrepancy is the high percentage of the not employed women who were so categorized because of their retirement status or their being homemakers. This made it difficult to tease out the effect of unemployment separate from age and income. Differences were also found in the impact of marital status. The literature found marital status to be related only to depressed mood. This study found the state of being unmarried to be associated with having hypertension, being a cigarette smoker, and having a high risk profile for CHD when income was excluded. Marital status may, in effect, be "absorbing" the effect of income, thus the relationship with marital status is likely to be spurious.

Chapter 5

Discussion

Limitations

This research is subject to limitations based on the instrument, sampling methods, missing data, data processing errors, and generalizability. And, as this study utilized secondary data, the researcher was required to work within the constraints of the original research.

The limitations of the instrument included omission of important data, a potential for bias in self-report interviews, limitations in comparability of responses, reliability and validity of the variables measured, and dependence on the interviewee having independently received recent and appropriate health screening. Important SES data which was omitted from the instrument is occupation; this would have captured much more information as a variable than simply knowing employment status.

The potential for bias in self-report is found particularly in the variables overweight, physical inactivity, and cigarette smoker. These biases may be further skewed according to SES group, with the higher SES groups being more prone to false reports; this may be due to an increased awareness of social unacceptability of these lifestyle behaviors for their SES. This bias may have affected the results in higher SES

groups by an under report of weight, refusal to respond to cigarette smoking question, and an overestimate of physical activity.

The responses for education are somewhat limited in their valid comparability across respondents as they account only for years of formal education and are not sensitive to the quality of the formal education achieved; furthermore, the responses do not account for informal education or generational differences in educational attainment.

The measurement of the variables "depressed mood" and "physical inactivity" possibly lack validity and likely lack reliability. Depressed mood contains two questions related to mental health from the Medical Outcomes Study 36-item short-form (MOS SF-36): (a) Have you felt downhearted and blue? and (b) Have you been a happy person? (Ware & Sherbourne, 1992). These two question refer to only one symptom, mood, of the eight diagnostic symptoms for depression in the DSM-IV (American Psychiatric Association, 1994). In addition to the potential for bias in the self-report for physical inactivity, self-report is also subject to individual interpretation as to what constitutes moderate activity.

Finally, the measurements of high cholesterol, diabetes mellitus, and hypertension, were dependent on the interviewee having independently received recent health care with appropriate screening and follow-up. This could be confounded further by access to health care, which in turn is influenced by SES.

An additional limitation was possible data processing errors or missing data. This was especially problematic for the variables annual household income, high cholesterol, and cigarette smoker. Under household income, for example, it was found that 1.4% of the respondents had an income greater than or equal to $125,000 and going up to more

than $1,000,000. As this seemed unlikely, a cross-tabs procedure was done to compare income and education. The researcher determined that of these high incomes, 24 cases had a reported education level of some college or less; this level of education generally does not correspond to very high incomes. Though indeed these incomes may have been accurate the researcher judged that there may have been a data processing error, possibly an additional zero, inflating the annual household income; therefore, for the purpose of this study, these incomes were adjusted by dropping the assumed additional zero in 24 cases. Also puzzling was the lowest level of income where annual incomes as low as zero dollars were reported. As state welfare programs provide for the most needy, reports of no income at all are improbable and were likely the result of a misunderstanding of "earned income" vs. "welfare" with the annual household income question, possibly indicating a need in the instrument to more carefully explain and question household sources of income during the data collection process.

The variables of high cholesterol and cigarette smoking status contained a large number of cases with missing data. The cholesterol variable, with only 60.6% valid responses, was cross tabulated with age. For younger respondents (aged 40 years or less) the invalid responses consistently exceeded 50%. Similarly, for the question about cigarette smoking, 50.6 % of the cases had missing responses. However, these missing responses were not related to the respondents' age. Confounding the issue of missing data further was the potential effect of other socio-demographics on the missing data. The treatment of this missing data created a statistical analysis conundrum. Which would be the greater error: (a) having a sampling bias by eliminating the cases with missing data; or (b) having a model bias by excluding the variables with large amount of missing

data? The researcher elected to err with sampling bias and to focus on the subset of the sample in which only the cases with complete data on all seven individual risk factors were accepted.

The sampling methods may have also resulted in problems with random selection and stratification of the sample. Random selection is threatened as telephone penetration rates vary with SES. According to the Federal Communication Commission (1997), telephone penetration rates are lower for Blacks, Hispanics, and Native Americans, households with a higher number of persons in the household, younger householder age, unemployment, and lower income. In Michigan in 1995, the year the survey for this study was conducted, 95.3% of the households had telephones; however in households with an annual income of $9,999 or less, telephone penetration rates dropped to 87.6% (Federal Communication Commission, 1997). Thus lower income and particularly Native American persons may have been under represented in this sample based on telephone surveys. Stratification of the sample occurred when selecting the interviewee based on the ratio of women to men living in a home and when there was more than one phone in a home.

Generalizability was limited in at least two ways by the geographical location of this sample. First, the survey was conducted in a rural area. Second, this rural area had pockets of resort communities which were occupied by summer residents during the time when the survey was completed. When combined, these two factors created a unique disparity in SES. The sample may have had lower SES individuals based on the rural character of the area and the lower paying seasonal jobs characteristic of a resort economy. Yet, within this sample is a concentration of retired individuals and higher SES

individuals based on the attraction of living in resort communities for those who are economically mobile.

A potential limitation of the data analysis was the management of marital status and being a member of an unmarried couple. The definition for being married was "a legal contact, entered into by a man and a women, to live together as husband and wife." As operationalized in the study a member of an unmarried relationship was placed into the unmarried category together with divorced, widowed, separated, or never married. However, being in an unmarried relationship - especially if it is a long-term, stable relationship - could indeed confer the same social support as being married. In this sample 2.2% of the respondents were in an unmarried relationship thus this limitation would have had a minimal effect on the results.

Implications for Advanced Practice Nurse

To direct the implications for the APN the "web of causation" has been revised to reflect the findings of this study. The significant SES predictors for individual risk factors for CHD were advanced age, as a non-modifiable risk factor, and lower education, being unmarried and lower household income, as the modifiable risks factors, these relationships are shown in Figure 2. Further, the revised "web of causation" demonstrates the relationships between the individual risk factors.

Utilizing the "web of causation" to contextualize the complex relationship between SES and individual risk factors for the onset of CHD in women, the APN is directed to extend her/his scope of practice beyond primary care and the individual to the broader community, from the individual risk factors to conditions which precede and correlate to them. The APN must use interventions which incorporate political activity

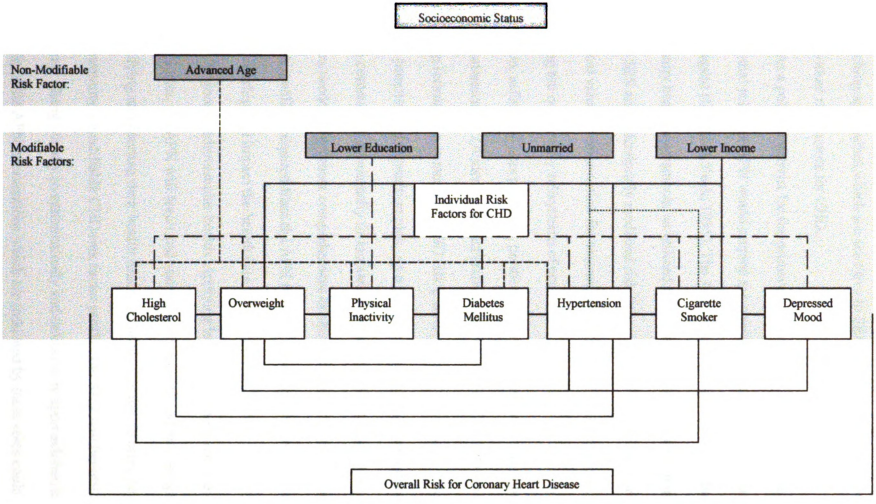

Figure 2 - The "web of causation" for coronary heart disease for women in Northern Michigan, demonstrating the relationships between socioeconomic status and individual risk factors as well as the relationships between individual risk factors

and teaching approaches which are sensitive to SES to lessen the link between SES and the individual risk factors for CHD.

As a political activist for the primary prevention of CHD at the community level, the essential roles the APN would employ are assessor, planner, leader, educator, and change agent (Givens & Peek, 1995). The APN must begin by assessing the community. Community health assessments, as utilized in this study, provide core community data to identify SES and behaviorally mediated risk factors for CHD within the community. Additional valuable information for community assessment could be gleaned from analyzing the community subsystems of economics, recreation, physical environment, education, safety and transportation, politics and government, health and social services, and communication (Anderson & McFarlane, 1988). Combined, this diverse information will help formulate a community CHD risk profile, identify community resources, and direct a community intervention plan. As a planner, the APN will work in collaboration with the community, to mutually formulate community CHD oriented goals and identify resources needed to promote comprehensive cardiovascular health for women. Leadership will be required from the APN to facilitate groups in forming common goals; thus, leadership will impact the health care and community systems which create the climate for good cardiovascular health. Applying learning theories and learning methods, as an educator, the APN will teach and assist the community and all appropriate groups in identifying and meeting their health education needs. Finally, to bring positive changes in a community's modifiable CHD risk factor profile, the APN will benefit from employing change theory to systematically and deliberately approach barriers to health.

Specific APN interventions which are indicated by these roles could take place at

all levels of government, the public health department, the educational system, the work site, and the community infrastructure.

The APN needs to be aware of national and state policies which effect the provision of health care and the distribution of income. With knowledge that lower SES results in an increase in individual risk factors, the APN needs to be aware of social policies that increase the economic disparity in the SES hierarchy and lobby for more egalitarian social policies.

With education, of all the SES measures, having been demonstrated as the measure having the greatest impact on individual risk factors for CHD, the APN must support initiatives which provide access to quality education at the primary, secondary, and collegiate levels in the state and community. This includes supporting the provision of alternative education programs for the students at high risk for dropping out. Also, lobbying for funding of adult education programs which offer graduation equivalency diplomas (GED) is necessary as well. Additionally, both public and private schools are ideal targets for programs aimed at promoting healthy cardiovascular lifestyles as the individual risk factors for CHD are behaviorally mediated patterns which begin in childhood and youth.

The APN will need to work with public health departments to reduce barriers to health education. To reach low literacy groups, utilization of videotape teaching materials has been demonstrated to be more effective than written materials (Meade, McKinney, & Barnas, 1994). These videotapes would be available at primary care clinics as well as public health departments in conjuction with programs such as Women, Infant, and Children (WIC), Maternal Support Program, Breast and Cervical Clinics, and

Immunization Clinics which target the lower SES population. A further community strategy using audiovisual educational materials will require campaigns that spread the cardiovascular health information through the mass media, especially TV and radio, through use of public service announcements.

Worksite wellness programs have also been found to be an effective means of promoting cardiovascular health in adults (O'Quinn, 1995). Within the worksite, the APN can offer health promotion programs which use peer role models to demonstrate healthy lifestyles. This would be especially effective for lower SES groups for whom role models have been lacking.

Furthermore, the APN needs to be involved with the local government advocating the provision of community facilities which promote cardiovascular health by providing visible and safe places to engage in aerobic exercise year round. In Northern Michigan, this might include paths for bicycling and walking, wilderness areas with trails for hiking, snowshoeing and cross-country skiing, and community accommodations for sports and recreation.

Implications for Future Research

The findings of this study, as they apply to the "web of causation" as previously shown in the revised "web" (Figure 2), reinforce the error of approaching individual risk factors for CHD in isolation from SES risk factors and offer potential questions for future research. What educational interventions are appropriate for population with less than a high school education? What is the interaction effect of marital status on individual risk factors for CHD in women when combined with the variables of age, education, employment, and income? Are there additional variables to be considered in the "web of

causation" that are secondary to SES but precede the individual risk factors such as feeling of self-efficacy, perception of vulnerability, knowledge of CHD risk factors, and access to health care. Finally, a further study of SES and individual risk factors for CHD in women that incorporates sampling methods which do not under represent the lowest income and Native American persons is indicated.

Summary

Knowledge of the relationship between SES and the individual risk factors for CHD makes it incumbent upon the APN to go beyond individual risk factor interventions in primary care to community interventions through political activism in order to be effective in the primary prevention of CHD in women. This activism will take the APN into the arena of local, state and national government, as well as the educational system, worksite wellness programs, public health initiatives, and the mass media.

APPENDICES

APPENDIX A

Instrument

QAGE
What is your age?
___ Years
DK
REF

QGEN
GENDER OF RESPONDENT: DO NOT ASK UNLESS UNSURE
"Just to be sure, I need to ask whether you are male or female."
1. Male
2. Female
DK
REF

Q10.C
How much of the time during the past four weeks have you felt DOWNHEARTED AND BLUE? Would you say:
1. ALL OF THE TIME
2. MOST OF THE TIME
3. A GOOD BIT OF THE TIME
4. SOME OF THE TIME
5. A LITTLE OF THE TIME
6. NONE OF THE TIME/NEVER (DO NOT READ #6)
DK
REF

Q10.D
How much of the time during the past four weeks have you been a HAPPY PERSON? Would you say:
1. ALL OF THE TIME
2. MOST OF THE TIME
3. A GOOD BIT OF THE TIME
4. SOME OF THE TIME
5. A LITTLE OF THE TIME
6. NONE OF THE TIME/NEVER (DO NOT READ #6)
DK
REF

Q23
About how long has it been since you last had your blood pressure taken by a doctor, nurse or other health professional?
_____ DAYS, WEEK, MONTHS, YEARS
DK
REF

Q24
Have you ever been told by a doctor, nurse or other health professional that you have high blood pressure?
1. YES
2. NO
DK
REF

Q25
Blood cholesterol is a fatty substance found in the blood. Have you ever had your blood cholesterol checked:
1. YES
2. NO --> Q.28
DK --> Q.28
REF

Q26
About how long has it been since you last had your blood cholesterol checked?
____DAYS, WEEKS, MONTHS, YEARS
DK
REF

Q27
Have you ever been told by a doctor, nurse or other health professional that your blood cholesterol is too high?
1. YES
2. NO
DK
REF

Q28
Have you ever been told by a doctor, nurse or other health professional that you have diabetes?
1. YES
2. NO
DK
REF

QWGT
About how much do you weight without shoes?
____WEIGHT IN POUNDS ROUND FRACTIONS UP
DK
REF

QTALL
About how tall are you without shoes?
____ FEET, ____INCHES

QMODEX
In an average week, on how many days out of seven do you get 30 MINUTES or more of AT LEAST MODERATE exercise, over the course of the entire day? Brisk walking and moving somewhat heavy materials are examples of moderate exercise. This exercise can take place over one 30 minute period or even over as many as four periods of 7 or 8 minutes each.
____NUMBER OF DAYS PER WEEK GET AT LEAST MODERATE EXERCISE
DK
REF

Q41
Do you smoke cigarettes now?
1. YES
2. NO
DK
REF

Q43
How long has it been since you last smoked cigarettes regularly, that is, daily?
____DAYS, WEEKS, MONTHS, YEARS
DK
REF

QRACE
What is your race? Would you say:
1. WHITE
2. BLACK or AFRICAN AMERICAN
3. ASIAN, PACIFIC ISLANDER
4. AMERICAN INDIAN, ALASKA NATIVE or
5. Are you a MEMBER OF SOME OTHER RACIAL GROUP (SPECIFY)
DK
REF

QMARR
Are you:
1. MARRIED
2. DIVORCED
3. WIDOWED
4. SEPARATED
5. Have you NEVER BEEN MARRIED, or are you
6. A MEMBER OF AN UNMARRIED COUPLE?
DK
REF

QEDUC
What is the highest grade or year of school that your have completed?
00. NEVER ATTENDED SCHOOL, OR KINDERGARTEN ONLY
01-11. ENTER GRADES 1 THROUGH 11
12. HIGH SCHOOL GRADUATE OR GED
13 -15. ENTER SOME COLLEGE
16. COLLEGE GRADUATE
17. SOME GRADUATE SCHOOL
18. MASTERS
19. DOCTORATE
DK
REF

QINC
What was your ANNUAL HOUSEHOLD income for all sources before taxes in 1994?
____ ANNUAL HOUSEHOLD INCOME IN 1994
999,997=999,997 OR MORE
DK
REF

APPENDIX B

Study Approval Letters

NORTHERN
MICHIGAN
HOSPITAL
◆
BURNS CLINIC
Foundation
360 Connable Avenue
Petoskey, Michigan 49770
616/487-4800
Fax: 616/487-7798

INSTITUTIONAL REVIEW BOARD

October 30, 1997

Jane M. Denay, RN, BSN

Thank you for your letter of October 14, 1997 pertaining to the your thesis entitled "Socioeconomic status and modifiable risk factors for coronary heart disease for women in northern Michigan".

Your letter indicates that you need to have written consent from our agency (the Northern Michigan Hospital Burns Clinic Foundation). You also state in your letter that you will need access to the Community Health Assessment data set in the future.

Your request for written consent is hereby granted along with access to the data set.

Sincerely,

Robert Sloan, MBA
Director of Research
Northern Michigan Hospital Burns Clinic Foundation

MICHIGAN STATE
UNIVERSITY

December 8, 1997

TO: Manfred Stommel
A-230 Life Sciences Building

RE: IRB#: 97-788
TITLE: SOCIOECONOMIC STATUS AND MODIFABLE RISK FACTORS FOR CORONARY HEART DISEASE FOR WOMEN IN NORTHERN MICHIGAN
REVISION REQUESTED: N/A
CATEGORY: 2-H
APPROVAL DATE: 11/25/97

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/ CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,

David E. Wright, Ph.D.
UCRIHS Chair

DEW:bed

cc: Jane Denay

OFFICE OF
RESEARCH AND GRADUATE STUDIES

University Committee on Research Involving Human Subjects (UCRIHS)

Michigan State University
246 Administration Building
East Lansing, Michigan
48824-1046

517/355-2180
FAX: 517/432-1171

The Michigan State University IDEA is Institutional Diversity: Excellence in Action.

MSU is an affirmative-action,

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