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A Comparison Study on Heart Disease Among North Carolinians and Robesonians

A Thesis

Presented to

The Chancellor's Scholars Council of
The University of North Carolina at Pembroke

In Partial Fulfillment

Of the Requirements for Completion of
The Chancellor's Scholars Program

by

Christina Locklear

April 13, 1999

Faculty Advisor Harold D. Maxwell

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Introduction

What is heart disease? In layman's terms a nurse specializing in heart disease at Vaxjo Hospital, Sweden, once defined it as a disease of one or all of the following: the coronary vessels, the heart muscles, valves of the heart, or electrical systems of the heart. She also said that the disease occurs as a result of a person's lifestyle, age, or heredity. One is not inflicted with heart disease overnight. Instead, heart disease gradually invades the heart's muscles and vessels. For example, someone who suffers from hypertension may eventually develop heart disease in years to come. Hypertension can make the heart and blood vessels weaker than they would normally be. Therefore, hypertension can lead to heart disorders. One disorder resulting from hypertension, is the narrowing of the coronary vessels. As the coronary vessels start to narrow, complete blockage of the vessel can occur from fatty deposits of cholesterol known as plaque. The plaque in the coronary vessels can make the vessels hard, which is commonly referred to as the hardening of the arteries. As the arteries harden and become blocked with fatty lipids, oxygen rich blood cannot travel through the coronary vessels in the needed abundance to supply the heart muscles with the necessary oxygen and nutrients. Since the lack of oxygen in heart muscle ultimately leads to the "death" of that muscle, a heart attack, or a myocardial infarction, occurs. The percentage of blockage in the vessels determines the severity of the heart attack that takes place. Once a muscle of the heart "dies," it cannot be replaced or reformed surgically or physiologically. Therefore, if a person does not die from the effects of a heart attack, his or her heart must continue to beat without the help of the now "dead" muscle (Thibodeau, 1992 and Prairie Public Broadcasting, 1997). As

can be seen from the aforementioned sequence of events, the hardening of the coronary vessels, heart disease, develops gradually and eventually can result in a myocardial infarction.

Heart disease is a prominent disease among the American population. Globally, the USA "has one of the highest" rates for coronary heart disease (Joseph, 1994, p. 56). Heart disease is the single largest cause of death in the US, killing over 600,000 people each year and effecting 50,000,000 Americans (DNWHIC, 1995, p.1). "The most common cause of death among older persons, as well as the total population, is heart disease, which accounts for almost 42% of all deaths in the 65 and older population" (Brock, 1990, p.11). Research has revealed that heart disease was the leading cause of death for the male population and the female population each year from 1970 to 1993. A decline in the occurrence of heart disease was noticed in the male and female populations from 1970 until 1979. After 1979, until 1993, the decrease in the occurrence rate of heart disease mortality in the female population was not as rapid as that of the male population. The decrease in mortality as a result of heart disease in the female population was 23%, as opposed to the 30% mortality rate of the male population (DNWHIC, 1995, p.1). Although, the mortality rate as a result of heart disease has declined over the years, the prominence of heart disease is still a reality in every state of the United States of America.

North Carolina is one of the many states of the United States of America that suffers greatly from the prevalence of heart disease. Research has revealed that an amazing 20,000 North Carolinians die as a result of heart disease each year. In addition,

a study "based on dismal old facts" says that North Carolina is ranked as second in the United States for mortality rates as a result of heart disease. Additional research by the North Carolina Center for Health Statistics has greatly emphasized the reality of North Carolina's high rate of heart disease. After reviewing death certificates of deceased North Carolinians for the 1997 calendar year, the State Center for Health Statistics found that overall 150.1 people out of 100,000 people died as a result of some form of heart disease. With these ideas in mind, one might conclude that there is a possibility that some counties in the state may display a mortality rate higher than the state rate of 150.1 per 100,000 as a result of heart disease. On the contrary, mortality as a result of heart disease may be lower than the state average in other counties. With these ideas in mind one might ask, "In North Carolina, what factors effect the rate of mortality as a result of heart disease, from one county to another?"

One factor that effects the heart disease rate for a particular county would be the various ethnic backgrounds of the county's population. For example, recent studies have revealed that 71% of the African American population has high blood pressure, a higher percentage than the 60% of adults in the Caucasian population (Jones and Mitchell, 1993, p.2). Seigfried J. Kra, M.D., F.A.C.P., author of *What Every Woman Must Know About Heart Disease*, says "African Americans suffer from more hypertension and are more prone to heart attacks than the White population." Seigfried J. Kra, M.D., F.A.C.P., then asks, "Is it because blacks are generally poorer and therefore have less access to medical care? Is it because they tend to eat more salty foods and cook with less expensive saturated fats such as lard? Is it because of some genetic biological differences? With

these questions at hand, it is necessary to note that the same thoughts could be applied to other minority groups, such as Native Americans and Hispanics that reside in various counties of North Carolina. After all, the socioeconomic status of Native Americans and Hispanics is usually similar to that of African Americans. Kra goes on to say "we cannot make any sweeping generalizations about ethnicity and heart disease risks until solid studies are completed"(Kra, 1996, p. 52). According to the previous information, a county with diverse ethnic backgrounds (a high population of different racial groups), would be expected to have a higher death rate as a result of heart disease, than a county consisting mostly of Caucasians. One such county that can be studied to draw conclusions about the effects of heart disease on Caucasians, and different minority groups is Robeson County, North Carolina.

Robeson County consists of approximately 38,000 Caucasians, 26,000 Native Americans, and 41,000 African Americans (Herald Sun, 1998). Also, many Hispanics have immigrated to Robeson County to find work as farm hands, factory workers, etc. Heart disease is rampant in Robeson County among Caucasians (Whites), Native Americans, African Americans, and Hispanics. One resource from the Robeson County Health Department suggests that there is no known study that reveals which ethnic group suffers the most from the great American "killer", heart disease.

Aim of the Study:

In comparing the occurrence rate of heart disease among Caucasians, and Minorities of Robeson County, the aim of this study is to discover which population has the highest occurrence rate of heart disease.

Questions at Issue:

- What are specific types of heart disease?
- How does the mortality rate, as a result of heart disease, in Robeson County compare with the state statistics for the mortality rate as a result of heart disease?
- What are the occurrence rates of heart disease among Robesonian Caucasians, and minority groups as a whole?
- If the occurrence rate among each Robesonian minority group and Caucasians can be determined, among which ethnic group is heart disease most prevalent?
- What role does heredity play in a person's chances of developing heart disease?
- What measures can a person practice to prevent the development of heart disease?

Method

The information in this report is the product of research that took place in Pembroke, North Carolina. The research occurred over an eight month period, from September 1998 until April 1999. The writing of this thesis is necessary to meet the requirements for graduating a Chancellor's Scholar at the University of North Carolina at Pembroke (UNCP). The data for this study was obtained from literature, North Carolina Government Documents on microform, the internet, the Southeastern Regional Medical Center Clinics (SRMC clinics), and from a previous field study conducted in Vaxjo, Sweden.

To obtain literature references, I used the on-line card catalog in the Sampson-Livermore Library, located on the campus of UNCP. I searched the on-line catalog for any books pertaining to heart disease by typing in "heart disease" at the "keyword" icon. Next, I selected books that dealt with ethnicity and heart disease. I also found North Carolina Government Documents on microform displaying mortality statistics from heart disease. The types of government documents needed were those from the North Carolina State Center for Statistics. A source from the Robeson County Health Department, and a source from the North Carolina State Center for Health Statistics, were helpful in giving me information about these documents. In addition, to obtain information needed for this study I searched the internet, via the Yahoo Search internet site. I searched the internet for information concerning heart disease in Robeson County and North Carolina. All information searched for was obtainable. Next, I called local

family practice clinics seeking accessibility to medical records in an effort to determine the relationship of heart disease to race, and the number of heart disease cases for any given clinic. Access to these records was denied due to the breach of confidentiality. Finally, I contacted a source at the Southeastern Regional Medical Center (SRMC). He, along with others in the department, granted me the information I needed from the Southeastern Regional Medical Center Clinics. Information about heart disease diagnosis and the race for each diagnosis came from the diagnosis databank of SRMC's clinics in St. Pauls, Red Springs, Rowland, and Fairmont, North Carolina. Finally, some information in this report comes from a field study I performed in Vaxjo, Sweden, during the Spring Semester of 1998. While I participated in an exchange program between Vaxjo University, and UNCP, one class I attended was "Intercultural Perspectives on Health." In the class, we were required to conduct a field study. I chose to research and compare heart disease cases and treatment in Sweden as opposed to the United States of America. Information I obtained from the interview of a heart disease nurse and a heart disease physical therapist, from Vaxjo Hospital, Sweden, appear when necessary in this report.

I chose not to distribute questionnaires for this study due to the broad range of different types of heart diseases. Also, I would have needed to contact several people from all four racial groups in Robeson County in order to analyze their diets. After all, diet does play a major role in the development of heart disease. I also chose not to mention the names of individuals I used as sources for obtaining information needed in this report. This decision was partly due to the permission needed to mention their names

in this report. However, all professional sources are truly employed by Southeastern Regional Medical Center, the North Carolina State Center for Health Statistics, and the Robeson County Health Department. In the event any further investigation concerning this report is necessary, names, job titles, and addresses may be rendered.

Conducting the research needed to investigate and answer the questions at issue is surely a tedious process. However, all separate resources of information combine well to expend a great deal of information about heart disease in Robeson County, as compared with North Carolina as a whole.

Results

Heart disease can be categorized into many different types. Various examples of heart disease are Coronary Heart Disease, Valvular Heart Disease, Congenital Heart Disease, and Heart Muscle Disease (Sivasubramanian, 1998 , p.1) These examples of heart disease are briefly explained below:

- *Coronary Heart Disease*

The most dominant disease among adults, Coronary Heart Disease evolves over time as the arteries begin to narrow as a result of fatty build-up, otherwise known as atherosclerosis. (In this category you would find heart attacks and angina.)

- *Valvular Heart Disease*

The aortic, pulmonic, tricuspid, and mitral valves of the heart may be weakened as a result of a "degenerative disease" due to age. It is common for the heart valves to narrow and begin to leak as Valvular Heart Disease invades the valves.

- *Congenital Heart Disease*

Birth defects result in abnormalities of the heart, leading to congenital heart disease. (An example of a complication due to Congenital Heart Disease, would be a "hole in the heart."

- *Heart Muscle Disease*

The heart muscles weaken as a result of prolonged heart disease, and are unable to complete their duties in the function of the heart. The end result of Heart Muscle

Disease is heart failure.

(Sivasubramanian, 1998, p.2)

North Carolina and Heart Disease

Various types of heart diseases kill many North Carolinians each year, and the North Carolina State Center for Health Statistics keeps a record of these mortality rates. One of the many employees of the State Center for Health Statistics, suggested that he analyzes death certificates, and records the cause of death for each deceased individual. As a result, all those who are deceased due to heart disease are further categorized into a specific category of heart disease. The Department of Health and Human Services, a division of the North Carolina State Center for Health Statistics, made available the information obtained from death certificates across the state. The report was titled "North Carolina Detailed Mortality Statistics: 1997." In the report race was represented by (W), White North Carolinians, and (M), the North Carolinian Minority population. It is important to note that 90% of the minority population in North Carolina is predominantly black (North Carolina State Center for Statistics, 1998, p.iii). The report serves as an excellent basis for comparing the mortality rates, due to specific types of heart disease, among Whites (Caucasians), and Minorities.

The "North Carolina Detailed Mortality Statistics: 1997" report stated that 19,265 North Carolinians died as a result of heart disease in 1997. Also, 5,658 of these deaths were the result of an Acute Myocardial Infarction (Acute M.I.) and 6,927 of these deaths occurred because of Ischemic Heart Disease (North Carolina State Center for Health

Statistics, 1998, p. vi). Although this information is easily understood, one must study the report to observe the large number of deaths due to many specific types of heart disease. The total number of deaths in the white and minority populations should be associated with the specific heart disease that initiated death. The following chart was derived from the "North Carolina Detailed Mortality Statistics: 1997" report:

Disease of the Heart	Total Number Of Deaths	White Male	White Female	Minority Male	Minority Female
• Diseases of the Mitral And Aortic Valves	25	7	17	0	1
• Hypertensive Heart Disease	714	148	264	135	167
• Ischemic Heart Disease	12,585	5,563	4,588	1,244	1,190
• Acute Myocardial Infarction	5,658	2,482	2,127	514	535
• Coronary Atherosclerosis	2,022	809	803	201	209
• Cardiomyopathy	901	349	271	166	115
• Hypertrophic Obstructive Cardiomyopathy	15	5	7	2	1
• Congestive Heart Failure	1060	281	563	73	143
• Total Number of Deaths for each Category	22,980	9,644	8,640	2,335	2,361
Total Number of Deaths Among Whites		Total Number of Deaths Among Minorities			
18,284		4,696			

Table 1: The information represented here was obtained from pages 68-77 of the "North Carolina Detailed Mortality Statistics: 1997" Report. *Note: The diseases represented here are only eight of the numerous kinds of heart disease recorded in the report.*

As can be seen from Table 1 most deaths in North Carolina, as a result of heart disease, were due to Ischemic Heart Disease. In fact, there were more than twice as many deaths as a result of Ischemia, than the second leading cause of death in Table 1, Acute Myocardial Infarction. There was a total of 40 deaths due to diseases of the Mitral and Aortic Valves and Hypertrophic Obstructive Cardiomyopathy, a figure less than the latter.

Robeson County vs. North Carolina: Mortalities As A Result Of Heart Disease

Although the mortality rates as a result of heart disease, that were recorded across the state are interesting, it is important to note the mortality rate in Robeson County from heart disease. From the year 1993 until 1997, the total number of Robesonians who died from heart disease was 1,604. In 1997 alone, 338 Robesonians died as a result of heart disease (Scholl, 1998, p.1). As can be seen, the Robesonian mortality rate, as a result of heart disease, is an impressive figure. To further acknowledge the predominance of heart disease in Robeson County, Robesonian mortalities resulting from Ischemic Heart Disease and from Acute Myocardial Infarction, the two leading causes of death in Table 1, can be compared to North Carolina.

The North Carolina State Center for Health Statistics researched Robesonian death certificates from 1996 and 1997. The focus of the study was to discover mortality rates as a result of heart disease at a rate per 100,000 Robesonians. The following chart displays Robeson County's occurrence rate for heart disease in general, Ischemia and Acute Myocardial Infarction along with North Carolina's occurrence rates for the same diseases:

Robeson County Rate per 100,000 Robesonians					North Carolina Rate per 100,000 North Carolinians			
Cause Of Death	White Male	White Female	Minority Male	Minority Female	White Male	White Female	Minority Male	Minority Female
Total # of Deaths from Heart Disease	246.6	118.0	291.1	170.5	195.3	94.6	268.8	148.1
Acute M.I.	113.3	50.7	125.0	65.7	73.5	32.2	78.3	44.0
Ischemic Heart Disease	87.5	40.0	101.0	56.3	71.6	29.7	91.0	42.5
Total Number of Robesonian Deaths from Heart Disease					Total Number of North Carolinian Deaths from Heart Disease			
826.2					706.8			
Whites		Minorities			Whites		Minorities	
364.6		461.6			289.9		416.9	
Total Number of Robesonian Deaths from Acute M.I. and Ischemic Heart Disease					Total Number of North Carolinian Deaths from Acute M.I. and Ischemic Heart Disease			
639.5					462.8			
Whites		Minorities			Whites		Minorities	
291.5		348.0			207.0		255.8	

Table 2: The information here was obtained from "Community Diagnosis 1997" Report distributed to The Robeson County Health Department in 1998 by the North Carolina State Center for Health Statistics. The data was collected from death certificates from the years of 1996 and 1997. *Note: The diseases represented here are only two of the many kinds of heart disease recorded in the report.*

According to the study, more Robesonian Minorities died as a result of heart disease than Robesonian Whites. More minorities died as a result of an Acute

Myocardial Infarction and Ischemic Heart Disease than Robesonian Whites. In every category listed in Table 2, the total deaths were higher in Robeson County when compared with the state as a whole. Even the Robesonian White populations had a higher incidence of death from Acute Myocardial Infarction, Ischemic Heart Disease, and other kinds of heart disease, than North Carolinian Whites as a whole. To be more specific, overall 84.5/100,000 Robesonians died as a result of an Acute Myocardial Infarction compared to the 51.8/100,000 North Carolinians dying from the same cause. Overall, 67.2/100,000 Robesonians died as a result of Ischemia; a figure greater than the 50.67/100,000 North Carolinians who died from Ischemia. Finally, the total rate for heart disease in Robeson County is 198.0/100,000 Robesonians. The total rate for Heart Disease in North Carolina is 150.1/100,000 North Carolinians. In summary, the overall occurrence rate of heart disease, whether it be noticed from cases of Acute Myocardial Infarction or Ischemic Heart Disease, is greater than that of North Carolina as a whole (Community Diagnosis, published by the North Carolina State Center for Health Statistics, 1998).

In Robeson County a total of 1,465.7 people died from heart disease, 656.1 Whites and 809.6 Minorities. The total number of deaths in North Carolina, from the diseases listed in Table 2, was 1169.6. The number of North Carolinian Whites that died from the diseases in Table 2 was 496.9, and the number of North Carolinian Minorities that died from the same diseases was 672.7. There are more deaths, as a result of heart disease, in Robeson County in comparison with the State of North Carolina. The reason this number is higher, may be due to the high number of minorities in Robeson County as

compared with Robesonian Whites. One source stated that there are 38,000 Whites, 26,000 African Americans, and 41,000 American Indians in Robeson County (Herald Sun, 1998). When considering the large number of Hispanics also living in Robeson County, it is necessary to recognize Robeson County as a county high in ethnic diversity. However, in the reports compiled by the North Carolina State Center for Health Statistics, neither North Carolinian or Robesonian African Americans, American Indians, or Hispanics were separated into 3 separate minority categories. Instead, all the populations previously mentioned were placed into one common category: Minority. It is important to note any difference in the occurrence rate of heart disease among American Indians, African Americans and Hispanics, specifically in Robeson County. One feasible way to attempt to measure the occurrence rate of heart disease among the four major races of Robeson County (White, Black, American Indian, and Hispanic), is by assessing patient medical records, and screening them for a particular heart disease. Screening for particular types of heart disease is important since the category of heart disease is too general to apply to medical records. Also, it is important to assess medical records from a facility that renders medical care to a large portion of Robeson County.

Heart Disease Diagnosis In Robeson County

The four clinics of Southeastern Regional Medical Center are dispersed across Robeson County, and therefore, serve as a good databank for the screening of medical records. Southeastern Regional Medical Center has clinics located in Fairmont, St. Pauls, Red Springs and Rowland, North Carolina, all of which are located in Robeson County.

The diagnosis databank for these clinics were screened for the following heart diseases: Valvular Heart Disease, Congenital Heart Disease, Heart Muscle Disease (CHF), Ischemic Heart Disease, and the occurrence of Myocardial Infarctions. Also, each type of heart disease was compared with the race of the patient to which it applied. The results of the screening are shown here:

Diagnosis	Race	Number of Patients Found With Specified Diagnosis
Congestive Heart Failure	Black	15
	American Indian	10
	White	15
	Hispanic	2
Congenital Heart Disease	Black	0
	American Indian	0
	White	1
	Hispanic	1
Myocardial Infarction	Black	0
	American Indian	1
	White	0
	Hispanic	0
Total Number of Patients Diagnosed With Heart Disease		45
Total Number of Minorities Diagnosed With Heart Disease		29
Total Number of Whites Diagnosed With Heart Disease		16

Table 3: The information here represents those patients seen from October 1, 1998 until February 28, 1999. *Note: No Cases of Valvular Heart Disease or Ischemic Heart Disease were treated during this time period in the SRMC clinics.*

Table 3 represents the results found when the Southeastern Regional Medical Center (SRMC) Clinical Diagnosis Database was screened. As mentioned earlier in this report, the database was screened for Valvular Heart Disease, Congenital Heart Disease, Heart

Muscle Disease (CHF), Ischemic Heart Disease, and the occurrence of Myocardial Infarctions. However, when the database was searched for visits to SRMC's clinics from October 1, 1998 until February 28, 1999, only CHF (a form of Heart Muscle Disease), Congenital Heart Disease and the occurrence of Myocardial Infarctions were found among patient medical records. As can be seen in Table 3, a total of 45 patients were treated for a form of heart disease. Sixteen patients of the 45 patients with heart disease were White. Therefore, 29 patients were Minorities. Three Hispanics, 11 American Indians, and 15 Blacks had heart disease of some form. It is interesting to note that most cases of heart disease found in the databank were as a result of Congestive Heart Failure, a subcategory of Heart Muscle Disease. Although the information found from the clinics made clear the dominance of Congestive Heart Failure, the data was inconclusive in my quest to find the dispersion of heart disease among the races of Robeson County. The reasons the data has proven to be inconclusive is as follows:

- The number of heart disease cases found was not large enough to measure a true dominance of heart disease in one race as compared with another.
- There were 29 minorities found with heart disease as opposed to 16 Whites. This ratio reflects Robeson County's population which is one-third White, and two-thirds Minority.
- The data from the clinics yields only a small number of Robesonians with heart disease (45), as compared with the total 13,800 visits to SRMC's clinics. (*Note: Of the 13,800 visits to SRMC'S clinics, some of the visits where patients returning to the*

clinics on a two to several occasions for "check-ups", various illnesses, etc.)

Heart disease in Robeson County must not be omitted from our concerns as being a major health threat. The statistics mentioned earlier, those published by the North Carolina State Center for Health Statistics, reveal the dominance of the disease in Robeson County. However, until today's date, according to an expert in Community Diagnosis from the Robeson County Health Department, and an expert in Mortality Statistics at the North Carolina State Center for Statistics, there is no published or reported study that divides heart disease among the many races in Robeson County.

Although there is no published scientific study in Robeson County that measures the prolonged occurrence of heart disease from one race to another, there is scientific evidence that suggests heart disease can be viewed on a hereditary basis. Therefore, depending on a person's race, he or she maybe predisposed to heart disease due to heredity. Heredity, and it's role in the promotion of heart disease among individuals, can be further studied and analyzed using Genetic principles and research.

Heredity and Heart Disease

Genetics began over one hundred years ago with Gregor Mendel who analyzed the segregation of pea shapes. Mendel used his research and observations of pea shapes to show "...what genes might be," according to Richard Lifton, M.D., HHMI Investigation at Yale University School of Medicine. (Richard Lifton, M.D., Ph.D. Lecture: Telldales Genes: Charting Human Disease). Later a geneticist, by the name of Thomas Hunt Morgan, found that chromosomes were similar in behavior to what Mendel discovered gave rise to different pea shapes. Therefore, you can relate chromosomes to

traits. Chromosomes have two main components: DNA and Proteins. DNA is a genetic material composed of genes. Proteins code for genes. As a protein is coding for a gene, occasionally a mutation, a heritable gene alteration, occurs (Hartle, 1998, p.15). A genetic mutation, and the gene on which it resides interacts with the physiology of humans to cause disease (Richard Lifton, M.D., Ph.D. Lecture: "Telldales Genes: Charting Human Disease"). A genetic mutation, and a poor blood supply to the heart, can lead to the development of heart disease (Christine Seidman, M.D. Lecture: Braveheart the Circle of Life).

Geneticists are now trying to identify the approximately 100,000 genes found in the human genome. At the molecular level, 824 genes for human disease have been identified. When a disease gene is identified, the utilization of the identification is very significant. Disease gene identification provides insight into the way a particular disease works. Also, by identifying specific disease genes, individuals who are susceptible to the development of a particular disease can be identified. Disease gene identification "sets targets and pathways" for new therapies for the disease to be developed. Finally, the identification of disease genes results in the "tailoring and treatment" of abnormalities, not yet pronounced in affected individuals. Therefore, further investigation of the human disease genome will render great advantages to the treatment of those susceptible to a specific disease (Richard Lifton, M.D., Ph.D. Lecture: "Telldales Genes: Charting Human Disease").

It is important for individuals to be diagnosed before the development of a disease to help in the treatment of that disease. One such disease that should be diagnosed before

full development is heart disease. In the event a family recognizes a pattern of heart disease development, from one generation to another, the family should seek medical advice in receiving diagnostic testing to pin-point heart disease in the present generation. There is a general procedure used in the laboratory for diagnosing heart disease in individual family members. This procedure is known as Linkage Analysis. DNA is first made from actual blood of family members. Next, the scientist finds which chromosome segment contains the genes that are contributing to Heart Disease. Then, the scientist must work from that chromosome segment to approach an individual gene causing disease. Finally, family members that have a mutation on the gene for a particular kind of heart disease can be identified before they display hypertension or a myocardial infarction (Richard Lifton, M.D., Ph.D. Lecture: "Telldates Genes: Charting Human Disease).

An example of an inheritable disease that can be diagnosed prior to its expression is Hypertrophic Cardiomyopathy. Cardiomyopathy results from gene mutations and is associated with abnormalities within the myocyte cells of the heart. In the lecture "Heartbreak: Of Mutation and Maladies," Christine Seidman, M.D. remarks that the myocyte cell is "...the most important cell within the human heart." However, this "important cell" expresses histological abnormalities in Hypertrophic Cardiomyopathy. The myocyte cell has an abnormal large size. As a result, the mass of the heart is increased. Also, people with Hypertrophic Cardiomyopathy have enlarged heart chambers, increasing intraventricular volume. However, the size and structure of the heart wall are not enlarged to compensate for the increased size of the heart chambers.

Hypertrophic Cardiomyopathy , the end result of many problems stemming from enlarged myocyte cells, is the most common cause of sudden death in young athletes. A vast majority of people suffering from Hypertrophic Cardiomyopathy exhibit some symptoms associated with the disease, but not all. (Symptoms include chest pains, shortness of breath, and palpitations). Usually, the most obvious symptoms have serious consequences such as heart failure, and even sudden death (Christine Seidman, M.D. Lecture: "Heartbreak: Of Mutations and Maladies).

Molecular Genetics is currently serving as an avenue to understand the causes Hypertrophic Cardiomyopathy. In the clinical setting, a family with a history of Hypertrophic Cardiomyopathy are questioned about the family history of the disease, and any symptoms associated with the disease they have experienced. Also, family members may undergo routine physical exams and their heart rhythms may be observed by the use of an electrocardiogram (EKG). Then a blood sample may be taken from a family member(s) to undergo Linkage Analysis. *(Note: Linkage Analysis, and a brief, generalized description of the procedure was mentioned earlier in this report.)*

Christine Seidman, M.D. revealed information about linkage analysis that she found interesting after performing the procedure on a family with a history of Hypertrophic Cardiomyopathy. She suggested that the myosin heavy chain gene, a component of a sarcomere, was mapped to chromosome #14 and mutated to every individual in a French Canadian family. Dr. Seidman noted, however, that the chromosome location for the mutation that causes Hypertrophic Cardiomyopathy is not the same in all families. She also noted that genetic heterogeneity is a common characteristic of Hypertrophic

Cardiomyopathy. In other words, not one gene, but many genes are mutated to yield a similar genotype of Hypertrophic Cardiomyopathy. This genetic mutation, which occurs in the gene sequence of the sarcomere, is referred to as a missense mutation (Christine Seidman M.D., Ph. D. Lecture: "Heartbreak: Of Mutations and Maladies"). A missense mutation is "...an alteration in a coding sequence of DNA that results in an amino acid replacement in the polypeptide"(Hartle, 1998, p.812). The following diagram is an example of a missense mutation found in Hypertrophic Cardiomyopathy:

Normal Gene Sequence	Missense Mutation Present In Gene Sequence
<p>G A A A G G T G G G</p> <p>G A A A <u>G</u> G T G G G</p>	<p>G A A A G G T G G G</p> <p>G A A A <u>C</u> G T G G G</p>
(AGG is the Amino Acid Arginine)	(ACG is the Amino Acid Threonine)

Table 4: In the normal gene sequence the two Guanines (**G**) exist as a base pair. In the gene sequence containing the missense mutation the Guanine (**G**) is base paired with the Cytosine (**C**). Therefore, the amino acid Threonine replaces the amino acid Arginine to cause the missense mutation. This mutation would be a culprit in causing Hypertrophic Cardiomyopathy.

One minute change (mutation) in the nucleotide sequence causes changes in the structure of the heart. In the case focused on here, Hypertrophic Cardiomyopathy, the mutation results in the enlargement of the myocyte cell. It is important to acknowledge the fact that all persons with normal myosin have the same gene coding sequence for the myocyte cell, as opposed to those who suffer from Hypertrophic Cardiomyopathy who have a mutation in the gene sequence coding for his/her myocyte cells.

After a Linkage Analysis in a family is performed, and the location of the missense mutation is identified, individuals who have Hypertrophic Cardiomyopathy can be informed of their condition. Next, a human pedigree can be generated. A human pedigree is a diagram that shows the “familial relationships among relatives” (Hartle, 1998, p. 815). Dr. Christine Seidman revealed in her lecture the phenotypic pedigree of the French Canadian family on which she conducted a Linkage Analysis. The following pedigree represents the “familial relationships among relatives” of the French Canadian family with a history of Hypertrophic Cardiomyopathy.

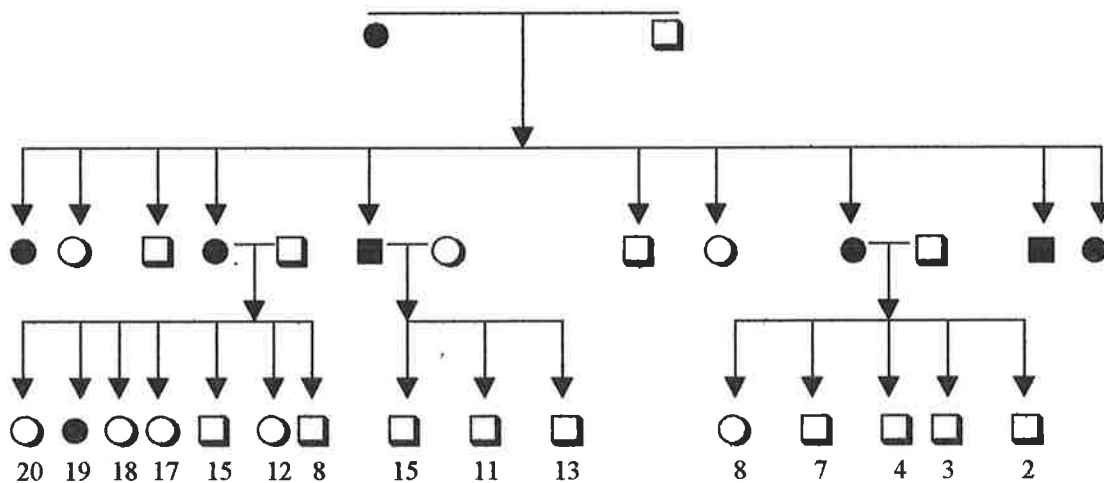


Figure 1: The legend for the above figure is as follows: ● = Female with Hypertrophic Cardiomyopathy, ○ = Normal Female, ■ = Male with Hypertrophic Cardiomyopathy, and □ = Normal Male. *Note: The numbers listed beneath the 3rd generation are the ages of the individuals.*

In reference to Figure 1, Dr. Christine Seidman suggests that the transmission of

Hypertrophic Cardiomyopathy in the French-Canadian family is not the result of autosomal dominance. Therefore, Hypertrophic Cardiomyopathy occurs in the French Canadian family as the result of a mutation on a recessive gene. Genetically, at least half of the children in the third generation should display Hypertrophic Cardiomyopathy. Without progress in understanding and utilizing molecular genetics, the latter pedigree would not exist with such exactness and accurateness it exhibits (Christine Seidman, M.D. Lecture: "Heartbreak: Of Mutation and Maladies").

Advancement in Molecular Genetics is important in the quest to find disease genes. Finding disease genes, such as those associated with Hypertrophic Cardiomyopathy, are important in improving clinical diagnosis of diseases. In addition, identifying disease genes is necessary so that animal models of human disease can be produced. After the discovery of disease genes by the use of procedures such as Linkage Analysis, treatment of diseases can be improved, and most importantly, "...molecular insights in pathophysiology" can be obtained (Christine Seidman, M.D. Lecture: "Heartbreak: Of Mutation and Maladies").

Preventing Heart Disease

For the most part heart disease occurs as a result of heredity, or an unhealthy lifestyle. However, basic preventive measures can be employed to reduce one's risk of developing heart disease, or post-pone its development.

An unhealthy diet is a major culprit of heart disease. One should practice eating healthy foods to reduce his or her risk of developing heart disease. Janis Jardin, R.D.,

stated in an article titled "Gene Defying Diets," that "Cutting back on saturated fat (found in red meat, chicken skin, butter, cream, whole milk and cheese) helps keep total blood cholesterol low, and eating monosaturated fats (such as olive and canola oils) increases levels of good cholesterol" (Jardin, 1998, p.71). One should also eat foods with a high fiber content (found in fruits, vegetables, and whole grains). Diets high in fiber aid in regulating LDL, the "bad cholesterol." One should also "Use cooking methods that require little or no fat, such as boiling, broiling, baking, roasting, poaching, or steaming" (American Heart Association and Charles Hennekens, M.D., 1999, p. 11).

Along with maintaining a healthy diet, to reduce the risk of developing heart disease, one should commit to a cholesterol screening once a year after the age of 20. Also, it is a good idea to maintain a healthful weight. (American Heart Association and Charles Hennekens, M.D., 1999, p.11). It is easier to maintain a healthful weight, through the use of a good exercise routine.

Exercise is very important in preventing heart disease. Some people wrongly assume that they do not need to follow an exercise program, because they are very active at their place of employment, or during their daily routine. However, exercise is not the activity done at a place of employment, instead it is physical activity done on a person's leisure time. Therefore, it is leisure physical activity that can help prevent heart disease (Joseph, 1994, p.67). For example, a good idea of an exercise routine is the performance of 20 to 30 minutes of aerobic activity 3 or 4 times a week. Charles Hennekens, M.D. and the American Heart Association suggests that one should use the stairs when going to higher levels of a building, rather than using the elevator. They also suggest that "If you

rely on public transportation, get off one or two stops before your destination."

From a former field study, done in Vaxjo, Sweden in 1998, a nurse who specialized in heart disease expressed that everyone should work to prevent heart disease. She also said that those who have heart disease should work to prevent their disease from getting worse, and that any heart disease patient is able to get better regardless of his/her age.

Discussion

In this study, I planned to explore the effects of heart disease on Robesonian Caucasians and Minorities in comparison with the North Carolinian Caucasians and Minorities as a whole. I feel that I have satisfactorily answered the questions at issue located on page ---.

Although the data collected from the SRMC clinics proved to be inconclusive, due to reasons already mentioned in this report, I found it compelling that most cases of heart disease in the clinics were diagnosis of Congestive Heart Failure. Also, in comparing the 45 cases of heart disease diagnosed in SRMC's clinics, with the 826 people who died in Robeson County from heart disease (from the years on 1996 to 1997), more Robesonians need medical attention for diagnosing and treating heart disease. Secondly, after reviewing my findings in this research, two question have come to mind: First, how great of an effect does race have on the development of heart disease? One third of the Robeson County population is Caucasian. Therefore, two-thirds of the county's population is minorities. Yes, the number of heart disease cases was greater among minorities of the county, but the occurrence of heart disease should be greater in concordance with the high population of minorities in Robeson County. Another question that has been brought to my attention is: Why is the occurrence rate of heart disease greater in Robeson County than the North Carolina State average? (For a review of this information refer to Table 2.) Maybe the occurrence is higher in Robeson County, compared with the state, because of the high number of minorities. However, the higher

occurrence could be a reflection on Robesonian diets and lifestyles. I feel further research should be done to find the answers to the questions at hand. Research concerning heart disease in Robeson County is necessary so that Robesonians can be better informed of their risk of developing heart disease. Also, further research could possible lead to information on preventive measures the Robesonians in particular should practice to lower the occurrence rate of heart disease in Robeson County below the state average. Extensive research on the reasons for a high occurrence of heart disease in Robeson County could be very beneficial to Robesonians.

The occurrence rate of heart disease varies from county to county, state to state, and from nation to nation. However, the physiology and anatomy of the human heart is very similar from one nationality to another. "The heart is a pump, an engine of our lives, it pumps enough blood and iron to fill a backyard pool each week" (Heartbreak: Of Mutations and Maladies"). With this in mind, I feel Charles Hennekens, M.D. was correct in saying, "Your heart works hard for you. Return the favor by taking better care of yourself" (Charles Hennekens, M.D., 1999, p.11).

For the most part, my choice in research method was good, but more data should be collected to reach more conclusions about heart disease in Robeson County. A resource at the Robeson County Health Department "set me on the right track" to find the information needed to compare the occurrence rate of heart disease in Robeson County with North Carolina as a whole. Also, a source at the Southeastern Regional Medical Center was very helpful in making the information I needed from the SRMC clinics

accessible. Finally, the field study in Sweden, and information from interviews of that study, were very helpful in giving me a good background knowledge of heart disease. All contributions and formerly obtained information were all very appreciated when performing the study.

Conducting this research has expended to me knowledge of heart disease in Robeson County, as compared with North Carolina. I also gained experience in "networking" with area professionals to obtain information needed to complete this study. The aforementioned personal gains, made conducting this study very worth while. I would like to thank the Chancellor's Scholar Committee for allowing me the opportunity to gain the knowledge and experience that stemmed from this Chancellor's Thesis on Heart Disease.

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