AN ABSTRACT OF THE THESIS OF

Glenn T. Gerhard for the degree of Doctor of Philosophy in Nutrition and Food Management presented on August 4, 1997. Title: Coronary Heart Disease Risk Factors in Premenopausal Black Women Compared to White Women

Abstract approved:_ _____
Rosemary C. Wander

Background: Premenopausal black women have a 2-3 fold greater rate of coronary heart disease (CHD) than premenopausal white women. The purpose of this study was to provide insight into the reasons for this difference.

Methods and Results: We compared CHD risk factors in 100 black and 100 white, healthy premenopausal women age 18-45 years and of relatively advantaged socioeconomic status. Black women consumed diets higher in saturated fat and cholesterol (12% of kcal as saturated fat and 360 mg of cholesterol per day) than did white women (10% of kcal and 290 mg/day) ($p= 0.008$). Black women also had a higher body mass index (BMI) (32.0 ± 9.2 vs. 29.0 ± 9.4 kg/m^2, $p=0.021$), and higher systolic (124 ± 17 vs. 115 ± 14 mmHg, $p<0.0001$), and diastolic (79 ± 14 vs. 75 ± 11 mmHg, $p=0.048$) blood pressures. The mean plasma Lp(a) concentration was higher in the black women (40.2 ± 31.3 mg/dl) than in the white women (19.2 ± 23.7 mg/dl) ($p<0.0001$). The black women, however, had lower plasma triglyceride levels (0.91 ± 0.46 vs. 1.22 ± 0.60 mmol/L, $p<0.0001$), and a trend toward higher HDL cholesterol levels (1.37 ± 0.34 vs. 1.29 ± 0.31 mmol/L, $p=0.064$) than the white women. Plasma total and LDL cholesterol levels were similar. Rates of cigarette smoking and alcohol intake were low and similar between the races.

Black women additionally had higher levels of plasma total homocysteine (8.80 vs. 7.81 μmol/L, p=0.013), lower plasma folates (3.52 vs. 5.23 ng/ml, p<0.0001), and higher vitamin B_{12} levels (522 vs. 417 pg/ml, p<0.001) than white women. More white women than black women took a multivitamin supplement (42.4% vs. 24.7%, p=0.019). When adjusted for multivitamin use, homocysteine levels did not differ, but plasma folate remained significantly lower in black women. Sixty-eight percent of black women carried the wild-type methylenetetrahydrofolate reductase genotype, 32.0% were heterozygotes, and none were homozygotes. Of the white women, 47.4% were wild-type, 40.3% heterozygotes, and 12.3% homozygotes (p=0.013).

Conclusions: Premenopausal black women consumed more saturated fat and cholesterol and had a higher mean body mass index, blood pressure, Lp(a), and plasma total homocysteine levels than white women. These differences in coronary risk factors may explain the higher incidence of CHD in premenopausal black compared to white women.

Coronary Heart Disease Risk Factors in Premenopausal Black Women Compared to White Women

by

Glenn T. Gerhard

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APPROVED:

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Glenn T. Gerhard, Author

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CONTRIBUTION OF AUTHORS

Glenn T. Gerhard: Dr. Gerhard is obviously the primary author on both papers and the Ph.D. candidate. He was intimately involved in all aspects of the research project, including development of the research protocol, day-to-day conduct of the study, and data analysis, and was primarily responsible for the writing of the manuscripts.

Dr. Rosemary C. Wander: Dr. Wander's role in the research project and in the preparation of the papers was obviously critical. She participated in the conceptualization of the project, and helped with the development and editing of the research proposal. Although the research was conducted at the Oregon Health Sciences University (OHSU), Dr. Wander's influence remained important. She and I (Dr. Gerhard) were in regular communication during the conduct of the study. She offered important input which ranged from advice on subject recruitment to suggestions as to how the data analysis should be approached. The LDL oxidation experiments were performed in her laboratory. She did extensive editing of both papers as well as of the introduction to the dissertation. Equally important, however, was the role played by Dr. Wander in my early

development as a scientist; this training became the foundation out of which arose my future research efforts at OHSU culminating in this dissertation. She taught me how to approach a scientific problem in a systematic and logical fashion. While with Dr. Wander at OSU I received my first instruction in writing research proposals; we submitted five grants together. I also received my first practical experience in laboratory work at OSU under the direction of Dr. Wander, who encouraged the development of an extremely thorough and fastidious approach to the lab. In particular, she helped me adapt to our lab an immunoturbidimetric method for measuring plasma apolipoprotein B concentrations; a collaborative publication arose out of these efforts. The work described in this dissertation, starting with the development of the research proposal and culminating in the preparation of the two manuscripts, reflects in large measure the implementation of principles and skills first learned under Dr. Wander's direction.

Dr. William E. Connor: Dr. Connor was likewise critical to the work described in this dissertation. He and I were intimately involved in development of the research proposal for this project, which was ultimately funded by the USDA. Dr. Connor helped establish the over-all direction of the project and guided me

in its day-to-day supervision. He of course played a critical role in the editing of the two manuscripts as well as the introduction to the dissertation. Thus, the skills I began to learn from Dr. Wander at OSU continued to grow under Dr. Connor's supervision. A particular skill I have learned in large measure from Dr. Connor was scientific writing, an often neglected element of research training yet a skill which is essential to any academic career. His influence is reflected in the composition of all three chapters in this dissertation.

M. René Malinow: Dr. Malinow performed the homocysteine analyses, played an integral role in the conceptualization and design of the homocysteine study, and helped edit both papers.

Dr. Tom DeLoughery: The MTHFR analyses were performed in Dr. DeLoughery's lab. He helped edit the sections in the homocysteine paper relating to this data.

Adam J. Evans: Adam performed the MTHFR analyses. He developed the method for extraction of DNA from plasma which made the MTHFR genotyping possible.

Sonja L. Connor: Sonja was important to the conceptualization of the risk factor paper, helped supervise the collection of data in the women whose cardiac risk factors we surveyed, and helped analyze the dietary data.

Dr. Gary Sexton:	Dr. Sexton helped in the design of the project and in the statistical analyses.
Dr. Anuradha S. Pappu:	Dr. Pappu suggested measuring plasma CETP activity and she performed these analyses.

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Chapter 1

INTRODUCTION

INCREASED CORONARY HEART DISEASE RISK OF PREMENOPAUSAL BLACK WOMEN

Black women within the premenopausal age range are at a higher risk for coronary heart disease (CHD) than premenopausal white women {1-11}. Furthermore, this racial disparity is increasing {12-15}. In a large prospective study, one million black and white men and women were followed from 1960 to 1972. One outcome measure of this study was death from coronary heart disease. Black women age 40-49 in that study had a 2.44 times higher CHD mortality rate than similarly aged white women {4}. A study conducted in Atlanta, Georgia, between 1979 and 1985 {5} found that black women age 20-49 had a threefold higher CHD mortality rate than white women the same age. Studies conducted in other locations, including Wayne County {6}, Nashville {7}, Newark {9}, and Baltimore {10,11}, also indicated that black women of reproductive age have a higher rate of CHD than white women. Further, black women may be at higher risk of dying suddenly from CHD than white women {6,7,9,10}, possibly due to their greater rates of hypertension-related left ventricular hypertrophy and diabetes {6, 16-20}. In addition, black women, as a result of their lower socioeconomic status as well as cultural factors which may discourage medical care-seeking behavior {19,20}, may be

diagnosed at a later stage of their coronary disease than white women; this could place the black women at higher risk for sudden death. Finally, two multicenter autopsy studies, the International Atherosclerosis Project {21} and the Pathobiological Determinants of Atherosclerosis in Youth (PDAY) Study {22}, showed that black women aged 15-44 who died unexpectedly had more extensive fatty streaking in their coronary arteries than similarly-aged white women. The fatty streak is the progenitor to the raised lesions, including the fibrous plaque, that produce symptomatic coronary heart disease {22,23}. Thus, these two autopsy studies provide a pathological basis for the observation that premenopausal black women, especially in the later premenopausal years, are at higher risk for the development of CHD than premenopausal white women.

The reasons for the increased risk of premenopausal black women for coronary heart disease are not entirely clear, but are likely related to racial differences in both "standard" as well as more newly-established risk factors. This report will begin with a review of the literature regarding the prevalence of cardiac risk factors in premenopausal black women and white women and the significance of these risk factors to the pathogenesis of coronary heart disease in these women. The risk factors to be considered are obesity, hypertension, plasma lipids and lipoproteins, diet, physical activity, cigarette smoking, and diabetes (standard risk factors), as well as socioeconomic status, postprandial lipemia, plasma levels of Lp(a) and homocysteine, and the susceptibility of LDL to oxidative modification ("newer" or less well established risk factors).

OBESITY

Obesity is an independent risk factor for coronary heart disease {24-26}. Prior studies {27-31} have suggested that premenopausal black women weigh more and have a higher body mass index (BMI=weight kg/height m^2) than premenopausal white women. In NHANES-I (the first National Health and Nutrition Examination Survey), black women age 25-44 had a significantly higher mean BMI (26.9) than white women of a similar age (24.3) {27}. In the NHANES-II study, black women age 18-44 weighed more than similarly-aged white women (151 vs. 139 lbs, respectively). Further, a higher percentage of reproductive age black women than white women in NHANES-II were overweight (BMI $\geq$ 27.3) (40.8% vs. 24.8%), and severely overweight (BMI $\geq$32.3) (16.6% of black women vs 7.3% of white women) {28}. In the Pittsburgh Healthy Women Study of premenopausal women age 42-50 years, black women had a higher mean weight than did white women (153 vs. 146 lbs) and a higher BMI (26.1 vs. 24.7), as well as a greater weight gain since age 20 (34.2 lbs. versus 21.9 lbs.) {29}. Black women also weighed more (69.2 kg vs. 62.8 kg) and had a higher mean BMI (25.9 vs. 23.1) in the CARDIA (Coronary Artery Risk Development in Young Adults) Study, a multicenter survey of 5,115 black and white men and women age 18-30 begun in 1985 {30,31}.

The relative abundance of central (abdominal) fat in premenopausal black women compared to white women is not known with certainty but is important. A more central distribution of body fat, termed visceral obesity, is more frequently linked to metabolic complications than is a more peripheral distribution of body fat. These metabolic complications include hyperinsulinemia, diabetes, hypertension, and dyslipidemia, all

energy to concern themselves with diet and exercise that they perceive may only impact their health several years later. Low SES women may, therefore, eat more fat and calorie-laden fast foods and convenience foods, as well as exercise less than their higher socioeconomic white counterparts {31,43}. In addition to socioeconomic factors per se, cultural factors within the black community may predispose black women to the development of obesity. In particular, obesity may be culturally more acceptable for black women than for white women. Black women do not necessarily equate being overweight with being unattractive {44-46}, and may, therefore, be less inclined to modify their diet and physical activity level to prevent weight gain or to lose weight. Reproductive differences are a further environmental factor that may contribute to the greater adiposity in black women. Compared to white women, black women have earlier menarche, younger age at first childbirth, and greater parity {43}.

These environmental factors likely act against a backdrop of a genetic predisposition to obesity in black women. In one study, black women had a 12% lower resting metabolic rate than white women ($p=0.02$), which could result in a greater propensity for weight gain {47}. It is also possible that racial differences in the obesity gene and its hormone product leptin {48} may make black women more susceptible to environmental perturbations which increase their weight. Leptin levels have not been reported in premenopausal black women. Determination of leptin levels in premenopausal black women and white women and the relationship of leptin to the racial differences in obesity rates should be an important goal of future research.

HYPERTENSION

Premenopausal black women have higher blood pressures and an approximately 2-3 fold greater prevalence of hypertension than premenopausal white women {29,49-53}. The greater adiposity of black women is likely an important contributing factor to their excess hypertension {26,54-58}. In the Pittsburgh Healthy Women Study {29}, premenopausal black women had significantly higher mean systolic and diastolic blood pressures than did premenopausal white women (114.7 vs. 108.0 mmHg for systolic blood pressure and 74.9 vs. 71.3 mmHg for diastolic blood pressure). Similarly, black women age 35-44 years in the Minnesota Heart Survey {49} had higher systolic (116.2 vs. 113.1 mmHg) and diastolic (75.5 vs. 71.5 mmHg) blood pressures than did white women the same age. The prevalence of hypertension in the Minnesota Heart Survey was 21.9% in black women and 7.8% in white women {49}. In both NHANES-I {50,51} and NHANES-II {52,53}, black women age 18-44, compared to similarly-aged white women, had an approximately 2-3 fold greater prevalence of hypertension. In NHANES-II, the relative risk for hypertension in black women compared to white women increased from 1.54 at age 15 to 3.80 at age 45 {59}. In NHANES-III, the hypertension rate at ages 18-29 was 2.3% in black women and 1.0% in white women; by ages 40-49, the prevalence rate had risen to 33.2% and 11.3% in black women and white women, respectively {53}. These data indicate that racial differences in hypertension in women arise at an early age, with a progressive increase in prevalence across the premenopausal age range in both black women and white women.

Hypertension is likely an important risk factor for the development of both fatal and non-fatal CHD and other cardiovascular diseases in black women {3,60}. In the

Charleston Heart Study, a population-based prospective cohort study of black and white men and women initiated in 1960, the level of systolic blood pressure upon entry into the study was strongly predictive of 30-year mortality from CHD in black women {3}. Similarly, 20-year follow-up in the Evans County Study, which included 549 white women and 391 black women, indicated that systolic blood pressure was the most important factor contributing to the excess mortality from cardiovascular disease in black women compared to white women {60}. One mechanism by which hypertension may increase the risk of coronary death in black women is through induction of left ventricular hypertrophy, which increases the risk of coronary mortality by sixfold {61,62}. In addition, hypertension accelerates the development of atherosclerosis in the major coronary vessels and may also damage the smaller cardiac intramural blood vessels {63,64}, in both cases producing coronary ischemia, which may lead to angina pectoris, myocardial infarction, or sudden death.

Factors other than their higher rates of obesity are also likely to contribute to the greater prevalence of hypertension in premenopausal black women compared to white women. One such factor is the lower socioeconomic status in blacks {19,36-40,65}. Lower socioeconomic status may increase the risk for hypertension, not only through its association with increased obesity, but also because of its accompanying psychosocial stressors, including single parenthood, racial discrimination, crowded living conditions, and higher crime rates {20,65,66}. Chronic exposure to these stressors may lead to feelings of anger and suppressed hostility, which have been linked to hypertension in black women in at least three studies {67-70}. Another factor which may contribute to the greater prevalence of hypertension in black women is a genetically determined racial

difference in cation transport regulation. In particular, blacks exhibit a lower activity of Na+K+ATPase, the enzyme which regulates the pump responsible for transporting sodium out of and potassium into the cells of various tissues, including the vasculature. Excessive sodium may then accumulate in vascular smooth muscle cells, causing vasoconstriction and hypertension. This defect may render blacks more sensitive to dietary salt-induced hypertension than whites {71,72}.

In addition to sodium, other cations that may be important to blood pressure regulation are calcium, potassium, and magnesium, all of which may lower blood pressure {73-79}. In NHANES-III {80} and CARDIA {31} black women of reproductive age had lower dietary intakes of calcium, potassium, and magnesium than did white women. Thus, borderline deficiencies of these nutrients in black women may also contribute to their greater prevalence of hypertension compared to white women.

LIPIDS AND LIPOPROTEINS

The results of previous studies suggest that plasma total and possibly LDL cholesterol levels may be similar in premenopausal black women and white women {31,49,81-84}. In the CARDIA Study, the mean total cholesterol level was 176 mg/dl in white women and 179 mg/dl in black women. Plasma levels of LDL cholesterol in CARDIA were 106 and 111 mg/dl, respectively, in white women and black women {31}. Although the LDL cholesterol difference in CARDIA was statistically significant ($p<0.001$) {85}, likely due to the high statistical power afforded by the large sample size (1459 black women and 1300 white women), it was probably not clinically meaningful. In NHANES-II, the total cholesterol levels of white women and black women age 20-44

were also similar (195 and 194 mg/dl, respectively) {81}. The mean LDL cholesterol level of white women of reproductive age in NHANES-II was 122 mg/dl; age-specific LDL cholesterol values were not available for premenopausal black women. However, the overall age-adjusted LDL cholesterol level in NHANES-II did not differ significantly between the black women (132 mg/dl) and the white women (138 mg/dl) {82}. Black women and white women age 35-44 in the Minnesota Heart Survey also had very similar total plasma cholesterol levels (184 and 186 mg/dl, respectively) {49}, but levels of LDL cholesterol were not reported. Finally, the total cholesterol levels of black and white premenopausal women also did not differ in NHANES-I {83} or in the ARIC (Atherosclerosis Risk in Communities) Study {84}. Thus, the racial disparity in CHD prevalence cannot be attributed to differences in the plasma total or LDL cholesterol concentrations.

Plasma levels of triglyceride and HDL cholesterol, in contrast to total and LDL cholesterol, may be different in premenopausal black women compared to white women. In particular, plasma triglyceride levels, while generally low in premenopausal women of both races, are lower in black women. Black women also have higher HDL cholesterol levels {29,82,84-86}. Lower concentrations of triglyceride and higher HDL cholesterol would tend to protect against, not promote, the development of CHD in black women. In the ARIC Study, premenopausal black women had a mean triglyceride level of 88 mg/dl, compared to 102 mg/dl in white women {84}. Similarly, in the Lipid Research Clinics Program Prevalence Study, the mean triglyceride level of black women was 83 mg/dl and white women 101 mg/dl {86}. Premenopausal black women in the Pittsburgh Healthy Women Study also had a lower mean triglyceride level (75 mg/dl) than premenopausal

white women (85 mg/dl) {29}. Finally, in CARDIA, the mean triglyceride level of the black women (64 mg/dl) was slightly lower than that of the white women (70 mg/dl) {85}. The relatively small racial triglyceride difference as well as the lower triglyceride levels in both black women and white women in CARDIA compared to the other studies may be due to the younger age (18-30 years) of the CARDIA participants.

One factor which tends to raise the plasma triglyceride level is obesity {26}. It is thus remarkable that black women, who are more obese than white women, have lower plasma triglyceride levels. Furthermore, in the CARDIA and ARIC studies, the triglyceride concentration in blacks increased only one third to one half as much as in whites with similar increments in obesity {87}. This suggested that black women may be more resistant to the hypertriglyceridemic effect of obesity than white women. This apparent resistance of black women to obesity-induced hypertriglyceridemia may be secondary to a smaller compartment of visceral adipose tissue in blacks {34,35}. In one study, obese black women had 23% less visceral adipose tissue than similarly-obese white women ($p=0.007$), as estimated by CT scanning at levels L2-L3 and L4-L5 of the lumbar spine. Not surprisingly, the black women in that study also had lower plasma levels of triglyceride, glucose, and insulin {34}. In a later study {35}, Lovejoy similarly found that obese premenopausal black women had a 16% lower visceral fat area on CT scan than did white women with a similar degree of obesity (BMI approximately 30). The black women in the Lovejoy study also had lower triglyceride levels, but had higher, not lower, insulin levels and reduced insulin sensitivity as measured using a frequently sampled intravenous glucose tolerance test technique. This increased insulin resistance of the black women in Lovejoy's study was puzzling in view of their lesser degree of

visceral obesity compared to the white women. However, it is important to note that the relationship between visceral fat and the insulin resistance syndrome, Syndrome X, has been largely described in white populations. It is possible, as Lovejoy concluded {35}, that the relationship between body fat distribution and health risk factors including insulin resistance may not be the same in African-Americans and Caucasians. Notwithstanding the inconsistent results of these two studies, the feature common to both is the lesser amount of visceral fat in the black compared to the white women. Since the visceral adipose tissue releases free fatty acids into the portal circulation, and these fatty acids are incorporated into VLDL (very low density lipoprotein) particles by the liver {88}, a smaller visceral adipose tissue compartment in black women would be expected to result in the production of VLDL particles with less triglyceride. This would result in lower fasting plasma triglyceride levels, which were observed in both studies which quantitated visceral adipose tissue {34,35}.

Another possible mechanism to explain the lower triglyceride levels in premenopausal black women is suggested by data in small numbers of blacks, which indicates that they may have a higher activity of adipose tissue lipoprotein lipase (LPL) than whites {89}. An increased activity of adipose tissue LPL could lower plasma triglycerides by enhancing clearance. A higher activity of LPL in black women could be the result of genetic factors, racial differences in the apolipoproteins which regulate LPL (apolipoproteins C-II and C-III), or other factors.

The results of several studies suggest that premenopausal black women have modestly higher plasma HDL cholesterol concentrations than white women {82,84,90}. These studies include NHANES-II (HDL cholesterol level of 56 vs. 52 mg/dl in

reproductive age black women and white women, respectively) {82}, ARIC (59 vs. 57 mg/dl) {84}, and the Cincinnati Lipid Research Clinics Princeton School Study (57 vs. 54 mg/dl) {90}. It is believed that HDL protects against the development of coronary heart disease, in part by mediating the reverse transport of cholesterol from the arterial wall to the liver {88}. A 1 mg/dl increase in HDL cholesterol across the spectrum of HDL levels is associated with a 3% decreased risk of coronary heart disease {91}. Thus, the approximately 3 mg/dl higher HDL cholesterol level observed in premenopausal black women in the studies cited may decrease their risk of CHD by 9% relative to white women, a clinically meaningful reduction. The higher HDL cholesterol level in black women seems paradoxical in view of their higher rate of CHD. This suggests that the relatively modest protective effect of higher HDL cholesterol levels in black women must be counterbalanced by other factors which increase their risk.

The reason for the racial difference in HDL cholesterol levels in premenopausal women is unclear. Factors associated with the HDL cholesterol concentration are body mass index, exercise, alcohol, cigarette smoking, genetic factors {92,93}, and, perhaps most importantly, the plasma triglyceride level {94,95}. Compared to white women, black women have a higher BMI and may be less physically active {31}, factors which would tend to decrease, not increase, their HDL cholesterol level relative to white women. In NHANES-II, the intake of alcohol, which raises the HDL cholesterol level, was low and similar in black women and white women {96}. The prevalence of cigarette smoking, which lowers HDL cholesterol {97}, may be similar in black women and white women {30,60}. However, since white women tend to smoke more cigarettes per day {49,98}, they may sustain a greater overall exposure to cigarette smoke and nicotine,

which could decrease their HDL cholesterol levels relative to black women. The activity of the cholesteryl ester transfer protein (CETP), which mediates the transfer of cholesteryl esters from HDL to other lipoproteins and is likely genetically determined {99,100}, could conceivably influence HDL cholesterol concentrations; CETP activity has not been measured in premenopausal black women. One intriguing hypothesis is that higher HDL cholesterol levels in the African ancestors of American blacks conferred a survival benefit because HDL particles may facilitate the macrophage immobilization of Trypanosoma brucei, the protozoan agent which causes sleeping sickness in equatorial Africa {92,101}. Finally, the higher HDL cholesterol levels of black women are consistent with their lower triglycerides, since mature HDL particles are formed from nascent HDL as triglycerides are catabolized through the action of lipoprotein lipase, a precursor-product relationship {88,95,102}. Thus, black women may simply clear fat from the circulation more efficiently than white women. It has indeed been consistently demonstrated that HDL cholesterol and plasma triglyceride levels are strongly and inversely correlated {103-106}. This last may be the most likely explanation for the higher levels of HDL cholesterol in premenopausal black compared to white women.

In summary, premenopausal black women and white women have similar levels of total and LDL cholesterol, but black women have higher HDL cholesterol and lower triglyceride levels than white women. Hence, the overall lipid and lipoprotein profile of premenopausal black women is less, not more, atherogenic than the profile of their white counterparts.

POSTPRANDIAL LIPEMIA

The duration and magnitude of the elevation in the plasma triglyceride level following the ingestion of dietary fat, or postprandial lipemia, may also be a risk factor for coronary heart and other atherosclerotic vascular diseases. We do, after all, spend most of our lives in the postprandial state. Zilversmit {107} first proposed in 1979 that atherogenesis may be a postprandial phenomenon, and that the chylomicron remnant, formed as chylomicrons are degraded in the peripheral circulation following a fatty meal, was the responsible particle. Chylomicron remnants are cholesterol-enriched particles which may stimulate cholesteryl ester accumulation in macrophages, resulting in the formation of foam cells characteristic of the atheromatous lesion {107-109}. Several studies {110-113} have demonstrated an association between the magnitude of postprandial lipemia and coronary and carotid artery atherosclerosis. In a case-control study, Groot {110} demonstrated that patients with angiographically documented coronary artery disease had a delayed normalization of plasma triglyceride levels following an oral fat load, compared to control subjects. In another case-control study {111}, both the maximal triglyceride increase and the area under the triglyceride curve over eight hours following a fatty test meal were higher in patients with coronary disease compared to normal subjects. In another study, by Uiterwaal {112}, healthy young adult sons of men who had established coronary artery disease had prolonged postprandial hypertriglyceridemia, compared to the sons of men without coronary disease. And finally, Ryu {113} found that the peak triglyceride response following an oral fat load was significantly correlated with carotid wall intima-media thickness in middle-aged subjects. The results of these case-control and observational studies support the

hypothesis that prolonged exposure of arterial wall cells to postprandial lipoproteins enhances the atherogenic process.

We are aware of only one study comparing black women and white women with respect to the magnitude of the postprandial lipemic response to a standard test meal, the ARIC (Atherosclerosis Risk in Communities) Study. In that study {114}, elevated postprandial triglycerides appeared to be an independent risk factor for carotid intimal thickening in nonobese whites only; no such relationship existed for black women. Determination of the relative cardiovascular pathogenicity of postprandial lipemia in black women compared to white women awaits the results of prospective studies.

LIPOPROTEIN(a)

Lipoprotein(a) [Lp(a)] is a potent independent risk factor for coronary heart disease and stroke in white populations {115-117}. Plasma levels of Lp(a) above 30 mg/dl are associated with an approximately twofold greater risk of myocardial infarction {116}. Recent studies have demonstrated that Lp(a) levels are 2-3 times higher in premenopausal black women compared to white women {84,118}. In the CARDIA study, the median Lp(a) level of black women was 23.9 mg/dl, compared to 6.4 mg/dl in white women {118}. The mean plasma Lp(a) levels in premenopausal black and white women age 45-49 years in the ARIC Study were 16.1 and 8.1 mg/dl, respectively; median levels were 13.0 mg/dl in black women and 4.4 mg/dl in white women {84}. Interestingly, the plasma Lp(a) frequency distribution is markedly skewed to the left in white women, but more normally distributed in black women {118,119}. The reason for this racial difference in the shape of the Lp(a) distribution curve is unknown.

The mechanism(s) by which elevated plasma Lp(a) concentrations may increase the risk for cardiovascular disease are suggested by its structure, which combines elements of both the lipoprotein and blood clotting systems. Structurally, Lp(a) is an LDL-like particle which additionally contains the unique protein apolipoprotein(a) {120}. The Lp(a) particle, like LDL, has been identified within atherosclerotic plaques {121,122}. Apolipoprotein(a) is homologous to plasminogen {123}, the inactive zymogen which, upon cleavage to plasmin, stimulates clot lysis. Because of this homology, apolipoprotein(a) may compete with plasminogen for binding sites on endothelial cells. Unlike plasminogen, however, apolipoprotein(a) cannot be cleaved to the active protease {120}. Therefore, fibrinolysis may be inhibited if circulating levels of apolipoprotein(a) are high, thus increasing the likelihood of a clinical thrombotic event such as a myocardial infarction or stroke. Elevated Lp(a) concentrations, then, may increase the risk for cardiovascular disease by promoting both atherogenesis and thrombogenesis.

Plasma levels of Lp(a) are under genetic control by the apolipoprotein(a) gene, which codes for apolipoprotein(a) molecules of varying sizes {120,124,125}. The plasma Lp(a) level is inversely proportional to the size of the apolipoprotein(a) molecule {125}. The heritability of Lp(a) is estimated to be 90% {124}. The reason(s) for the markedly higher Lp(a) levels in black women compared to white women are unclear. However, it is likely that genetically determined differences in the apolipoprotein(a) size distribution or in other factors are responsible.

Although black women clearly have higher levels of Lp(a) than white women, two studies suggest that high Lp(a) levels in blacks may not be associated with increased

coronary risk. Both of these studies included both men and women {126,127}. In the study by Moliterno {126}, there were no significant differences in plasma Lp(a) concentrations between blacks with and without significant coronary artery disease, determined by angiography. In Sorrentino's study {127}, plasma Lp(a) levels prior to angiography were twice as high in blacks as in whites, yet the extent and severity of coronary artery disease were similar. Blacks may be more sensitive to tissue plasminogen activator than whites {128}, and thus protected from Lp(a)-mediated interference with plasmin generation. This would presumably make Lp(a) less thrombotic in blacks, and thus decrease the likelihood of acute coronary or cerebrovascular events. On balance, however, it must be concluded that the cardiovascular pathogenicity of Lp(a) in blacks is uncertain, and will only be ascertained when long-term prospective studies now underway are completed.

LDL OXIDATION

The susceptibility of LDL to oxidative modification may be an important risk factor for atherosclerosis and coronary heart disease, yet has not been reported in premenopausal black women. Several lines of evidence suggest that oxidation of LDL is a prerequisite for its incorporation into arterial wall macrophages, which then become foam cells, the earliest lesion in atherogenesis {23,129,130}. Oxidation of LDL may be induced by endothelial cells, macrophages, and smooth muscle cells within the arterial wall {23}. Endothelial cells and macrophages may generate lipoperoxides intracellularly through the action of lipoxygenase enzymes such as 15-lipoxygenase; these lipoperoxides are then transferred to LDL where they may initiate oxidation {23,131,132}. Smooth

muscle cells in the vessel wall may secrete reactive oxygen species, such as the superoxide anion, which are similarly taken up by native LDL to induce oxidation {23,133}. Once oxidized, LDL is avidly taken up by macrophages, resulting in cholesteryl ester accumulation and foam cell formation {23,129,134}. In addition, oxidized LDL may be cytotoxic to endothelial cells, producing functional or structural changes in the endothelium which may facilitate the penetration of blood monocytes into the arterial wall, where they become macrophages. Further, oxidized LDL may inhibit the migration of macrophages back to the plasma, thus trapping them in the blood vessel wall {129}, where they may engulf cholesteryl esters and form foam cells. Minimally modified, or mildly oxidized LDL (MM-LDL), also mediates recruitment of monocyte-macrophages, by stimulating endothelial cells to release monocyte chemotoctic and adhesion molecules and colony stimulating factors (135}. The trapped macrophages, in turn, may secrete more lipoperoxides, resulting in further LDL oxidation, which may lead to more recruitment of macrophages. This leads to a vicious circle {23,129}, eventually resulting in the development of atherosclerotic plaques and clinical cardiovascular events.

DIET

It is well established that diets high in saturated fat and cholesterol raise the LDL cholesterol concentration and increase the risk for coronary heart disease {136}. Relatively few studies, however, have compared the dietary intakes of total and saturated fat and cholesterol between black women and white women. In NHANES-II, black women and white women age 21-45 years consumed diets which were similarly high in total (37% of kcal) and saturated fat (13% of kcal). The daily cholesterol intakes of the

black women and white women were also similar (302 vs. 279 mg/day, respectively) {92}. In premenopausal black women and white women in the Pittsburgh Healthy Women Study {29}, the percentage of total kcal consumed as fat was also similar and high: 38.6% in black women and 37.5% in white women. Both of these studies used the 24-hour food recall method to assess dietary intake. This method of dietary assessment may not reflect the usual intake, is subject to problems of recall, and underestimates the total daily kcal intake {137}. Indeed, in NHANES-II, the estimated daily kcal intake was 1527 for black women and 1639 for white women age 21-45 {92}, and in the Pittsburgh Healthy Women Study, 1721 and 1759 kcal/day for black women and white women, respectively {29}. These caloric intakes are far lower than the estimated daily caloric requirement to maintain body weight, which is at least 2000 kcal, using the Harris-Benedict equation multiplied by an activity factor of 1.5 {138}. Thus, the reliability of the dietary data obtained in NHANES-II and the Pittsburgh Healthy Women Study may be in question.

The largest and most recent study comparing the dietary intakes of reproductive-age black women and white women, the CARDIA study, assessed diet using a detailed dietitian-administered quantitative food frequency questionnaire with food models and measuring cups and spoons to aid in the estimation of portion sizes. Usual intake was estimated using the previous month as the frame of reference {30,139}. This method may have provided more reliable dietary information and, indeed, did not underestimate the total calorie consumption (2590 kcal/day in black women and 2136 kcal/day in white women whose mean body weights were 69.2 and 62.8 kg, respectively) {31}. As in the earlier studies, black women and white women in CARDIA consumed a similar

percentage of their daily kcal as fat (37.7% vs. 36.5%, respectively) and as saturated fat (14% of kcal in black women and 13.8% in white women). However, black women consumed significantly more cholesterol per day (444 mg) than did white women (327 mg) {31,139}. In addition, the Keys Score, an index representing the combined effects of dietary saturated fat, polyunsaturated fat, and cholesterol upon the plasma total and LDL cholesterol levels {139,140}, was also higher in certain subsets of black women compared to white women {139}. Further, a greater percentage of black women than white women in CARDIA consumed diets with 30% or more of the kcal as fat and over 300 mg of cholesterol per day {139}. These data indicate that certain subgroups of black women may consume a more atherogenic diet than white women.

PHYSICAL ACTIVITY

Regular physical exercise has a beneficial effect upon the plasma HDL cholesterol concentration and lowers the risk for coronary heart disease {140,141}. The results of several studies suggest that black women expend fewer kcal in regular physical activity than white women {29,31,142}. In the Minnesota Heart Survey {142}, physical activity was assessed using the Minnesota LTPA (Leisure Time Physical Activity) Questionnaire, an instrument previously validated in a white population {143}. When all age groups were considered together, black women expended significantly less energy in leisure time physical activity (91 kcal/day) than did white women (123 kcal/day). Within the 35-44 year-old age group, black women expended 91 kcal and white women 135 kcal/day {142}. In the Pittsburgh Healthy Women Study {29}, physical activity was quantitated using the Paffenbarger Activity Questionnaire {144}, which asks about the number of

stairs climbed, city blocks walked, and sports activities performed in the previous week and over the past year. Compared to the white women, the black women expended significantly fewer kcal/week in physical activity in the preceding week (889 vs 1466 kcal) and over the preceding year (1008 vs. 1456 kcal/week) {29}. Finally, in the CARDIA study, physical activity was expressed in physical activity units based upon the Physical Activity History Questionnaire {30,31}, higher scores indicating greater activity. The total physical activity score was higher in white women (400 units) than in black women (278 units). The attainment of at least a high school degree was associated with a higher total physical activity score in white women, but not in black women {31}. The higher level of regular physical activity of the white women in CARDIA was reflected in their greater degree of cardiovascular fitness. White women were able to walk longer on a treadmill and took a longer time to reach a heart rate of 130 beats per minute than did black women {31,98}. Thus, a decreased level of physical activity in reproductive age black women may contribute to their greater rate of CHD compared to their similarly-aged white counterparts.

CIGARETTE SMOKING

Cigarette smoking is an established independent risk factor for coronary heart disease, increasing risk by as much as fivefold {136}. The association between smoking and coronary heart disease is dose-related {136}. The mechanisms(s) by which smoking increases CHD risk are uncertain, but may include direct toxicity of volatile components of tobacco smoke to the blood vessel wall; a decrease in the oxygen-carrying capacity of the blood due to higher carbon monoxide levels with resultant ischemia; activation of

platelets, thus increasing the risk of thrombosis; sympathetic overstimulation and vasoconstriction induced by nicotine {145,146}; and lowering of the HDL cholesterol level {97}.

The relative prevalence of cigarette smoking in black women compared to white women is not entirely certain. In the Evans County Study {60}, an equal percentage of black women and white women (15%) were cigarette smokers. Forty percent of white women but only 26% of black women in the Charleston Heart Study were current cigarette smokers {147}. In contrast, the prevalence of cigarette smoking was higher in black women (27.9%) than in white women (17.9%) in the Minnesota Heart Survey, but white women smoked more cigarettes per day {49}. In the CARDIA Study, a similar percentage of black women (31%) and white women (28%) were current smokers {30}, but as in the Minnesota Heart Survey, white women smoked more cigarettes per day (14.7) than did black women (10.7) {98}. The duration of cigarette smoking was similar in black women and white women in CARDIA (7.3 years and 7.8 years, respectively) {31}. The results of the various studies are thus conflicting. However, if, as observed in the largest and most recent study, the CARDIA Study, the prevalence of cigarette smoking is similar in black women and white women, but white women smoke more cigarettes per day, then the total burden of cigarette smoking would be lower in the black women. This would tend to decrease, not increase, their risk of coronary heart disease compared to white women.

DIABETES MELLITUS

It has been established that diabetes mellitus is an important independent risk factor for the development of coronary heart disease {140}. The mechanisms by which diabetes accelerates atherogenesis and increases the risk for CHD are uncertain, but may include associated abnormalities of lipoprotein composition and particle distribution, increased tendency to thrombosis, atherogenic effects of insulin, and glycation of proteins in the arterial wall {148}. Diabetes is a particularly important risk factor for CHD in women {2,149,150}. In the Framingham Study, diabetes increased the risk for CHD by 2.7-fold in women, compared to 1.7-fold in men {2,149}. Women with diabetes have the same risk of CHD as men of the same age. Thus, the relative protection from CHD enjoyed by premenopausal women is lost if diabetes is present {149}. Further, insulin resistance without elevation of the fasting plasma glucose level, which may predate frank diabetes, may also increase the risk for CHD {33}.

Black women have an approximately twofold greater prevalence of diabetes than white women when all age groups are considered together {16,49,147,151}. The prevalence of diabetes in premenopausal women, while low, may also be higher in blacks than in whites. In NHANES-II, black women age 20-44 years had a 3.5% rate of diabetes, compared to a 2.2% rate in similarly aged white women {151}. In the Pittsburgh Healthy Women Study, premenopausal black women, compared to white women, had significantly greater plasma insulin and glucose levels two hours after administration of a 75 g oral glucose load {29}, indicating a greater degree of insulin resistance in the black women and a predisposition to the development of overt diabetes.

The reason(s) for the greater prevalence of diabetes in black women compared to white women are unknown. Although obesity is more common in black women, it may not explain their higher prevalence of diabetes {57,152}. In fact, two small studies previously cited have demonstrated that black women, compared to white women, actually have smaller, not larger, depots of visceral fat {34,35}, the type of fat most strongly associated with metabolic and cardiovascular risk {153}. In the more recent of these studies {35}, black women of a similar BMI as white women had reduced sensitivity to insulin, in spite of their smaller visceral fat depots. The significance of this seemingly paradoxical finding is uncertain. Thus, the greater prevalence rate of diabetes in black women compared to white women may be due to factors other than differences in obesity rates or visceral fat depots. Elucidation of these unknown factors which predispose black women to insulin resistance and diabetes should be an important goal for future research.

SOCIOECONOMIC STATUS

Even apart from its postulated association with obesity and hypertension, low socioeconomic status is an important predictor of morbidity and mortality from CHD and other cardiovascular diseases, as well as all-cause mortality {39,154}. In the National Longitudinal Mortality Study, family income, a surrogate for socioeconomic status, independently accounted for 24% of the excess cardiovascular disease mortality in black compared to white women age 25-44 years {39}. Similarly, in the NHANES-I Epidemiologic Follow-Up Study {154}, 38% of the excess mortality of black compared to white adults in the United States was explained by differences in family income, after

adjusting for other risk factors. Low socioeconomic status may create impediments to health care, resulting in decreased access to and utilization of medical care services by blacks. These impediments include inadequate health care facilities, lack of health insurance, long waiting times, and racial discrimination {20}. Lack of health insurance may be particularly significant in the working poor: their employers may not provide health insurance coverage, yet their income is not low enough to qualify for government assistance. Additionally, as a consequence of both their lower SES as well as cultural factors, blacks may have deficient knowledge of CHD symptoms and risk factors, perceive themselves to be less susceptible to CHD, or be unwilling to enter the medical care system {20}. As a result of these social, economic, and cultural barriers to health care, blacks may visit the physician less frequently than whites {20}, experience longer delays between the onset of chest pain and arrival at the emergency room {155}, and be less frequently referred for coronary artery bypass graft surgery and angioplasty {156}. All of these factors may contribute to the higher CHD mortality rate in premenopausal black women compared to white women.

PLASMA TOTAL HOMOCYSTEINE

The level of plasma total homocysteine, a sulfur containing amino acid derived from the essential amino acid methionine {157}, is an independent risk factor for the development of coronary heart disease, stroke, and peripheral arterial disease {158-160}. Plasma homocysteine levels have not been reported in premenopausal black women. In the Physicians' Health Study {161}, men in the highest 5% of the homocysteine distribution had a 3.1 fold greater risk of myocardial infarction than men in the bottom

90% of the distribution. Although that study suggested a threshold effect for plasma homocysteine, later results indicated that, like cholesterol, the cardiovascular risk associated with homocysteine increases in a graded fashion over the spectrum of homocysteine values {162,163}. In a case-control study conducted by Pancharuniti {162}, the odds ratio for coronary heart disease per quartile increase in the plasma homocysteine concentration based on control values was 1.6. In a recent meta-analysis {163}, a 5 μmol/L increment in the plasma total homocysteine concentration increased the risk for CHD by 60% in men and 80% in women. In another study, a 5 μmol/L increment in plasma total homocysteine increased CHD risk in women by at least 240% {164}. Thus, elevated plasma homocysteine may be a particularly important risk factor for CHD in women, especially premenopausal women {165}.

The mechanism(s) by which elevated homocysteine may increase the risk for cardiovascular disease are uncertain. Currently, the most popular hypothesis is that homocysteine-induced injury to vascular endothelial cells is the initiating event {166}. This, in turn, leads to vascular dysfunction characterized by decreased vasodilatory response to endogenous vasodilators {167} and to other changes that promote both atherogenesis and thrombogenesis {157,166}. Based upon in vitro studies, the initial endothelial cell injury is believed to be chemical, possibly due to hydrogen peroxide (H_2O_2) generated by homocysteine oxidation within the endothelial cell {157,168}. The injured endothelium may desquamate, with resultant activation of platelets exposed to the subendothelial layer. The activated platelets produce the prothrombotic and vasoconstricting compound thromboxane A-2 {157,159,166}, and also stimulate smooth muscle cell proliferation {169}, an important event in atherogenesis {129}.

Homocysteine may additionally promote atherogenesis by inducing the oxidation of LDL particles, as demonstrated in vitro {170,171}. Finally, homocysteine may decrease thrombomodulin-dependent endothelial cell activation of protein C, a natural anticoagulant {172,173}, increase activation of Factor V {174}, and alter tissue plasminogen activator binding to endothelial cell receptors {175}. These changes in clotting factors could shift the balance toward a prothrombotic state within the vasculature, increasing the likelihood of thrombotic occlusion of the coronary or cerebral circulation and the peripheral arterial tree.

Factors which could contribute to an elevation of plasma total homocysteine levels can be appreciated from a consideration of homocysteine metabolism (Figure 3.1). At least three vitamins, folic acid, vitamin B_{12} and vitamin B_6, play an important role in homocysteine metabolism {160,176}. Folic acid, present as 5-methyl tetrahydrofolate (5-methyl THF), functions as methyl donor in the remethylation of homocysteine to methionine, a reaction catalyzed by the vitamin B_{12}-dependent enzyme methionine synthase {159,176}. The formation of 5-methyl THF from 5,10-methylenetetrahydrofolate is catalyzed by the enzyme methylenetetrahydrofolate reductase (MTHFR) {177}. A common mutation in the gene which codes for MTHFR results in a thermolabile variant of the enzyme with reduced basal activity, which decreases formation of the necessary methyl donor (5-methyl THF) for the remethylation reaction and may thus raise the plasma homocysteine concentration {177,178}, especially if low plasma folate levels are also present {179}. Finally, vitamin B6 is a necessary cofactor for the enzyme cystathionine B-synthase in the two-step conversion of homocysteine to cysteine {159,176}. A mutation in cystathionine B-synthase is the cause

of the autosomal recessive congenital disease homocysteinuria, in which homocysteine levels may be as high as 200 μmol/L or more. Early death from vascular or thrombotic complications is the rule in this rare hereditary disorder {159,160,176}.

SUMMARY

In summary, premenopausal black women have a 2-3 fold greater rate of coronary heart disease than premenopausal white women. Black women in the later premenopausal years seem to be at particular risk. The greater rate of coronary disease in premenopausal black women may result from a higher prevalence of coronary heart disease risk factors in these women. Premenopausal black women have greater rates of obesity, hypertension, elevated plasma Lp(a), and possibly diabetes. However, the significance of these risk factors, especially Lp(a), to the pathogenesis of coronary heart disease in black women is uncertain and requires further study. Paradoxically, the overall lipoprotein profile of premenopausal black women, based on the limited data available, is actually less, not more, atherogenic than the lipoprotein profile of white women. Plasma levels of homocysteine, an important independent risk factor for CHD, have not been determined in premenopausal black women. The susceptibility of LDL to oxidative modification in black women is similarly unknown. The magnitude of the increased risk for CHD in premenopausal black women compared to white women is likely determined by the balance and interplay among these known risk factors.

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Chapter 2

PREMENOPAUSAL BLACK WOMEN ARE UNIQUELY AT RISK FOR CORONARY HEART DISEASE COMPARED TO WHITE WOMEN

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ABSTRACT

Background: Premenopausal black women have a 2-3 times greater rate of coronary heart disease (CHD) than premenopausal white women. The purpose of this study was to provide greater insight into the reasons for this difference, which are currently unclear.

Methods and results: We compared CHD risk factors in 100 black and 100 white, healthy premenopausal women age 18-45 years and of relatively advantaged socioeconomic status. Compared to white women, black women had a higher body mass index (BMI) (32.0±9.2 vs. 29.0±9.4 kg/m^2, p=0.021), and higher systolic (124±17 vs. 115±14 mmHg, p<0.0001), and diastolic (79±14 vs. 75±11 mmHg, p=0.048) blood pressures. The mean plasma Lp(a) concentration was markedly higher in the black women (40.2±31.3 mg/dl) than in the white women (19.2±23.7 mg/dl, p<0.0001). The plasma total homocysteine level was also higher in the black women (8.80±3.38 vs. 7.81±2.58 μmol/L, p=0.013). The black women, however, had lower plasma triglyceride levels (81±41 vs. 108±53 mg/dl, p<0.0001), and a trend toward higher HDL cholesterol levels (53±13 vs. 50±12 mg/dl, p=0.064) than the white women. Plasma total and LDL cholesterol levels were similar. Black women consumed more saturated fat and cholesterol in their diets. Rates of cigarette smoking and alcohol intake were low and similar between the races.

Conclusions: Premenopausal black women had a higher mean body mass index, blood pressure, Lp(a), plasma total homocysteine levels, and a greater consumption of saturated fat and cholesterol than white women. These differences in coronary risk factors may explain the higher incidence of CHD in premenopausal black women compared to white women.

KEY WORDS: coronary disease, risk factors, premenopausal women

INTRODUCTION

Coronary heart disease (CHD) remains the leading cause of death for both black and white men and women in the United States today {1}, despite decreased mortality in both races and sexes in recent years {2}. The decline in CHD mortality was, however, less marked in black women than in white women {2}. In premenopausal white women, the incidence of CHD is low {3}. Premenopausal black women, on the other hand, have a rate of coronary heart disease which approaches the high coronary rate of both black men and white men of comparable ages and is approximately 2-3 times that of similarly-aged white women {4-8}. Coronary heart disease becomes particularly prevalent in black women in the later premenopausal years, between the ages of 35 and 50 {4,7,8}.

Little definitive information is available regarding both the prevalence and significance of individual risk factors to the development of coronary heart disease in black women. While plasma total cholesterol levels appear to be similar in premenopausal black women and white women {9,10}, levels of LDL cholesterol have been variously described as higher {10}, the same {11}, or lower {12} in premenopausal black women than in white women. Most but not all of the available studies have demonstrated that black women have higher levels of HDL cholesterol {12,13} and lower plasma triglyceride concentrations {10,11,14} than white women, which would tend to protect black women from CHD rather than promote it. The relative prevalence of cigarette smoking in premenopausal white women and black women is uncertain {15-

17}, although some evidence suggests that among smokers, white women smoke more cigarettes per day than black women {15,16}.

Premenopausal black women have an approximately 1½-2 fold greater prevalence of obesity than their white counterparts {18,19}. Obesity is likely an important risk factor for coronary heart disease in white women {20,21}, but its role as a coronary risk factor in black women is less well-established {22,23}. Hypertension, another CHD risk factor, is 2-3 times more prevalent in premenopausal black compared to premenopausal white women {16,24,25}. The increased prevalence of hypertension in black women may be partly related to their greater adiposity {26}. Finally, although black women have higher levels of lipoprotein(a) [Lp(a)] {14,27}, a potent independent risk factor for coronary heart disease in non-black populations {28,29}, the significance of elevated Lp(a) to the pathogenesis of CHD in blacks has been questioned {30,31}.

Little or no information is available about the relationship of three other potentially important coronary risk factors to the development of CHD in premenopausal black women: the plasma total homocysteine level, susceptibility of LDL to oxidative modification, and diet. Levels of plasma total homocysteine, a strong independent risk factor for coronary heart disease {32,33}, have not been reported in premenopausal black women. Since plasma total homocysteine is inversely correlated with folate intake {34}, and premenopausal black women have a lower dietary intake of folate than white women {35}, black women may have higher plasma total homocysteine levels. The susceptibility of LDL to oxidation, which enhances its atherogenicity {36,37}, has similarly not been studied in black women. Relatively few studies have compared the diets of

premenopausal black women and white women, and those that have, provide inconsistent and conflicting information {9,38-40}.

Lastly, lower socioeconomic status (SES) is an additional important predictor of morbidity and mortality from coronary heart disease as well as all-cause mortality {41-43}. Black women living in the United States today generally have lower socioeconomic status than white women {43,44}, which may contribute to their higher coronary rates. The interaction of SES with other risk factors, particularly hypertension and obesity, has not been fully delineated.

To meet the challenge of these information deficits, we conducted a screening study for cardiac risk factors in 100 black and 100 white healthy, 18-45 year old premenopausal women. Standard coronary risk factors were measured as well as more recently described risk factors, including the plasma total homocysteine level, Lp(a), and the susceptibility of LDL to oxidative modification. A detailed dietary assessment was also conducted. This research was expected to provide insights into the reasons for the greater rate of coronary heart disease in premenopausal black women compared to white women. Effective preventive and therapeutic measures could then be devised to delay or prevent the development of coronary heart disease in black women in the later premenopausal years and beyond.

METHODS

Subjects and design

Coronary heart disease risk factors were measured in 100 white and 100 black premenopausal women age 18-45 years. The study was approved by the institutional

review board at the Oregon Health Sciences University, and all subjects gave informed consent. All women were healthy and had regular menstrual periods. Women with a known history of diabetes were excluded. No participant had thyroid, renal or hepatic disease. Subjects with a fasting plasma triglyceride concentration greater than 400 mg/dl were excluded. The women were recruited from among Oregon Health Sciences University employees, the mothers of children in a school-readiness program in Portland (Albina Head Start) and the general Portland community. Recruitment methods included advertisement in the campus newsletter and in local newspapers, radio advertisements, and word of mouth. Subjects were screened at either the Oregon Health Sciences University Clinical Research Center (CRC) or at the Albina Head Start main office as part of the screening procedure a medical history was administered by the physician investigators. Socioeconomic status was estimated by educational attainment {45}. Height, weight, and blood pressure was measured by the nursing staff. In addition, venipuncture was performed after a 12 hour fast for determination of plasma lipids and lipoproteins, Lp(a), plasma total homocysteine, the susceptibility of LDL to oxidation, and levels of the cholesteryl ester transfer protein (CETP), which modulates the transfer of cholesteryl esters from HDL to other lipoproteins {46,47}. High plasma CETP activity may lead to lower HDL cholesterol levels and an increased risk for atherosclerosis. Finally, a dietary history was obtained by dietitians trained in using the Diet Habit Survey, a 40-item eating behavior questionnaire developed at the Oregon Health Sciences University for assessment of dietary intake over the preceding month. The Diet Habit Survey has been previously validated {50} and is particularly useful for estimating the saturated fat and cholesterol content of the diet.

Laboratory analysis

Homocysteine

Plasma total homocysteine concentrations were measured using a high-performance liquid chromatography method with electrochemical detection, as previously described {51,52}. The percent recovery of added homocysteine was 101.2±5.5%. The within-assay precision (coefficient of variation) was 1.1%, and the between-assay precision for replicates analyzed through a 2-month span was 9.1% {51}.

Lipoprotein(a)

Plasma levels of lipoprotein(a) were quantified by an enzyme-linked immunosorbent assay with monoclonal antibodies {53} (Strategic Diagnostics, Newark, Delaware).

Lipids and lipoproteins

Plasma lipids and lipoproteins were measured in our Lipid Laboratory by standard procedures in compliance with the standardization and surveillance programs of the Center for Disease Control Laboratory in Atlanta, Georgia, according to procedures established by the Lipids Research Clinics Program {54}.

LDL oxidation

The susceptibility of LDL to oxidation by $CuSO_4$ was measured as described by Esterbauer {55} with modifications by Wander {56}. Samples were stored at -80°C until analysis. The length of sample storage was similar in black women (22.3 months) and white women (21.8 months). The kinetics of conjugated diene formation were determined

by monitoring absorbance at 234 nm, using a Shimadzu spectrophotometer model UV160U (Columbia, Maryland). The absorbance at 234 nm is proportional to the amount of conjugated dienes. The kinetic parameters of conjugated diene formation (lag time, rate, maximal level) are indices of LDL oxidation.

Cholesteryl ester transfer protein

The plasma activity of CETP was measured by incubating donor HDL_3 containing radiolabeled lipids with acceptor VLDL in the presence of 20 μl of each subject's plasma for 90 minutes at 37°C. The CETP activity was expressed as the percentage transfer of labeled substrate from donor lipoprotein to acceptor lipoprotein/20 μl plasma/90 minutes {57}.

Statistical methods

One subject was an outlier on plasma triglyceride (562 mg/dl, greater than 10 standard deviations above the mean) and plasma total homocysteine (60.54 μmol/L, nearly 20 standard deviations above the mean), and was thus not included in the analysis. The final sample upon which the analyses were performed, therefore, consisted of 99 black women and 100 white women.

Coronary heart disease risk factors and the dietary data were compared between black women and white women using a two-tailed unpaired t-test {58}. The plasma total homocysteine and triglyceride data were severely skewed in both black women and white women, and therefore $\log_{10}$ transformation was performed before all analyses involving these variables; the results are presented in the original (untransformed) scale. The Lp(a) data overall exhibited less skewness and was therefore not transformed. To ascertain

factors predictive of body mass index (BMI), multiple linear regression analysis of BMI (dependent variable) on race, educational attainment in years, and the presence or absence of a college degree was performed {59}. In a similar fashion, multiple linear regression analysis of systolic blood pressure (dependent variable) on race, BMI, $\log_{10}$ plasma total homocysteine, educational attainment in years, presence or absence of a college degree, and salt intake was performed. A similar multivariate regression analysis was performed for the diastolic blood pressure. The percentages of black women and white women who were hypertensive {systolic blood pressure $\geq$140 mmHg or diastolic blood pressure $\geq$ than 90 mmHg or on medication} were compared using the z-test for proportions {58}. Similarly, a *z* statistic was used to compare the percentages of black women and white women who had a BMI of 30 kg/m^2 or greater. The percentages of black women and white women who had college degrees were also compared using the z-test statistic. Finally, the z-test for proportions was used to compare the percentages of black women and white women with plasma total homocysteine levels $\geq$ 10 μmol/L. The LDL oxidation data from 12 black women and 12 white women were analyzed using an unpaired t-test.

Pearson product moment correlation coefficients "r" were computed to test for correlations between selected pairs of the measured variables. The coefficient of determination (r^2) was calculated to determine the percentage of the variability in a given factor (dependent variable) that was attributable to another factor (independent variable) {58}. The strength of the correlations of systolic and diastolic blood pressure with BMI was compared between black women and white women, using a two-sample test with Fisher's transformation of r {58}.

Least squares regression lines were estimated for the regression of $\log_{10}$ triglyceride (dependent variable) on BMI (independent variable) in white women and black women {59}. The slopes of the regression lines were compared using a multiple regression model {59} and the strength of the correlations using a two sample test with Fisher's transformation of *r* {58}. The Lp(a) frequency distribution of the black women and white women was graphed by quintiles, with quintile ranges of 1-25, 26-50, 51-75, 76-100, and 101-125 mg/dl respectively.

The statistical analyses were performed using the Sigma Stat statistical software package (Jandel Scientific, Version 1.0). Graphic displays were created with Sigma Plot (Jandel Scientific, Version 2.0).

RESULTS

Educational attainment

The mean educational attainment of the black women and white women in our study was very similar, 14.3 years versus 14.9 years, respectively (Table 2.1). However, a nearly 2-fold greater percentage of white women (46%) than black women (24%) had college degrees (p=0.002). Both the white women and the black women in our study were more well-educated than comparably aged white women and black women in Portland {60} and in the United States as a whole {61}. The educational attainment of women within the Portland community was intermediate to that of the women in our study and in the United States.

Table 2.1 Coronary heart disease risk factors in premenopausal white women and black women

	Mean ± Standard Deviation		
	White Women	Black Women	P-value
Age (yrs)	35.0±7.2	33.8±7.4	>0.10
Education (yrs)	14.9±2.3	14.3±2.0	0.054
Height (m)	1.65±0.06	1.64±0.06	>0.10
Weight (Kg)	78.6±26.0	86.3±26.0	0.039
Body Mass Index	29.0±9.4	32.0±9.2	0.021
Systolic blood pressure (mm Hg)	115±14	124±17	<0.0001
Diastolic blood pressure	75±11	79±14	0.048
Mean blood pressure (mm Hg)	89±11	94±15	0.003
% Current cigarette smokers	13%	11%	>0.10
Total plasma cholesterol**	4.58 ± 0.85 (177±33)	4.65 ± 0.9 (180±36)	>0.10
LDL cholesterol	2.72 ± 0.78 (105±30)	2.82 ± 0.90 (109±32)	>0.10
HDL cholesterol	1.29 ± 0.31 (50±12)	1.37 ± 0.34 (53±13)	0.064
Triglycerides	1.22 ± 0.60 (108±53)	0.91 ± 0.46 (81±41)	<0.0001
VLDL cholesterol	0.57 ± 0.28 (22±11)	0.41 ± 0.21 (16±8)	<0.0001
Lp (a)	19.2 ± 23.7	40.2 ±31.3	<0.0001
Homocysteine (μmol/L)	7.81± 2.58	8.80 ± 3.38	0.013

** Lipid and lipoprotein values are expressed as mmol/L, with mg/dL in parentheses. Lp(a) is expressed as mg/dL.

Plasma total homocysteine

The mean plasma total homocysteine level was significantly greater in black women than in white women (8.80 vs. 7.81 μmol/L, respectively, p=0.013). More than twice as many black women (26%) as white women (11%) had plasma total homocysteine levels $\geq$10 μmol/L, a level which may be undesirable. Plasma total homocysteine was significantly correlated with systolic blood pressure in black women (r=0.200, p=0.049) (Table 2.2), but not in white women (r=0.073, p>0.10) (Table 2.3). Plasma total homocysteine levels did not differ significantly between smokers and nonsmokers, although the ability of this study to detect such a difference was limited by the low number of smokers in both races.

Lipoprotein(a)

The mean plasma lipoprotein(a) concentration was 40.2 mg/dl in the black women and 19.2 mg/dl in the white women (p<0.0001). The Lp(a) distribution curve by quintiles was skewed to the left in both races, but more-so in the white women (Figure 2.1).

Weight and body mass index

The black women in our study had a significantly greater mean body weight than the white women (86.3 vs. 78.6 kg, respectively, p=0.039) (Table 2.1). The black women also had a higher mean body mass index (32 kg/m^2) than the white women (29 kg/m^2) (p=0.021). A significantly greater percentage of black women (54%) than white women (37%) had a BMI of 30 or greater (p=0.028).

Table 2.2 Pearson product moment correlations, black women

	Education	BMI	Sys. BP*	Dias. BP†	Saturated Fat and Cholesterol Intake	TC‡	LDL-C	HDL-C	TG§
Education	-								
BMI	-0.106	-							
Sys. BP	-0.118	0.533****	-						
Dias. BP	-0.026	0.533****	0.782****	-					
Saturated Fat and Cholesterol Intake	-0.269**	0.031	-0.076	-0.064	-				
TC	0.038	0.024	0.155	0.120	0.077	-			
LDL-C	0.028	0.132	0.144	0.108	0.137	0.908****	-		
HDL-C	0.127	-0.424****	-0.171	-0.122	-0.041	0.305**	0.054	-	
TG	-0.138	0.331***	0.374***	0.352***	0.113	0.190	0.144	-0.431****	-

* p value < 0.05
** p value < 0.01
*** p value < 0.001
**** p value < 0.0001

* = systolic blood pressure
† = diastolic blood pressure
‡ = total plasma cholesterol
§ = plasma triglycerides

Table 2.3 Pearson product moment correlations, white women

	Education	BMI	Sys. BP•	Dias. BP†	Saturated Fat and Cholesterol Intake	TC‡	LDL-C	HDL-C	TG§
Education	-								
BMI	-0.274^{++}	-							
Sys. BP	-0.068	0.568^{++++}	-						
Dias. BP	-0.084	0.500^{++++}	0.775^{++++}	-					
Saturated Fat and Cholesterol Intake	-0.231^{+}	0.194	-0.146	0.106	-				
TC	-0.148	0.168	0.322^{++}	0.192	0.096	-			
LDL-C	-0.249^{+}	0.182	0.285^{++}	0.189	0.139	0.925^{++++}	-		
HDL-C	0.312^{++}	-0.380^{++++}	-0.261^{++}	-0.242^{+}	-0.057	0.013	-0.247^{+}	-	
TG	-0.140	0.469^{++++}	0.498^{++++}	0.362^{+++}	-0.028	0.504^{++++}	0.372^{+++}	-0.392^{++++}	-

$^{+}$ p value < 0.05
$^{++}$ p value < 0.01
$^{+++}$ p value < 0.001
$^{++++}$ p value < 0.0001

• = systolic blood pressure
† = diastolic blood pressure
‡ = total plasma cholesterol
§ = plasma triglycerides

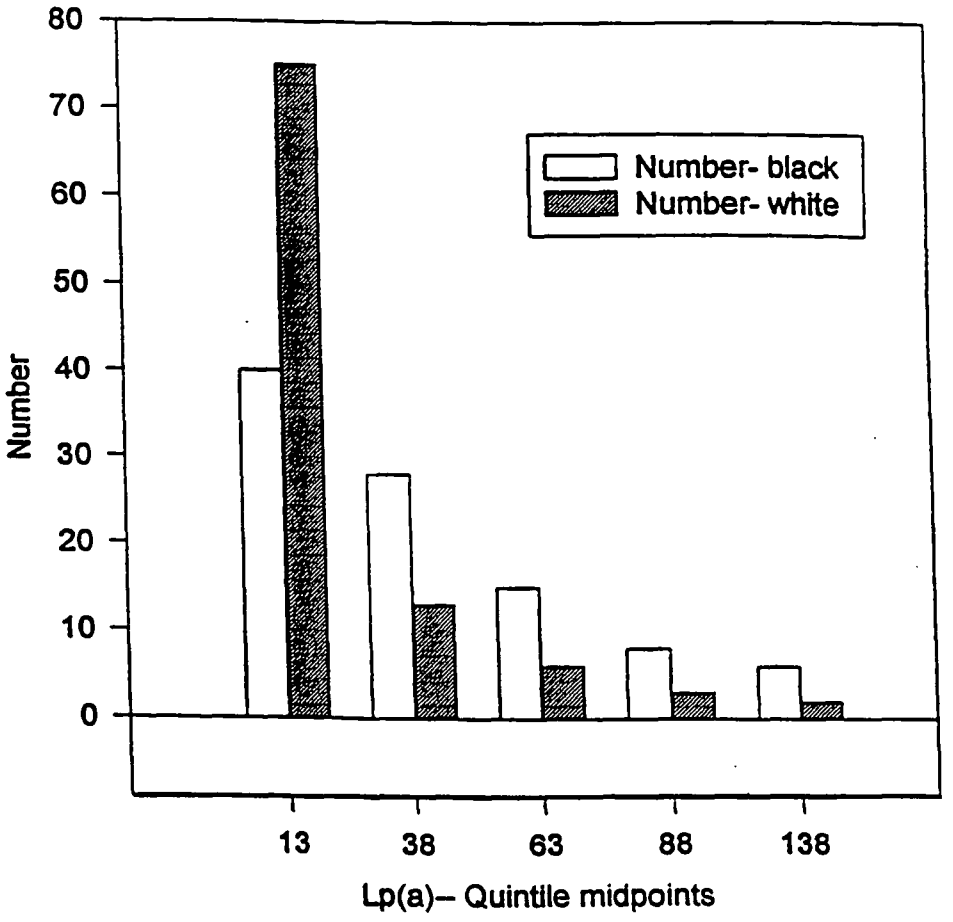

Figure 2.1 Lp(a) frequency distribution by quintiles in white women and black women

Body mass index was inversely correlated with educational attainment in years in white women (r=-0.274, p=0.006) (Table 2.3) but not in black women (r=-0.106, p>0.10) (Table 2.2). In a multiple linear regression analysis of BMI on race, educational attainment in years, and presence or absence of a college degree, only the attainment of a college degree was a significant predictor of BMI. The mean BMI of white women with and without a college degree was 25.7 ± 6.6 and 31.8 ± 10.5, respectively. Black women with a college degree had a mean BMI of 28.4 ± 5.4, compared to 33.2 ± 9.8 in black women without a college degree.

Blood pressure

Compared to white women, black women had a higher mean systolic (124 vs. 115 mmHg, p<0.0001), diastolic (79 vs. 75 mmHg, p=0.048), and mean blood pressure (94 vs. 89 mmHg, p=0.003) (Table 2.1). The prevalence of hypertension was nearly 3-fold greater in black women than in white women (31% vs. 12%, respectively, p=0.002). Blood pressure was not significantly correlated with educational attainment in either white women (Table 2.3) or black women (Table 2.2).

Both the systolic and diastolic blood pressure were highly correlated with BMI in both white women and black women (p<0.0001) (Tables 2.2 and 2.3). In white women, 32% of the variability in systolic blood pressure and 25% of the variability in diastolic blood pressure (r^2) was accounted for by BMI. Twenty-eight and 15%, respectively, of the variability in systolic and diastolic blood pressure was accounted for by BMI in black women. The correlation of systolic and diastolic blood pressure with BMI did not differ between the races. In a multiple linear regression analysis of systolic blood pressure on

race, BMI, $\log_{10}$ plasma total homocysteine, educational attainment in years, presence or absence of a college degree, and salt intake, only BMI and race were significant predictors of systolic blood pressure. When a similar regression analysis was performed for diastolic blood pressure, only BMI was a significant predictor.

Higher blood pressure in both white women and black women was associated with a significantly more adverse lipoprotein profile (Tables 2.2 and 2.3), possibly through its association with BMI; this relationship was stronger in the white women. Neither the systolic or diastolic blood pressure was significantly correlated with salt intake in either the white women or the black women.

Diet

There were significant dietary differences between black women and white women (Table 2.4). The cholesterol-saturated fat score from the Diet Habit Survey was significantly different ($p=0.008$) and indicated that black women were consuming typical U.S. amounts of cholesterol and saturated fat whereas white women were consuming lower amounts that meet the U.S. Dietary Guidelines. Use of low-fat recipes was different ($p=0.002$) with white women using more low-fat recipes than black women. Black women reported making significantly fewer low-fat, high complex carbohydrate and fiber choices than white women when eating out ($p<0.0001$). Daily cholesterol and saturated fat intake were inversely correlated with educational attainment in both white women ($r = -0.231$, $p = 0.021$) and black women ($r = -0.269$, $p = 0.007$) (Tables 2.2 and 2.3). The salt score was different ($p=0.019$) and indicated that the black women were consuming approximately 8 pounds of salt a year; the white women were consuming 7

Table 2.4 Dietary intakes of black women and white women

Intake*	White Women	Black Women	p value
Cholesterol, mg/day	290	360	0.008
Saturated fat, % kcal	10	12	0.008
Sodium, mg/day	3700	4200	0.019
Low-fat recipes, #/wk	2-3	1-2	0.002
Restaurant choices, # low-fat	4-5	2-3	<0.0001
Alcohol, drinks per week	1	1	>0.10

*Based on the Diet Habit Survey, an eating habit questionnaire.

pounds of salt a year. Salt intake decreased as educational attainment increased in the black women ($r = -0.242$, $p = 0.016$) but not the white women ($r = -0.099$, $p > 0.10$). Alcohol intake was low and similar in both races, about 1 drink per week (1 drink = 12 ounces of beer or 1 ½ ounces of spirits or 4 ounces of wine).

Lipids and lipoproteins

Black women and white women had similar fasting plasma levels of total cholesterol [4.65 mmol/L (180 mg/dl) vs. 4.58 mmol/L (177 mg/dl)], respectively (Table 2.1). The LDL cholesterol level was also similar between the races: 2.82 mmol/L (109 mg/dl) in black women and 2.72 mmol/L (105 mg/dl) in white women. Plasma triglyceride levels, although normal in both races, were significantly lower in black women [0.91 mmol/L (81 mg/dl)] than in white women [1.22 mmol/L (108 mg/dl)] ($p<0.0001$). HDL cholesterol tended to be higher in black women [1.37 mmol/L (53 mg/dl)] than in white women [1.29 mmol/L (50 mg/dl)] ($p=0.064$).

Plasma LDL cholesterol levels were inversely correlated with educational attainment in white women ($r=-0.249$, $p=0.012$) (Table 2.3), but not black women ($r=0.028$, $p>0.10$) (Table 2.2). The HDL cholesterol level was positively correlated with alcohol intake in both white women ($r=0.442$, $p<0.0001$) and black women ($r=0.279$, $p=0.005$). The HDL cholesterol level and BMI were inversely correlated in both white women ($r=-0.380$, $p<0.0001$) and black women ($r=-0.424$, $p<0.0001$). There was an inverse correlation of plasma triglyceride and HDL cholesterol in both races ($r=-0.392$, $p<0.0001$ in white women and $r=-0.431$, $p<0.0001$ in black women) (Tables 2.2 and 2.3). Plasma triglyceride was correlated with the BMI in both white women ($r=0.469$,

$p<0.0001$) and black women ($r=0.331$, $p<0.001$); the correlation coefficients did not differ statistically between the races. Similarly, there was no difference in the slope of the least squares regression line of $\log_{10}$ triglyceride on BMI between the white women (Figure 2.2) and the black women (Figure 2.3).

LDL oxidation

The lag time in minutes to onset of conjugated diene formation was similar in black women (51.0±18.2) and white women (53.0±11.4, $p>0.10$). The rate of conjugated diene formation, expressed as nmol diene/mg LDL protein/minute, tended to be higher in white women (10.13±1.44) than in black women (8.82±1.70) ($p=0.053$). Similarly, there was a tendency toward greater total conjugated diene production in white women than in black women (454.0±61.4 vs. 401.0±86.0 nmol/mg LDL protein, $p=0.095$).

Cholesteryl ester transfer protein (CETP)

The mean activity of plasma CETP was nearly identical in black women and white women (21.0±6.2% vs. 21.5±6.0% transfer/20 μl/90 minutes) ($p>0.10$).

Cigarette smoking

A similar percentage of white women and black women were current cigarette smokers (13% and 11%, respectively) (Table 2.1). This was less than the smoking prevalence rate of similarly-aged white women and black women in the United States {62}; comparable data for smoking prevalence are not available for the Portland community. Twenty-eight percent of the white women and 27% of the black women in our study were former cigarette smokers.

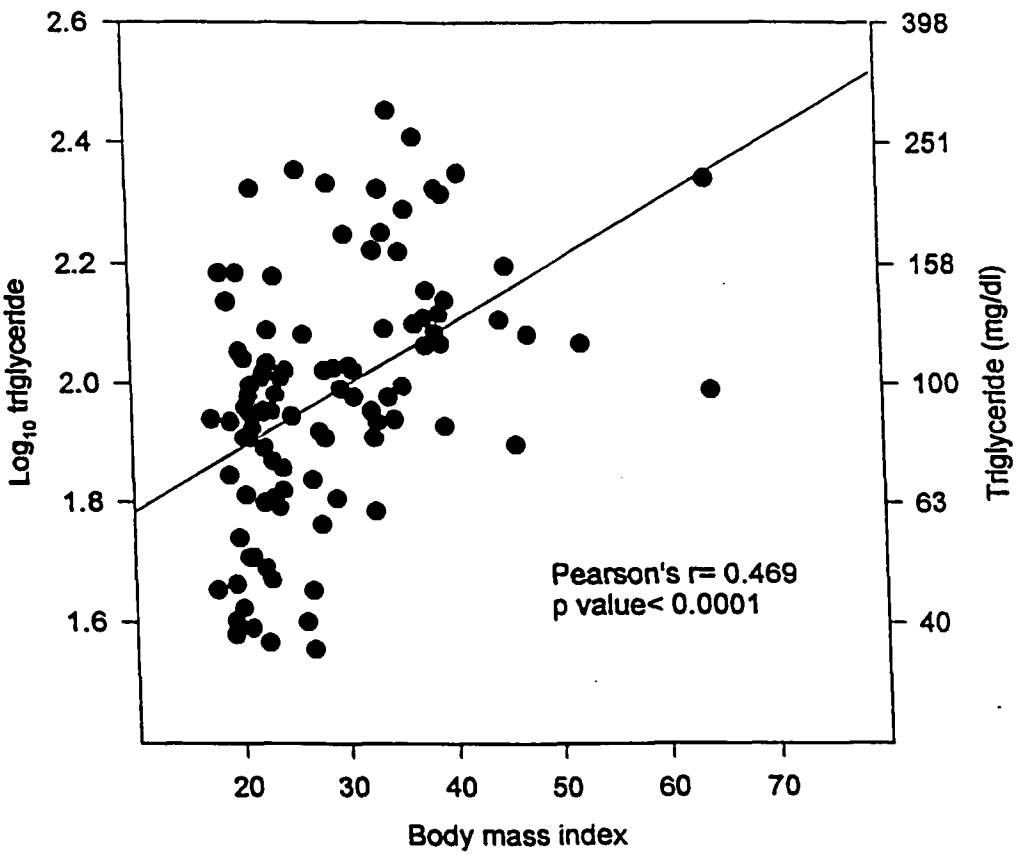

Figure 2.2 Least squares linear regression of $\log_{10}$ triglyceride on BMI, white women

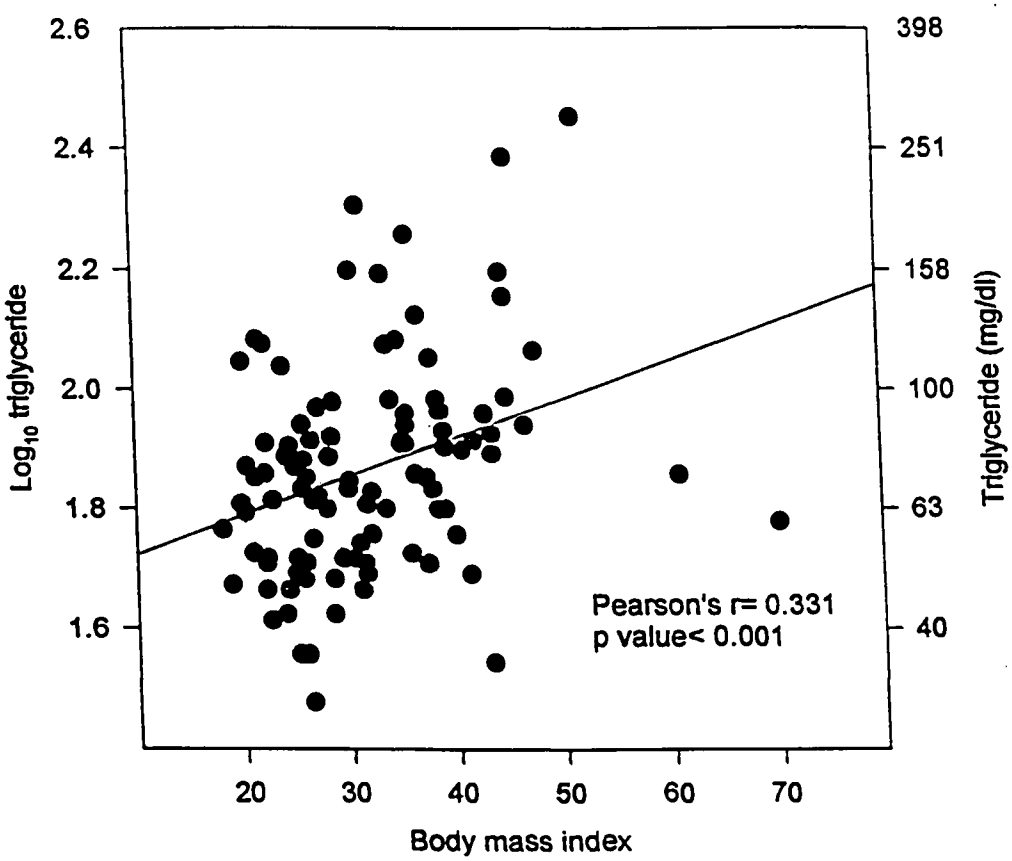

Figure 2.3 Least squares linear regression of $\log_{10}$ triglyceride on BMI, black women

DISCUSSION

An important and unique feature of our study was the relatively high socioeconomic status (SES) of both the black women and white women, compared to similarly-aged women in the Portland area and the general United States. The relatively high SES of the women in our study likely resulted from a greater health consciousness with advancing education, leading to an increased likelihood of volunteering for a study of this type. In addition, many subjects were recruited from among the Oregon Health Sciences University's professional staff, especially nurses. However, even with their comparatively high SES, the black women in our study had relatively high levels of CHD risk factors and were thus at substantial risk for the development of CHD.

The health profiles and habits of the black as well as the white women in our study generally improved with increasing educational attainment. More well-educated black women and white women had lower intakes of saturated fat and cholesterol than their less well-educated counterparts. Despite this, the plasma LDL cholesterol concentration decreased with increasing education in the white women only. The lack of correlation between the LDL cholesterol level and education in black women, despite their decrease in saturated fat and cholesterol intake at higher educational attainments, was puzzling. Salt intake, which was higher in the black women than in the white women, decreased with advancing educational attainment in the black but not the white women. In addition, the BMI was lower in black women and white women who had achieved a college degree, compared to women without a college education. Higher

educational attainment may be associated with a lower daily kcal intake and greater physical activity level {39,63}, both of which may lower the BMI.

This is the first study to report plasma total homocysteine concentrations in premenopausal black women. The higher plasma total homocysteine levels observed in the black women in our study suggests that racial differences in this risk factor may contribute importantly to the greater rate of CHD in premenopausal black women. Plasma total homocysteine may increase CHD risk through injury to vascular endothelial cells {64,65}, resulting in endothelial dysfunction {66}, as well as thrombogenesis and atherogenesis {33,65,67}. Based upon the results of a recent meta-analysis {68}, in which a 5 μmol/L rise in plasma total homocysteine increased the risk for CHD in women by 80%, the racial difference of 0.99 μmol/L in the plasma total homocysteine levels in our study would be predicted to increase the risk for CHD by 16% in the premenopausal black women compared to the white women, a clinically significant amount.

Another coronary heart disease risk factor that was higher, and strikingly so, in black women than in white women in our study was the plasma concentration of Lp(a), an LDL-like particle which contains the unique protein apolipoprotein (a) {69}. Other studies have also reported higher plasma Lp(a) concentrations in black women compared to white women {14,27}. The reason for the markedly higher Lp(a) levels in black women is unknown. Since the heritability of Lp(a) is estimated to be 90% {70}, it is likely that genetic rather than environmental factors are responsible for the racial difference. Plasma levels of Lp(a) are inversely proportional to the size of apolipoprotein(a), which, in turn, is under genetic control by the apolipoprotein(a) gene {69,71}. Racial differences in the apolipoprotein(a) gene may thus be responsible for the

strikingly higher Lp(a) concentrations in premenopausal black women compared to white women.

Lipoprotein (a) is a potent risk factor for coronary heart disease in white populations {28,29}; this increase in coronary risk is believed to result from both proatherogenic and prothrombotic effects of the Lp(a) particle. That Lp(a) is atherogenic is suggested by its structural similarity to LDL {69} and its identification within atherosclerotic plaques {72,73}. The thrombotic effect of Lp(a) may arise because of the homology of apolipoprotein(a) to the enzyme plasminogen {74}, which stimulates fibrinolysis. Apolipoprotein(a) may compete with plasminogen for binding sites on endothelial cells and thus decrease the rate of fibrinolysis {75}.

The pathogenicity of increased Lp(a) in black populations is uncertain. Moliterno {31} found no significant difference in Lp(a) levels between blacks with and without significant coronary artery disease, determined by angiography. In a study by Sorrentino et al. {30}, plasma Lp(a) levels prior to angiography were twice as high in blacks as in whites, yet the extent and severity of coronary artery disease was similar. One study suggests that blacks may be more sensitive to tissue plasminogen activator than whites {76}. As a result, blacks may be relatively protected from the anti-fibrinolytic effect of Lp(a), which would presumably attenuate the risk of acute thrombotic coronary events associated with higher Lp(a) levels. Prospective studies (CARDIA and the Atherosclerosis Risk in Communities (ARIC) Study) are currently underway to determine the relationship of Lp(a) to the development of coronary artery disease in black women as well as white women.

It has been demonstrated that obesity is an independent risk factor for CHD in white women {20,21} as well as black women {23}. The risk for CHD increases dramatically at a BMI of 30 or greater {21}; more than half of the black women in our study had a BMI that high. The higher BMI of the black compared to the white women in our study was attributable to the lower frequency of college degree attainment in the black women. The greater obesity of the black women in our study is in accord with the results of other studies {9,18,39} and suggests that racial differences in obesity prevalence may contribute to the greater CHD rate of black women. In the Pittsburgh Healthy Women Study, the mean BMI of premenopausal black women was 26.1 and of white women 24.7 {9}. Black women ages 18-44 years in NHANES-II (the second National Health and Nutrition Examination Survey) weighed an average of 68.6 kg, compared to 63.2 kg for the white women {18}. Similarly, in the CARDIA (Coronary Artery Risk Development in Young Adults) Study, black women ages 18-30 years weighed more (69.0 vs. 62.8 kg) and had a significantly higher mean BMI (25.8 vs. 23.1) than did comparably-aged white women {39}. Thus, while our results are qualitatively similar, the women in our study were heavier than the women in previous studies. Quite possibly, the women we surveyed may have considered themselves to be at high risk for coronary heart disease because of their obesity, and were, therefore, eager to obtain a detailed cardiac risk factor assessment. The women in our study were older than the CARDIA women, which may also have contributed to their greater weight compared to that study. Finally, it is possible that the greater weight and higher BMI of the women in our study, which was conducted eight years after CARDIA, was in part a reflection of the general trend toward increasing adiposity in the United States in recent years {19}.

Hypertension, like obesity, is likely an important risk factor for the development of coronary heart disease in black women {77}. Hypertension accelerates the development of atherosclerosis in the major coronary vessels, which leads to ischemia and myocardial infarction {78}. In addition, hypertension may also damage the smaller cardiac intramural blood vessels as well as lead to left ventricular hypertrophy, which greatly increases the risk of sudden death {79}. Our study and others have demonstrated that premenopausal black women have higher blood pressures and an approximately 2-3 fold greater prevalence of hypertension than similarly-aged white women. In the Pittsburgh Healthy Women Study {9}, premenopausal black women age 42-50 years had significantly higher mean systolic and diastolic blood pressures than did premenopausal white women (114.7 vs. 108.0 mmHg for systolic blood pressure and 74.9 vs. 71.3 mmHg for diastolic blood pressure). Black women age 35-44 years in the Minnesota Heart Survey {16}, compared to white women of a similar age, had higher systolic (116.2 vs. 113.1 mmHg) and diastolic (75.5 vs. 71.5 mmHg) blood pressures, and an almost 3-fold greater prevalence of hypertension (21.9% vs. 7.8%, respectively). In NHANES-III {25}, black women age 18-44 years had an approximately 2-fold greater prevalence of hypertension than similarly-aged white women.

Unlike for body mass index, differences in college degree status were not an important determinant of the higher blood pressure levels of the black women. The most important influence on blood pressure in our study was the body mass index. Indeed, the higher diastolic blood pressure of the black women was entirely accounted for by their greater BMI, although the higher systolic pressure was not. With respect to the systolic blood pressure difference, plasma total homocysteine, which may induce smooth muscle

cell proliferation and disruption of elastin fibrils in the blood vessel wall {80}, has been linked to higher systolic blood pressure in previous studies {81,82}. The racial difference in plasma total homocysteine levels in our study was thus considered as a possible contributing factor to the higher systolic blood pressure of the black women. Although plasma total homocysteine and systolic blood pressure were correlated in the black women, plasma total homocysteine was not a significant predictor of either systolic or diastolic blood pressure in a multiple linear regression model. Thus, the higher blood pressure levels of the black women compared to the white women in our study were not explained by their greater plasma total homocysteine concentrations. Similarly, salt consumption, although higher in the black women, was not a determinant of the racial blood pressure difference. Other factors associated with race but not measured in our study may have contributed to the greater systolic blood pressure of the black women. Among these other factors are the dietary intakes of calcium, magnesium, and potassium. Intakes of these nutrients, which may be associated with lower blood pressure {83-85}, were demonstrated to be lower in reproductive age black women compared to white women in both NHANES-III {86} and the CARDIA Study {39}. It is also possible that the higher systolic blood pressure of the black women in our study in part resulted from suppressed hostility due to racial discrimination {87,88}, which may affect even blacks of relatively high SES {88}.

Paradoxically, the lipoprotein profile of the black women in our study was moderately less, not more, atherogenic than that of the white women. The black women had lower plasma triglyceride and higher HDL cholesterol levels, while total and LDL cholesterol concentrations were similar, despite the greater intake of saturated fat and

cholesterol by the black women. The lower triglyceride levels in the black women in our study are in accord with the results of other studies {9-11,14}. It is remarkable that the black women had lower triglyceride levels than the white women, despite their greater obesity. This observation suggested that black women may be more resistant to the hypertriglyceridemic effect of obesity than white women. Data from the CARDIA and ARIC (Atherosclerosis Risk in Communities) studies, in which the plasma triglyceride concentration in blacks increased only 1/3 to 1/2 as much as in whites with similar increments in obesity, lend support to this hypothesis {89}. In our study, however, the slopes ($\Delta \log_{10}$triglyceride/ΔBMI) and the correlation coefficients for the regression of $\log_{10}$ triglyceride on BMI did not differ statistically between black women and white women. Thus, in contrast to CARDIA and ARIC, in our study obesity was similarly hypertriglyceridemic in both races.

The reason for the lower triglyceride levels in black women compared to white women is unknown. Data in small numbers of blacks indicates that they may have a higher activity of adipose tissue lipoprotein lipase (LPL) {90}, the enzyme responsible for clearance of plasma triglycerides, and thus be more efficient at clearing the hypertriglyceridemia accompanying obesity than whites {89,90}. Another possible mechanism to explain the lower triglyceride levels in black women is suggested by a recent study in which obese black women had 23% less visceral adipose tissue than similarly obese white women ($p=0.007$), as estimated by CT scanning at levels L_2-L_3 and L_4-L_5 of the lumbar spine {91}. This result was confirmed by a later study {92}. The visceral adipose tissue releases free fatty acids into the portal circulation, which then stimulate triglyceride and VLDL synthesis in the liver {93}. Thus, the smaller visceral

adipose tissue compartment in black women may decrease the delivery of fatty acids to the liver, resulting in a decreased synthesis of VLDL and lower fasting plasma triglyceride levels.

As in our study, premenopausal black women in both NHANES-II {94} and the Cincinnati Lipid Research Clinic Study {12} had an approximately 3 mg/dl higher HDL cholesterol level than their white counterparts. It is believed that HDL protects against the development of CHD, in part by mediating the reverse transport of cholesterol from the arterial wall to the liver {93}. Since a 1 mg/dl increment in HDL cholesterol is associated with a 3% decreased risk of coronary heart disease {95}, the 3 mg/dl higher HDL cholesterol level of the black women in our study would be predicted to decrease their risk of CHD by 9% relative to the white women.

The reason(s) for the modestly higher HDL cholesterol level of the black women compared to the white women in our study are unclear. Since HDL_2 particles are formed as triglycerides are catabolized by lipoprotein lipase {93}, the higher HDL cholesterol levels of the black women may simply reflect a more efficient clearance of fat from the circulation, consistent with their lower triglyceride levels. Alcohol intake, which is associated with higher HDL cholesterol levels {96}, was low and similar in both races. Similarly, the prevalence of cigarette smoking, which lowers HDL cholesterol {97}, was not different in black women and white women. The activity of the cholesteryl ester transfer protein (CETP), which may influence the HDL cholesterol concentration by modulating the transfer of cholesteryl esters from HDL to other lipoproteins {46,47}, was nearly identical in black women and white women. High activity of plasma CETP has been associated with atherosclerosis in monkeys fed an atherogenic diet {46}, in

transgenic mice {48}, and in humans {49}. An alternative and quite intriguing hypothesis is that higher HDL cholesterol levels in the African ancestors of American blacks conferred a survival benefit because HDL particles may facilitate the immobilization of Trypanosoma brucei, the causative agent for sleeping sickness in equatorial Africa {40,98}.

The prevalence of cigarette smoking, a long-established major CHD risk factor {4}, was similar in the black women and white women in our study, and lower than that of black women and white women in the United States as a whole {62}. This difference may reflect a greater health consciousness in the participants in our study, although underreporting cannot be ruled out. The relatively high percentages of black women and white women who were former smokers indicates that many had been successful in kicking the cigarette habit.

Finally, white women exhibited a trend toward greater rate and total conjugated diene production from LDL compared to black women, but there was no racial difference in lag time. These data must be interpreted cautiously, in view of the small number of women (12 white and 12 black) in whom the susceptibility of LDL to oxidation was determined.

In conclusion, premenopausal black women had higher plasma total homocysteine and Lp(a) levels, were more obese, and had higher blood pressures and a greater prevalence of hypertension than premenopausal white women. However, the black women had a moderately less atherogenic lipoprotein profile than the white women despite their greater consumption of saturated fat and cholesterol. No firm conclusions can be made from our study regarding racial differences in the susceptibility of LDL to

oxidative modification. A similar percentage of black and white women were cigarette smokers. On balance, black women had more risk factors than white women. The differences in risk factors observed in our study may explain part of the increased incidence of CHD in premenopausal black compared to white women. Future studies are needed to clarify the role of Lp(a) and oxidized LDL as risk factors for coronary heart disease in both races.

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Chapter 3

ELEVATED HOMOCYSTEINE LEVELS AND MARGINAL FOLATE STATUS IN PREMENOPAUSAL BLACK WOMEN COMPARED TO WHITE WOMEN

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ABSTRACT

Objective: We evaluated coronary risk factors by comparing plasma homocysteine, folate and vitamin B_{12} levels, and their interrelationships in premenopausal black and white women.

Design: Comparison survey.

Setting: Oregon Health Sciences University, and the Albina Head Start main office in Portland.

Participants: Ninety-seven black and 99 white, healthy premenopausal women, age 18-45 years, volunteered for the study. The women were recruited from Oregon Health Sciences University employees, Albina Head Start mothers and staff, and the Portland community.

Main outcome measures: Plasma total homocysteine, folate and vitamin B_{12} concentrations; percentages of black and white women taking a multivitamin supplement; methylenetetrahydrofolate reductase genotype distribution.

Results: Black women had higher levels of plasma total homocysteine (8.80 vs. 7.81 μmol/L, p=0.013; 95% confidence interval of the difference [CI], 0.14 to 1.83 μmol/L),

lower folate (3.52 vs. 5.23 ng/ml, p<0.0001; 95% CI, -2.60 to -0.83 ng/ml) and higher vitamin B_{12} levels (522 vs. 417 pg/ml, p<0.001; 95% CI, 48 to 162 pg/ml). More white women than black women took a multivitamin supplement daily (42.4% vs. 24.7%, p=0.019; 95% CI, 3.9% to 31.5%). Black women consumed significantly more meat and cheese (7 ounces per day) than did white women (4.5 ounces per day) (p=0.004). When adjusted for multivitamin use, homocysteine levels did not differ, but plasma folate remained significantly lower in black women. Sixty-eight percent of black women carried the wild-type methylenetetrahydrofolate reductase genotype, 32.0% were heterozygotes, and none were homozygotes. Of the white women, 47.4% were wild-type, 40.3% heterozygotes, and 12.3% homozygotes (p=0.013).

Conclusions: Black women had elevated plasma homocysteine levels associated with lower plasma folate concentrations despite a lower frequency of the homozygous methylenetetrahydrofolate reductase mutation. Folic acid supplementation may benefit this population, which is especially susceptible to coronary heart disease.

KEY WORDS:

homocysteine, folic acid, vitamin B_{12}, premenopausal black women and white women, coronary heart disease, methylenetetrahydrofolate reductase (MTHFR), multivitamins

INTRODUCTION

Elevated plasma total homocysteine is an independent risk factor for coronary heart disease, stroke, and peripheral arterial disease {1,2,3}. Recent data indicate that cardiovascular risk increases in a graded fashion over the spectrum of homocysteine values, much like plasma cholesterol levels {4}. A 5 μmol/L increment in the plasma total homocysteine concentration increases the risk for coronary heart disease by 60% in men and at least 80% in women {4,5}.

Premenopausal black women have a 2-3 times higher rate of coronary heart disease than premenopausal white women {6-18}. Although plasma total homocysteine levels have been reported in premenopausal white women {19}, no studies have measured plasma homocysteine in premenopausal black women. If a racial disparity in homocysteine exists, it could contribute to the higher rate of coronary heart disease in premenopausal black compared with white women.

Folic acid and vitamin B_{12} have an important role in homocysteine metabolism (Figure 3.1). The folic acid derivative 5-methyltetrahydrofolate (5-methyl THF), produced by the enzymatic reduction of 5,10 methylenetetrahydrofolate by methylenetetrahydrofolate reductase (MTHFR), acts as methyl donor in the remethylation of homocysteine to methionine. A common mutation in the gene which codes for MTHFR decreases the formation of the necessary methyl donor, 5-methyl THF. Vitamin B_{12} is an essential cofactor for methionine synthase in the remethylation reaction {2,3,20,21}. Thus, low plasma levels of folate and vitamin B_{12}, as well as decreased

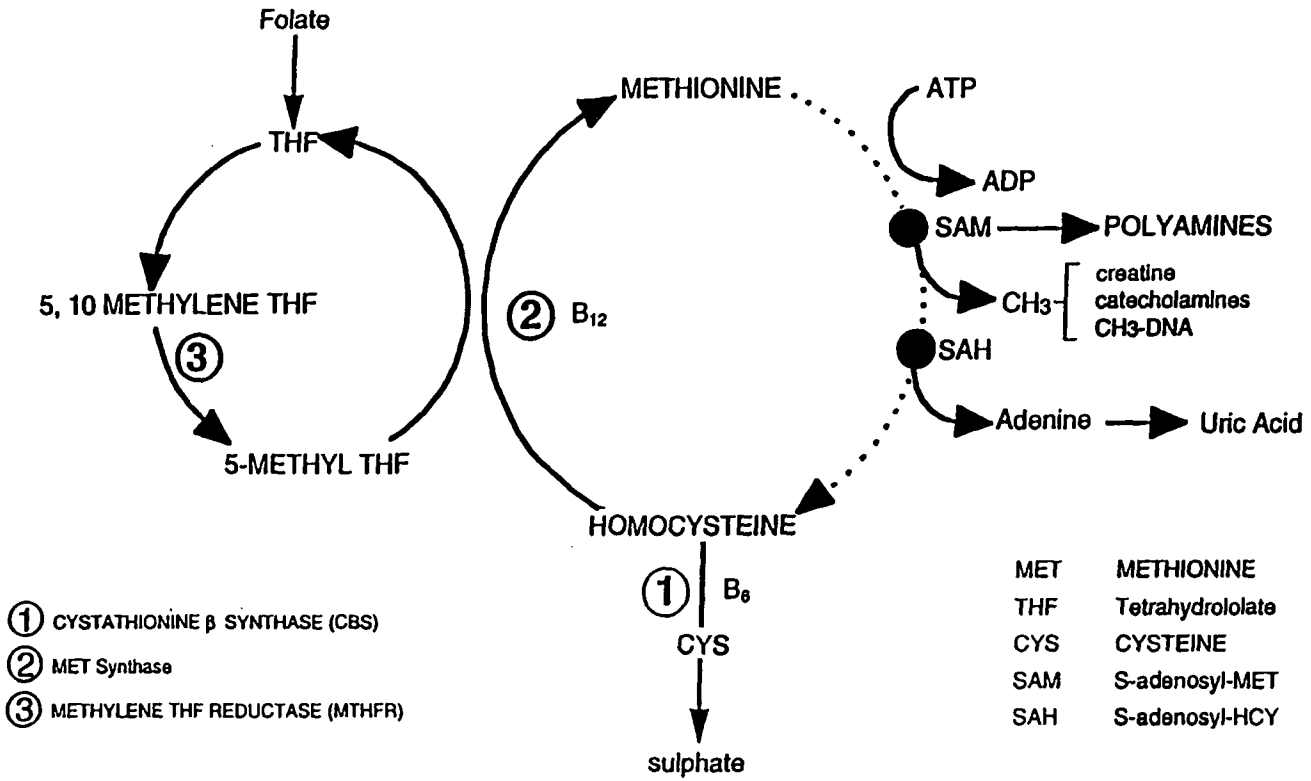

Figure 3.1 Homocysteine metabolism

activity of the enzyme MTHFR, may impair the conversion of homocysteine to methionine and raise plasma homocysteine levels {2,3,20}.

The primary focus of this paper is the interrelationships of plasma total homocysteine, folate, and vitamin B_{12} in premenopausal black and white women. There is no information to date about these relationships. Among men, a recent study {22} demonstrated that South African blacks actually metabolized homocysteine more effectively than did whites. This may not be the case for black women, however. Black women living in the United States have a lower dietary intake of folate than white women {23}. Given that plasma folate levels are related to dietary intake {24}, the black women may have lower plasma folate levels than white women, which could lead to higher homocysteine levels in the black women.

The hypothesis of this study is that premenopausal black women have higher homocysteine levels than premenopausal white women. We, therefore, measured plasma total homocysteine levels in a carefully defined sample of 97 black and 99 white, healthy, premenopausal women. If homocysteine levels are higher in the black women, this could contribute to their greater rate of coronary heart disease compared to white women. Plasma levels of folate and vitamin B_{12} were also measured. In a subset of women, the MTHFR genotype was determined. Dietary data and information concerning the use of multivitamin supplements were ascertained.

METHODS

Subjects and study design

The study described in this paper is an extension of a larger study that compared coronary heart disease risk factors in 97 premenopausal black women and 99 white women age 18-45 years. This study was approved by the Institutional Review Board at the Oregon Health Sciences University. All participants were healthy and had regular menstrual periods. Women with diabetes and renal or hepatic diseases were excluded, as well as potential participants currently abusing alcohol or illicit drugs. Women were recruited from Oregon Health Sciences University employees, Albina Head Start mothers and staff, and the general Portland community. Written informed consent was obtained from all participants. The evaluation procedure included administration of a medical history, measurement of height, weight, and blood pressure, and venipuncture after a 12 hour fast for determination of plasma total homocysteine, folate and vitamin B_{12}, and the MTHFR genotype. In addition, a dietary history was obtained by trained dietitians using the Diet Habit Survey, a previously validated 40 item eating behavior questionnaire developed by our group at the Oregon Health Sciences University for assessment of dietary intake over the preceding month {25}. Information regarding intake of fruit, vegetables, meat, and cheese was provided by this questionnaire. Women were also asked whether they took a multivitamin supplement on a daily basis.

Laboratory analyses

Plasma total homocysteine, folate and vitamin B_{12}

Approximately 10 ml of fasting venous blood were drawn into a tube containing dipotassium ethylenediamine tetraacetate (EDTA) as anticoagulant. After separation of the plasma by centrifugation, plasma total homocysteine levels were determined by HPLC methodology as previously described {26,27}. Plasma levels of folate and vitamin B_{12} were measured using the Quantaphase II B_{12}/folate radioassay kit provided by BIO-RAD Laboratories, Hercules, California {28,29}. The normal range for plasma folate using this method in our laboratory is 1.5-20.6 ng/ml and for vitamin B_{12} 130-770 pg/ml.

MTHFR genotyping by polymerase chain reaction (PCR)

DNA was extracted from frozen plasma by double phenol-chloroform extraction (Evans A.J., Deloughery T.G., Press, R.D., manuscript submitted), and the MTHFR genotype determined using PCR as previously described {30}.

Statistical methods

Log_{10} transformations of the plasma total homocysteine, folate, and vitamin B_{12} values were performed before all analyses to correct for skewness in the data. Racial differences in the plasma total homocysteine, folate, and vitamin B_{12} concentrations were tested using an unpaired t-test on the log transformed variables {31}. Pearson product moment correlation coefficients (r) were computed to test for associations between plasma total homocysteine, folate, and vitamin B_{12}. The percentage of the variability in

plasma homocysteine levels explained by plasma folate (coefficient of determination, r^2) was compared between black women and white women using Fisher's transformation of r {32}.

The percentages of black women and white women taking a multivitamin supplement daily were compared using the z-test of proportions {32}. A 2-way analysis of variance procedure (multivitamin use by race) was performed to determine the influence of multivitamin use upon plasma total homocysteine, folate, and vitamin B_{12} concentrations in black women and white women {33}. Median dietary intakes of fruits, vegetables, and meats plus cheese were compared between the races using the Mann-Whitney Rank Sum Test {32}. Spearman rank order correlation coefficients (r_s) were computed to test for a relationship between meat and cheese intake and plasma vitamin B_{12} levels {32}.

The distribution of MTHFR genotypes (wild-type, heterozygous or homozygous) in black women and white women was compared using the chi-square test statistic {31,32}. A z test of proportions {32} was employed to test for a significant difference in the percentages of black women and white women with plasma folate levels in the low (<1.5 ng/ml) or low normal (1.5-2.6 ng/ml) range.

Two-tailed values of p less than 0.05 were regarded as significant. The statistical analyses were performed using SIGMA STAT (Jandel Scientific, Version 1.0) and the graphic displays created with SIGMA PLOT (Jandel Scientific, Version 2.0).

RESULTS

Plasma total homocysteine, folate, and vitamin B_{12}

Plasma total homocysteine concentrations were significantly higher in black women (8.80±3.38 μmol/L) than in white women (7.81±2.58 μmol/L, p=0.013; 95% confidence interval for the difference [CI], 0.14 to 1.83 μmol/L) (Table 3.1). The plasma homocysteine frequency distribution by quintiles (Figure 3.2) was skewed to the left in both races. Twenty-seven percent of black women had homocysteine values ≥10 μmol/L, the median value in men (4), compared to only 12% of white women (p=0.019). The black women had lower plasma folate levels than the white women (3.52±2.68 vs. 5.23±3.28 ng/ml, p<0.0001; 95% confidence interval for the difference [CI], -2.60 to -0.83 ng/ml). After statistical adjustment for the difference in plasma folate levels, the homocysteine difference became non-significant (p=0.911).

Plasma levels of homocysteine and folate were inversely correlated in both black women (r=-0.408, p<0.0001) and white women (r=-0.551, p<0.0001) (Table 3.2). Seventeen percent of the variability (r^2) in plasma total homocysteine was attributable to plasma folate levels in black women and 30 percent in white women; these percentages did not differ statistically. The least squares regression lines for the regression of $\log_{10}$ homocysteine on $\log_{10}$ folate in the black women and white women are depicted in Figures 3.3 and 3.4, respectively.

The plasma folate frequency distribution was skewed to the left for both races (Figure 3.5). A greater percentage of black women (44.9%) than white women (24.4%) had low

Table 3.1 Levels of plasma total homocysteine, folate, and vitamin B_{12} in premenopausal black women and white women

	Black women	White women	p value
Homocysteine (μmol/L)	8.80±3.38*	7.81±2.58	0.013
Folate (ng/ml)	3.52±2.68	5.23±3.28	<0.0001
Vitamin B_{12} (pg/ml)	522±210	417±172	<0.001

*Mean ± standard deviation.

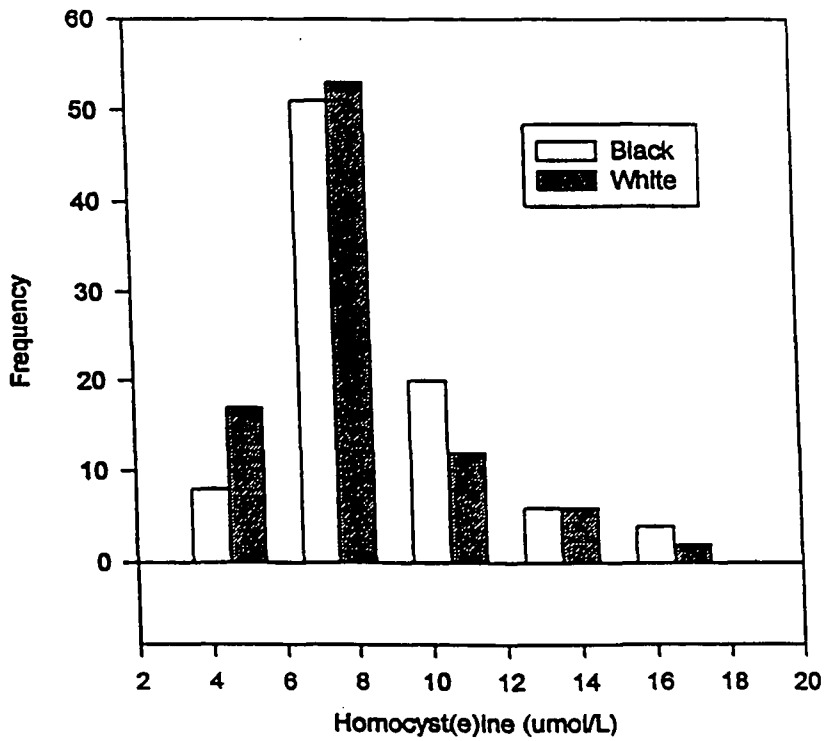

Figure 3.2 Plasma total homocysteine frequency distribution by quintiles in black women and white women

Table 3.2 Pearson correlation coefficients (r) for plasma total homocysteine, folate, and vitamin B_{12} in premenopausal black women and white women

	Race	Folate	Vitamin B_{12}
Homocysteine	Black women	-0.408*	-0.240**
	White women	-0.551*	-0.119
	Total group	-0.495*	-0.134
Vitamin B_{12}	Black women	0.219**	
	White women	0.313†	
	Total group	0.162**	

*p value <0.0001

†p value <0.01

**p value <0.05

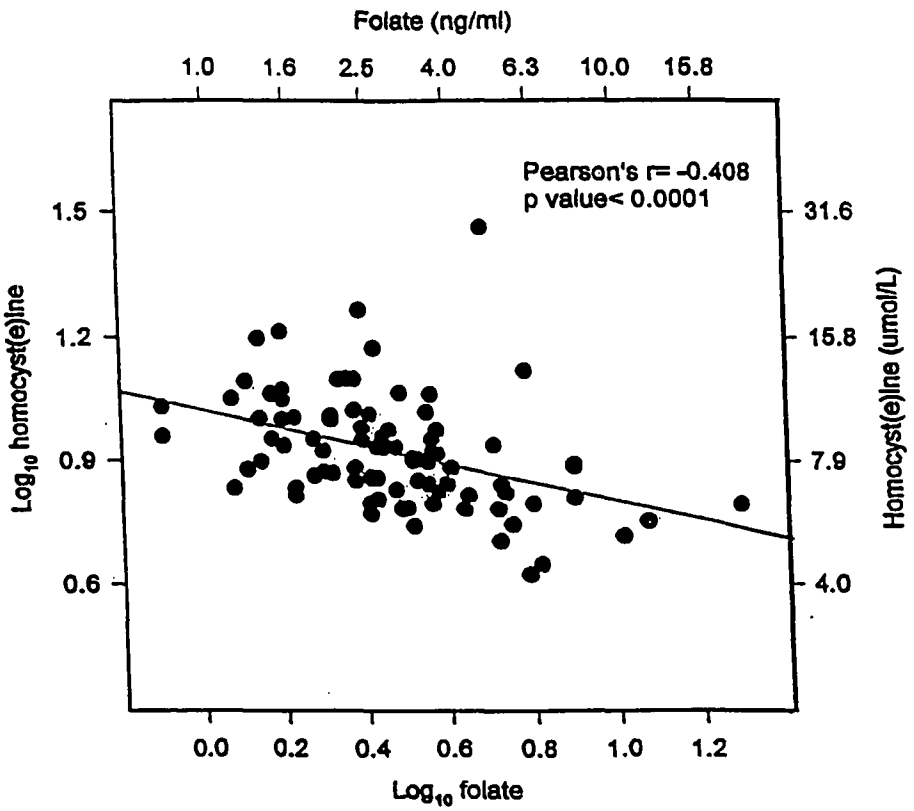

Figure 3.3 Least squares regression of $\log_{10}$ homocysteine (dependent variable) on $\log_{10}$ folate (independent variable) in black women

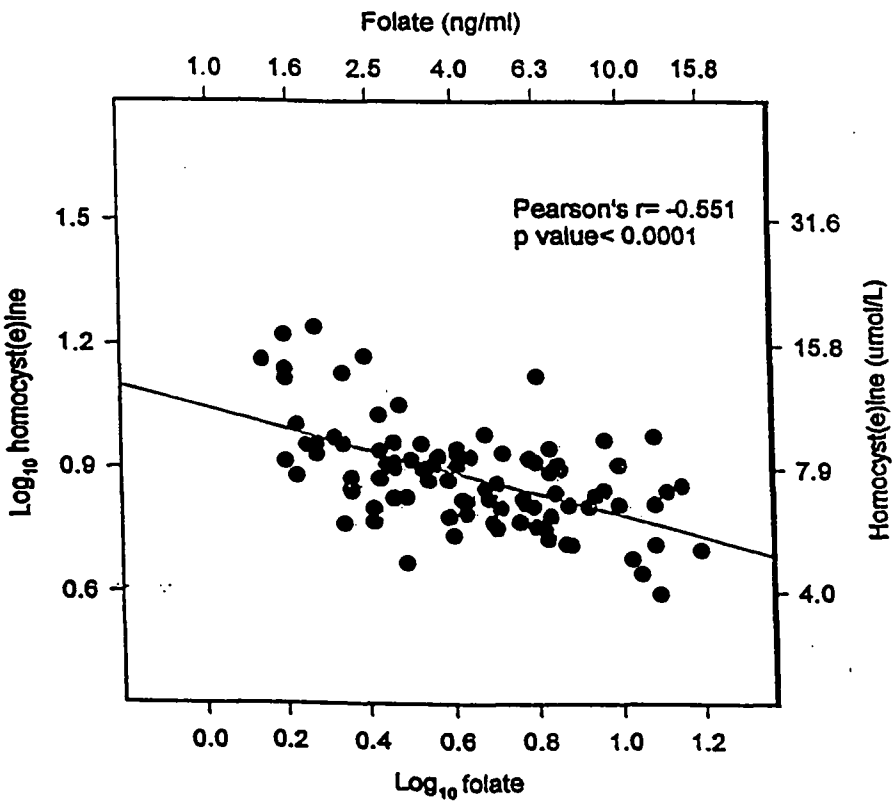

Figure 3.4 Least squares regression of $\log_{10}$ homocysteine (dependent variable) on $\log_{10}$ folate (independent variable) in white women

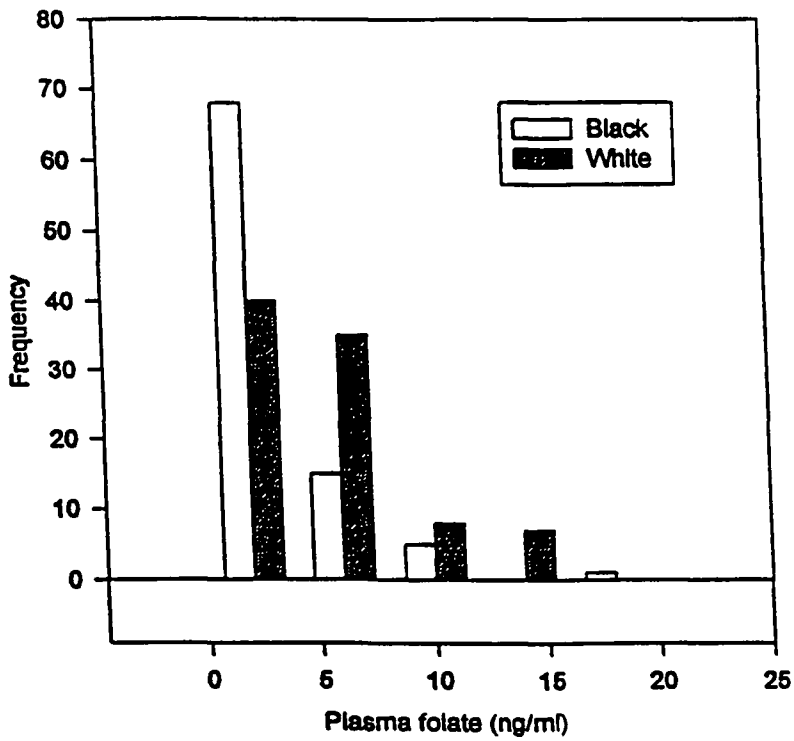

Figure 3.5 Plasma folate frequency distribution by quintiles in black women and white women

or low-normal plasma folate levels (p=0.006). Vitamin B_{12} concentrations, however, were higher in the black women (522±210 pg/ml) than in the white women (417±172 pg/ml, p<0.001; 95% confidence interval for the difference [CI], 48 to 162 pg/ml). Plasma vitamin B_{12} concentrations were less skewed than those of homocysteine and folate (Figure 3.6). Homocysteine and vitamin B_{12} were inversely correlated in black women only (r=-0.240, p=0.023). Plasma concentrations of folate and vitamin B_{12} were positively correlated in both black women (r=0.219, p=0.039) and white women (r=0.313, p=0.003).

Multivitamin use

A greater percentage of white women (42.4%) than black women (24.7%, p=0.019) took multivitamin supplements which provided 400 ug of folic acid per day. Plasma total homocysteine levels were significantly lower among regular users of multivitamin supplements (7.75±2.00 vs. 9.14±3.72 μmol/L in black women and 6.83±2.16 vs. 8.75±2.59 μmol/L in white women, p<0.0001) (Table 3.3). After adjusting for multivitamin use, the homocysteine levels of black women and white women did not differ statistically. Plasma folate levels were significantly higher (p<0.0001) in multivitamin supplement users compared to non-users (4.47±2.90 vs. 3.21±2.55 ng/ml in black women and 6.52±3.37 vs. 4.29±2.90 ng/ml in white women). In addition, plasma folate levels remained significantly lower (p<0.001) in black women compared to white women, even after adjusting for multivitamin use. There was no difference in vitamin B_{12} levels between users and non-users of multivitamin supplements.

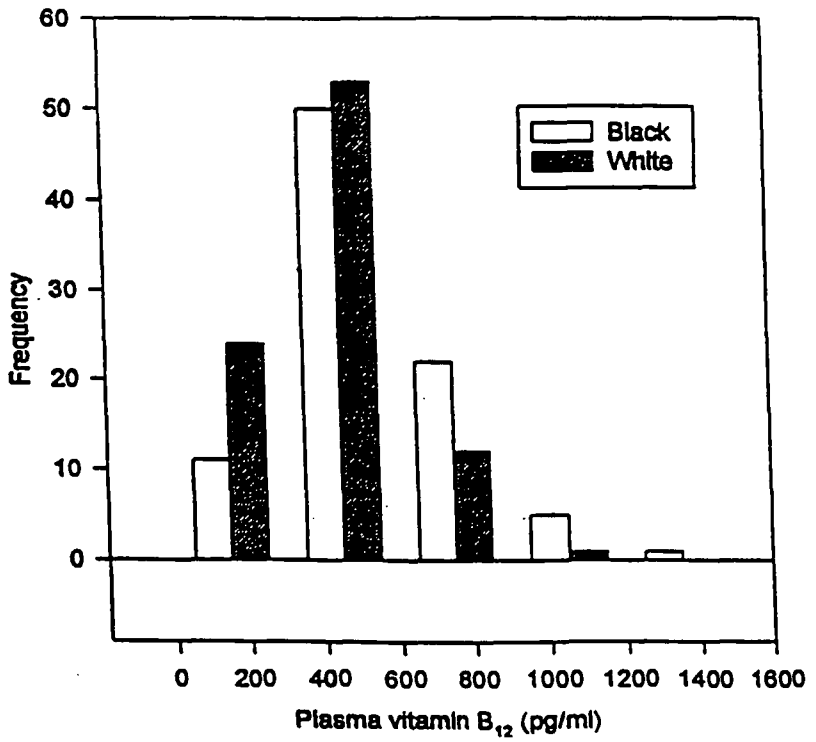

Figure 3.6 Plasma vitamin B_{12} frequency distribution by quintiles in black women and white women

Table 3.3 Plasma total homocysteine (μmol/L), folate (ng/ml), and vitamin B_{12} (pg/ml) by race and multivitamin use

	Race	Multivitamin Use	
		YES	NO
Homocysteine (μmol/L)	Black women	7.75±2.00* (n=24)	9.14±3.72 (n=73)
	White women	6.83±2.16 (n=42)	8.75±2.59** (n=57)
Folate (ng/ml)	Black women	4.47±2.90 (n=24)	3.21±2.55^{+} (n=73)
	White women	6.52±3.37 (n=24)	4.29±2.90** (n=57)
Vitamin B_{12} (pg/ml)	Black women	575±266 (n=24)	505±188* (n=73)
	White women	443±192 (n=42)	398±155 (n=57)

* Mean ± standard deviation.
$^{+}$ Black women vs. White women, p value <0.001
** Multivitamin vs. non-multivitamin use, p value <0.0001
There were no significant interaction effects.

Dietary intakes

The median daily intakes of fruits and vegetables were identical in the women (Table 3.4). Black women had a significantly higher median daily intake of meat and cheese than did white women. There was no correlation of plasma vitamin B_{12} concentrations with meat and cheese intakes in either race.

Cigarette smoking and alcohol intake

Thirteen percent of the white women and 11% of the black women were current cigarette smokers. Alcohol intake was low and similar in both groups, approximately one drink per week (1 drink=12 ounces of beer or 1-1/2 ounces of spirits or 4 ounces of wine).

Methylenetetrahydrofolate reductase genotype

To explore further the elevation in plasma total homocysteine in black women we determined MTHFR genotypes in a subset of 50 black and 57 white women. Thirty-four black women (68.0%) carried the wild-type (normal) genotype and 16 (32.0%) were heterozygotes for the mutation; there were no black homozygotes. Of the white women, 27 (47.4%) were wild-type, 23 (40.3%) heterozygotes and 7 (12.3%) homozygotes for this mutation (p=0.013) (Table 3.5). Since MTHFR status determines homocysteine response to folate depletion {29}, we examined homocysteine and folate levels in patients with wild type MTHFR genes. Black women who were wild-type had significantly higher mean homocysteine levels (8.48 vs. 6.98 μmol/L, p=0.003) and lower folate (3.26 vs. 5.23 ng/ml, p=0.001) than wild-type white women. Thus, controlling for the MTHFR genotype magnified the racial disparity in folate and total plasma homocysteine levels.

Table 3.4 Dietary intake of certain foods

	Black	White	p
For Folate Fruits + Vegetables (cups per day)	4	4	0.828
For Vitamin B_{12} Meat + Cheese (oz per day)	7	4.5	0.004

Table 3.5 Distribution of methylenetetrahydrofolate reductase genotypes in premenopausal black women and white women

	Black Women		White Women	
	n	%	n	%
Wild-type	34	(68.0)	27	(47.4)
Heterozygous	16	(32.0)	23	(40.3)
Homozygous	0	(0)	7	(12.3)
C677T allele frequency		16%		32%

p value = 0.013

DISCUSSION

The primary finding of this study is that premenopausal black women had significantly higher levels of total plasma homocysteine and lower plasma folate than premenopausal white women. This is the first study to report homocysteine concentrations in premenopausal black women.

The plasma total homocysteine level is an independent risk factor for the development of coronary heart disease. In the Physicians' Health Study {34}, men in the highest 5% of homocysteine levels had a 3.1 fold greater risk of myocardial infarction than men in the bottom 90% of the homocysteine distribution. In a case-control study conducted by Pancharuniti {35}, the odds ratio for coronary heart disease per quartile increase in the plasma total homocysteine concentration based on control values was 1.6. Elevated plasma total homocysteine is also a risk factor for the development of cerebrovascular disease {36} and peripheral arterial occlusive disease {26}.

Two recent studies {4,5} suggested that for every 5 μmol/L rise in plasma total homocysteine, the risk for coronary heart disease in women rises by 80-250%. Thus, the racial difference of 0.99 μmol/L in the plasma total homocysteine levels in our study would be expected to increase the risk for coronary heart disease by 16-50% in the premenopausal black women compared with the white women. Thus, higher homocysteine levels may contribute to the greater rate of coronary heart disease in premenopausal black women.

The mechanism(s) by which plasma homocysteine increases the risk for cardiovascular disease is uncertain. According to the most widely held hypothesis, the initiating event may be injury to vascular endothelial cells by homocysteine {37}. This, in turn, leads to vascular dysfunction characterized by decreased vasodilatory response to endogenous vasodilators {38} and to other changes that promote both atherogenesis and thrombogenesis {37,39}.

The higher plasma total homocysteine level of premenopausal black compared with white women in our study could be related to differences in the use of multivitamin supplements. Almost twice as many white women (42.4%) as black women (24.7%) in our study took a multivitamin supplement daily. The women who consumed a daily multivitamin supplement had lower plasma total homocysteine levels than those who did not. In women not receiving multivitamin supplements, mean homocysteine levels were then more similar in the black women and white women (9.14 vs. 8.75 μmol/L, respectively). These data strongly suggest that much of the elevation in homocysteine levels of the black women in our study was related to their lower rate of multivitamin use compared with the white women, and thus resulted from lifestyle factors rather than intrinsic racial differences.

In our study, the intake of multivitamin supplements was associated with higher plasma folate levels in the women. Further, the racial differences in folate levels for the entire group (1.7 ng/ml, Table 3.1) and for only those receiving supplements (2.1 ng/ml, Table 3.3) were greater than the difference in folate levels between black women and white women who did not consume multivitamin supplements (1.1 ng/ml). These data

illustrate the important contribution of multivitamin use to the higher plasma folate levels of the white women in our study. Plasma folate, in its turn, was the primary determinant of plasma total homocysteine levels, accounting for 30% of the variability in homocysteine in white women and 17% of the variability in black women (not statistically different). These data collectively indicate that the primary reason for the higher homocysteine levels of the black women in our study was their lower intake of folate in the form of a daily multivitamin supplement.

The black women in our study had a more marginal status of folic acid nutriture than did the white women. Almost twice as many black women as white women in our study had low (<1.5 ng/ml) or low normal (1.5-2.6 ng/ml) plasma folate levels (44.9%, black women, and 24.4%, white women). Since the plasma total homocysteine level is a functional test of folate activity {29,40}, the black women also exhibited compromised metabolic function because of their lower plasma folate levels compared with the white women.

The lower plasma folate levels in the black women in our study are partly a result of the racial difference in multivitamin usage. However, even after control for multivitamin use, the black women still had significantly lower plasma folate levels than the white women, suggesting that factors other than multivitamin use also contributed to the racial difference. The median intakes of fruits and vegetables, important dietary sources of folates, were similar in the races. None of the women had diseases or were receiving medications known to affect folic acid metabolism. The intake of alcohol, which interferes with folate utilization at multiple steps {41,42}, was low and similar in

black women and white women, as was the prevalence of cigarette smoking, which is also associated with lower plasma folate levels {43-45}. Thus, the lower plasma folate concentrations in the black women were not due to differences in alcohol intake or cigarette smoking between the races.

A common mutation in the gene which codes for the enzyme MTHFR is associated with higher plasma total homocysteine levels at a given plasma level of folate {46}, and, in addition, directly lowers plasma folate levels by decreasing the formation of 5-methyl THF, the primary circulating form of folic acid {30,47}. Thus, individuals homozygous for the MTHFR mutation have higher homocysteine levels {21,48,49} and are more sensitive to dietary folate depletion than individuals without the mutation {30}. The abnormal MTHFR variant results from a C (cytosine) to T (thymidine) point mutation at nucleotide 677 (changing alanine to valine in the protein), which renders the enzyme thermolabile and significantly reduces its basal activity {48}. We, therefore, postulated that the higher homocysteine and lower folate levels of the black women could be due in part to a greater frequency of the homozygous mutation in them compared with the white women. In fact, the opposite was observed. Most strikingly, there were no black homozygotes. In contrast, 12.3 percent of the white women were homozygous for the mutation. Our results are in agreement with other reports in the literature {21,48-51}. Thus, the racial disparity in plasma folate and homocysteine levels cannot be attributed to differences in the MTHFR genotype distribution, and, in fact, controlling for genotype magnifies the differences.

Genetic differences in folate metabolism other that MTHFR may contribute to lower plasma folate in black women. The relationship between plasma folate and homocysteine was not different between blacks and whites suggesting that the remethylation metabolic pathway was not different. However, there may be genetically determined racial differences in folate absorption or other aspects of folate metabolism that are responsible for the lower plasma folate levels in black women. The elucidation of these differences should be an important goal of future research.

Finally, plasma vitamin B_{12} concentrations were significantly higher in the black women. Although they had higher levels of vitamin B_{12}, the correlation of vitamin B_{12} with plasma total homocysteine was weak, so that their higher B_{12} levels did not protect against an increase in homocysteine levels associated with lower plasma folate. Plasma levels of folate and vitamin B_{12} were positively correlated in our study. This correlation has been observed in other studies {52}; both nutrients are probably reflections of the general nutritional status.

The reasons for the higher plasma concentration of vitamin B_{12} in the black women in our study are unclear. Although they consumed more meat and cheese, good dietary sources of vitamin B_{12}, there was no correlation between meat and cheese intake and the vitamin B_{12} level. All of the participants in our study were healthy and free from any diseases known to affect vitamin B_{12} metabolism. It is possible that the higher vitamin B_{12} levels in premenopausal black compared to white women may be a result of genetic differences between the races in the absorption, transport, or delivery of vitamin B_{12} to the body tissues {41}.

In conclusion, plasma total homocysteine levels were higher in premenopausal black women than white women. The racial difference in homocysteine levels was mainly attributable to lower plasma folate levels in black women, which resulted in part from their lower intake of folate-containing multivitamin supplements compared to white women. Higher homocysteine levels may contribute to the greater rate of coronary heart disease in black women. Regular intake of multivitamin supplements or folic acid alone may be a cost-effective means of attenuating this increase in coronary risk. Prospective clinical trials in premenopausal black women and white women are clearly needed to test this hypothesis.

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Chapter 4

SUMMARY

Black women within the premenopausal age range have a 2-3 times greater risk for coronary heart disease than premenopausal white women, a disparity which is increasing. The reasons for the increased risk of premenopausal black women for coronary heart disease are not entirely clear. The purpose of this study, therefore, was to examine the prevalence of coronary heart disease risk factors in premenopausal black women and white women and in so doing, provide greater insight into the reasons for the racial difference in the rate of coronary heart disease.

We found that black women had higher levels of a number of coronary heart disease risk factors compared to white women. Black women weighed more and had a higher body mass index than white women, a difference which was entirely attributable statistically to the lower frequency of college degree attainment in the black women. The black women also had higher blood pressures than the white women, largely due to their greater body mass index. Thirty one percent of the black women were hypertensive compared to twelve percent of the white women. Interestingly, blood pressure was not related to educational attainment in either black women or white women. The plasma Lp(a) concentration was twice as high in black women as in white women. The black women had lower triglyceride levels, and a trend toward higher HDL cholesterol levels than the white women. Plasma total and LDL cholesterol levels were similar, despite a greater consumption of saturated fat and cholesterol by the black women. Thus, the black

women had an overall less atherogenic lipoprotein profile than the white women. However, the protection afforded black women by their less atherogenic lipoprotein profile was likely modest, and unlikely to outweigh the deleterious effects of their other risk factors. Rates of cigarette smoking and alcohol intake were low and similar between the races. Resistance of LDL to oxidative modification did not differ significantly between black women and white women.

A unique finding of our study was that premenopausal black women had higher levels of plasma total homocysteine than premenopausal white women. The approximately 1 μmol/L elevation in homocysteine levels in the black compared to the white women is estimated to increase the risk of the black women for coronary heart disease by at least 16%. In addition, plasma folate levels were lower in the black women and were inversely correlated with the homocysteine concentrations. The higher plasma total homocysteine and lower folate levels of the premenopausal black women in our study were primarily related to their lower rate of multivitamin use compared to white women. Almost twice as many white women (42.4%) as black women (24.7%) in our study took a multivitamin supplement daily. The distribution of genotypes for the enzyme methylenetetrahydrofolate reductase (MTHFR) was also determined in a subset of black women and white women, in that an abnormal thermolabile variant of the enzyme has been linked to lower plasma folate and higher homocysteine levels in other studies. Interestingly, 12.3% of the white women were homozygous for the MTHFR mutation, but there were no black homozygotes. Thus, differences in MTHFR genotype

distribution did not contribute to the racial disparity in plasma folate and homocysteine levels and in fact, controlling for genotype magnified the differences.

In conclusion, premenopausal black women had higher plasma total homocysteine and Lp(a) levels, were more obese, and had higher blood pressure and a greater prevalence of hypertension than premenopausal white women. The black women, however, had a moderately less atherogenic lipoprotein profile than the white women. On balance, the black women carried a greater total burden of coronary heart disease risk factors than the white women. The differences in risk factor levels observed in our study may explain part or all of the increased incidence of coronary heart disease in premenopausal black women compared to white women. Future studies are needed to clarify the role of Lp(a), oxidized LDL, and diet in the development of coronary heart disease in premenopausal black women and white women. One possible means of attenuating the increased coronary heart disease risk of premenopausal black women which is available at the present time is regular intake of multivitamin supplements containing folic acid. Prospective clinical trials of multivitamin supplements or folic acid alone in the prevention of coronary heart disease in premenopausal black women and white women are clearly needed.

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APPENDICES

Appendix A

DATA FOR CORONARY HEART DISEASE RISK FACTORS IN PREMENOPAUSAL WHITE WOMEN AND BLACK WOMEN

	Age(W)	Educ.(W)	BP-Syst.(W)	BP-Dias.(W)	Ht.-m.(W)	Wt-kg(W)
1	31.0000	12.0000	122.0000	81.0000	1.6200	94.9000
2	38.0000	16.0000	122.0000	86.0000	1.6900	97.3000
3	26.0000	12.0000	99.0000	61.0000	1.5500	58.2000
4	25.0000	16.0000	99.0000	72.0000	1.5900	52.3000
5	40.0000	17.0000	118.0000	69.0000	1.6300	59.5000
6	37.0000	15.0000	111.0000	71.0000	1.6800	106.8000
7	30.0000	14.0000	132.0000	81.0000	1.6500	101.4000
8	45.0000	14.0000	133.0000	90.0000	1.6400	83.6000
9	34.0000	16.0000	101.0000	62.0000	1.6800	54.1000
10	42.0000	18.0000	149.0000	100.0000	1.6600	106.8000
11	35.0000	12.0000	99.0000	61.0000	1.6300	71.3000
12	34.0000	16.0000	115.0000	71.0000	1.6300	77.8000
13	29.0000	15.0000	110.0000	72.0000	1.6400	89.3000
14	44.0000	13.0000	102.0000	70.0000	1.6400	76.5000
15	41.0000	17.0000	103.0000	70.0000	1.6500	58.1000
16	23.0000	16.0000	114.0000	75.0000	1.6400	51.8000
17	38.0000	16.0000	80.0000	64.0000	1.5300	62.8000
18	44.0000	18.0000	101.0000	71.0000	1.7000	56.3000
19	44.0000	16.0000	123.0000	81.0000	1.7800	96.9000
20	38.0000	16.0000	109.0000	70.0000	1.6800	78.5000
21	41.0000	18.0000	100.0000	67.0000	1.6800	65.8000
22	23.0000	14.0000	108.0000	76.0000	1.6700	62.4000
23	28.0000	16.0000	107.0000	71.0000	1.5900	63.7000
24	43.0000	16.0000	124.0000	85.0000	1.6700	83.4000
25	30.0000	16.0000	124.0000	76.0000	1.6300	65.6000
26	32.0000	16.0000	102.0000	67.0000	1.6500	64.9000
27	24.0000	16.0000	98.0000	61.0000	1.7300	57.7000
28	40.0000	13.0000	109.0000	73.0000	1.6500	96.9000
29	39.0000	16.0000	109.0000	80.0000	1.5300	47.0000
30	43.0000	16.0000	116.0000	80.0000	1.6900	67.7000
31	23.0000	16.0000	101.0000	71.0000	1.6700	54.2000
32	28.0000	16.0000	110.0000	67.0000	1.5800	52.6000
33	32.0000	19.0000	102.0000	60.0000	1.6900	58.9000
34	24.0000	16.0000	101.0000	66.0000	1.5900	56.6000
35	31.0000	16.0000	113.0000	65.0000	1.7100	66.2000
36	26.0000	18.0000	110.0000	70.0000	1.6400	62.8000
37	41.0000	14.0000	139.0000	90.0000	1.7000	95.2000
38	42.0000	16.0000	117.0000	76.0000	1.6500	55.5000
39	43.0000	20.0000	109.0000	70.0000	1.7000	95.9000
40	40.0000	12.0000	113.0000	71.0000	1.5400	94.4000
41	31.0000	12.0000	128.0000	86.0000	1.5900	90.3000
42	31.0000	18.0000	112.0000	71.0000	1.5600	50.8000
43	45.0000	14.0000	134.0000	93.0000	1.6900	83.2000
44	28.0000	16.0000	117.0000	84.0000	1.6500	58.3000
45	27.0000	16.0000	127.0000	79.0000	1.7700	87.0000
46	44.0000	12.0000	101.0000	67.0000	1.6200	52.9000

	Age(W)	Educ.(W)	BP-Syst.(W)	BP-Dias.(W)	Ht.-m.(W)	Wt-kg(W)
47	38.0000	18.0000	132.0000	84.0000	1.7000	55.5000
48	41.0000	19.0000	122.0000	82.0000	1.6600	74.4000
49	33.0000	12.0000	132.0000	106.0000	1.6500	112.5000
50	45.0000	19.0000	151.0000	110.0000	1.6800	111.6000
51	26.0000	16.0000	116.0000	79.0000	1.7300	65.2000
52	27.0000	16.0000	129.0000	89.0000	1.6800	110.5000
53	36.0000	18.0000	93.0000	54.0000	1.6000	54.3000
54	30.0000	14.0000	102.0000	62.0000	1.6100	68.6000
55	44.0000	19.0000	112.0000	70.0000	1.6600	57.1000
56	31.0000	14.0000	119.0000	75.0000	1.6800	111.0000
57	28.0000	15.0000	110.0000	72.0000	1.5800	57.7000
58	40.0000	17.0000	132.0000	82.0000	1.6700	62.7000
59	34.0000	12.0000	117.0000	72.0000	1.6000	44.8000
60	27.0000	16.0000	100.0000	61.0000	1.5800	58.2000
61	39.0000	16.0000	122.0000	76.0000	1.4900	58.2000
62	21.0000	13.0000	110.0000	69.0000	1.6900	59.5000
63	40.0000	12.0000	115.0000	66.0000	1.6300	61.0000
64	35.0000	16.0000	102.0000	72.0000	1.6500	60.9000
65	38.0000	15.0000	128.0000	84.0000	1.6800	130.1500
66	29.0000	21.0000	116.0000	79.0000	1.6800	73.8000
67	43.0000	14.0000	105.0000	65.0000	1.7900	93.7000
68	41.0000	12.0000	131.0000	89.0000	1.5600	75.5000
69	40.0000	12.0000	105.0000	68.0000	1.7200	109.3000
70	23.0000	15.0000	94.0000	59.0000	1.6200	55.4000
71	37.0000	16.0000	121.0000	88.0000	1.6600	94.0000
72	27.0000	13.0000	127.0000	77.0000	1.6200	60.3000
73	32.0000	15.0000	98.0000	63.0000	1.7300	84.7000
74	24.0000	15.0000	113.0000	72.0000	1.6000	57.0000
75	38.0000	13.0000	131.0000	87.0000	1.6200	137.9000
76	21.0000	13.0000	103.0000	63.0000	1.5900	56.8000
77	43.0000	14.0000	136.0000	88.0000	1.6400	128.0000
78	40.0000	13.0000	119.0000	79.0000	1.6400	173.6000
79	43.0000	13.0000	148.0000	91.0000	1.5900	162.7000
80	45.0000	13.0000	121.0000	82.0000	1.6700	52.0000
81	47.0000	13.0000	130.0000	96.0000	1.7000	129.8000
82	35.0000	13.0000	121.0000	80.0000	1.6200	85.8000
83	30.0000	14.0000	102.0000	69.0000	1.7600	54.8000
84	39.0000	14.0000	123.0000	78.0000	1.6600	93.2000
85	43.0000	13.0000	143.0000	63.0000	1.6700	97.0000
86	31.0000	9.0000	125.0000	90.0000	1.6600	105.0000
87	45.0000	16.0000	139.0000	87.0000	1.6100	118.1000
88	39.0000	14.0000	111.0000	80.0000	1.6900	112.0000
89	39.0000	14.0000	97.0000	67.0000	1.5200	55.1000
90	33.0000	12.0000	113.0000	80.0000	1.7400	92.8000
91	24.0000	12.0000	120.0000	88.0000	1.5700	50.8000

	Age(W)	Educ.(W)	BP-Syst.(W)	BP-Dias.(W)	Ht.-m.(W)	Wt-kg(W)
92	41.0000	8.0000	126.0000	82.0000	1.5900	83.0000
93	33.0000	14.0000	108.0000	82.0000	1.7600	107.6000
94	21.0000	13.0000	103.0000	46.0000	1.7200	62.4000
95	35.0000	14.0000	105.0000	67.0000	1.6200	63.5000
96	39.0000	12.0000	89.0000	69.0000	1.6100	62.6000
97	37.0000	15.0000	101.0000	70.0000	1.5700	49.0000
98	26.0000	13.0000	116.0000	66.0000	1.5200	87.6000
99	42.0000	13.0000	121.0000	86.0000	1.6200	90.1000
100	42.0000	17.0000	132.0000	62.0000	1.6400	106.9000

	BMI(W)	ISI score(W)	WHO score(W)	ETOH(W)	SALT(W)	otal score(
1	36.2000	52.7000	34.4000	5.0000	12.0000	130.6000
2	34.1000	60.8000	72.3000	5.0000	17.5000	189.6000
3	24.2000	94.0000	82.0000	4.0000	23.0000	241.1000
4	20.7000	72.5000	55.3000	5.0000	13.0000	175.3000
5	22.4000	52.0000	81.2000	2.0000	11.0000	182.7000
6	37.8000	46.3000	58.9000	5.0000	8.0000	145.2000
7	37.2000	61.6000	53.1000	5.0000	13.0000	165.7000
8	31.1000	59.0000	44.6000	5.0000	13.0000	152.1000
9	19.2000	49.2000	41.5000	5.0000	14.5000	140.2000
10	38.8000	61.1000	64.4000	5.0000	20.0000	181.5000
11	26.8000	72.5000	44.1000	5.0000	9.0000	163.1000
12	29.3000	83.2000	63.9000	5.0000	23.0000	206.1000
13	33.2000	76.2000	65.9000	5.0000	25.0000	202.1000
14	28.4000	73.0000	60.4000	5.0000	20.0000	192.4000
15	21.3000	53.9000	49.7000	5.0000	20.0000	153.1000
16	19.3000	71.7000	71.1000	5.0000	14.0000	197.3000
17	26.8000	60.3000	54.4000	5.0000	11.0000	167.7000
18	19.5000	77.7000	67.0000	5.0000	18.5000	202.2000
19	30.6000	81.5000	79.1000	5.0000	6.0000	207.6000
20	27.8000	68.5000	64.6000	5.0000	12.5000	186.1000
21	23.3000	70.0000	70.1000	4.0000	15.0000	193.1000
22	22.4000	67.9000	57.9000	3.0000	14.0000	167.8000
23	25.2000	99.5000	130.4000	5.0000	23.0000	285.9000
24	29.9000	65.7000	53.8000	5.0000	5.0000	151.5000
25	24.7000	93.0000	103.9000	2.0000	17.0000	253.2000
26	23.8000	71.0000	68.2000	5.0000	10.0000	184.2000
27	19.3000	64.0000	75.7000	5.0000	19.0000	199.0000
28	35.6000	61.5000	80.7000	5.0000	13.0000	192.2000
29	20.1000	61.5000	52.0000	3.0000	13.0000	164.5000
30	23.7000	73.0000	34.2000	3.0000	17.0000	161.7000
31	19.4000	66.5000	47.7000	4.5000	14.5000	157.2000
32	21.1000	59.7000	65.0000	2.0000	12.0000	165.2000
33	20.6000	74.5000	51.1000	5.0000	14.0000	178.1000
34	22.4000	71.4000	90.7000	4.0000	18.0000	218.6000
35	22.6000	76.7000	42.9000	4.0000	21.0000	178.1000
36	23.3000	70.5000	64.3000	4.0000	16.0000	186.3000
37	32.9000	77.5000	48.2000	3.0000	12.0000	175.7000
38	20.3000	47.1000	38.6000	3.0000	9.0000	125.7000
39	33.2000	62.9000	79.3000	4.0000	14.5000	195.7000
40	39.8000	61.7000	83.4000	5.0000	10.0000	192.6000
41	35.7000	46.4000	45.6000	5.0000	6.0000	126.5000
42	20.9000	51.2000	53.9000	3.0000	17.5000	157.6000
43	29.1000	52.8000	88.5000	5.0000	13.0000	192.8000
44	21.4000	70.6000	52.5000	5.0000	10.0000	171.1000
45	27.8000	61.3000	61.3000	5.0000	11.0000	168.6000
46	20.2000	68.4000	76.1000	1.0000	13.0000	193.0000

	BMI(W)	:SI score(W	IHO score(W)	ETOH(W)	SALT(W)	otal score(
47	19.2000	56.9000	60.4000	3.0000	10.0000	154.8000
48	27.0000	57.3000	17.6000	1.0000	9.0000	114.4000
49	41.3000	43.5000	68.1000	5.0000	8.0000	144.6000
50	39.5000	55.2000	41.1000	5.0000	13.5000	141.3000
51	21.8000	99.0000	110.1000	5.0000	12.0000	267.6000
52	39.1000	65.5000	68.3000	5.0000	18.0000	187.8000
53	21.2000	71.4000	89.1000	5.0000	25.0000	223.5000
54	26.5000	63.2000	22.6000	5.0000	21.0000	141.3000
55	20.7000	66.0000	70.5000	4.5000	23.0000	193.5000
56	39.3000	47.5000	68.0000	5.0000	6.0000	151.5000
57	23.1000	60.0000	41.8000	5.0000	13.0000	152.1000
58	22.5000	64.5000	49.3000	5.0000	13.0000	156.8000
59	17.5000	50.5000	27.6000	5.0000	5.0000	106.1000
60	23.3000	50.8000	50.5000	4.0000	18.5000	153.8000
61	26.2000	71.0000	58.0000	5.0000	19.5000	188.0000
62	20.8000	58.0000	70.7000	3.0000	19.0000	185.2000
63	22.9000	47.2000	53.8000	5.0000	13.0000	152.0000
64	22.4000	46.8000	33.3000	4.0000	16.0000	125.6000
65	46.1000	68.5000	46.4000	5.0000	9.0000	158.4000
66	26.2000	95.3000	82.1000	5.0000	18.0000	238.4000
67	29.3000	55.1000	84.1000	3.0000	12.0000	181.7000
68	31.1000	77.0000	39.2000	4.0000	17.0000	172.2000
69	36.9000	60.5000	73.7000	5.0000	19.5000	185.7000
70	21.1000	66.0000	97.3000	5.0000	14.0000	215.3000
71	34.1000	76.0000	111.5000	5.0000	9.0000	240.0000
72	23.0000	68.0000	55.3000	5.0000	19.0000	178.3000
73	28.3000	66.5000	64.9000	5.0000	18.0000	183.9000
74	22.3000	62.0000	52.9000	3.0000	13.0000	159.9000
75	52.5000	44.8000	65.1000	5.0000	18.0000	163.9000
76	22.5000	80.0000	105.3000	5.0000	23.0000	248.3000
77	47.5000	58.3000	78.5000	5.0000	17.0000	191.8000
78	64.5000	66.0000	68.2000	5.0000	19.0000	187.7000
79	64.4000	53.2000	38.6000	5.0000	23.0000	144.8000
80	18.6000	88.0000	58.0000	4.0000	19.5000	206.8000
81	44.9000	40.7000	41.7000	5.0000	7.0000	117.9000
82	32.7000	58.7000	72.8000	5.0000	12.0000	181.0000
83	17.7000	44.7000	61.3000	5.0000	12.0000	149.5000
84	33.8000	44.6000	73.7000	5.0000	13.0000	160.3000
85	34.8000	47.0000	57.1000	5.0000	10.0000	142.1000
86	38.1000	80.8000	163.1000	5.0000	16.0000	308.4000
87	45.6000	57.2000	103.9000	5.0000	12.0000	208.1000
88	39.2000	67.0000	85.5000	5.0000	20.0000	208.0000
89	23.8000	57.0000	36.9000	3.0000	17.0000	135.9000
90	30.7000	65.2000	75.1000	4.0000	10.0000	188.8000
91	20.6000	45.2000	46.7000	5.0000	11.0000	133.9000

	BMI(W)	CSI score(W)	CHO score(W)	ETOH(W)	SALT(W)	otal score(
92	32.8000	44.0000	35.6000	4.0000	19.0000	125.6000
93	34.8000	49.1000	57.0000	5.0000	16.0000	157.6000
94	21.1000	51.0000	38.9000	5.0000	11.0000	127.9000
95	24.2000	42.0000	44.6000	5.0000	7.5000	133.1000
96	24.2000	54.7000	69.9000	5.0000	13.0000	170.1000
97	19.9000	50.9000	48.2000	5.0000	12.0000	148.6000
98	37.9000	69.2000	78.3000	4.0000	14.0000	198.5000
99	34.3000	54.8000	45.7000	5.0000	10.0000	137.5000
100	39.7000	56.0000	53.6000	5.0000	10.0000	152.6000

	TC(W)	TG(W)	VLDL-C(W)	LDL-C(W)	HDL-C(W)	Lp(a)-W
1	163.0000	196.0000	39.0000	80.0000	43.0000	9.0000
2	161.0000	124.0000	25.0000	90.0000	46.0000	3.0000
3	119.0000	66.0000	13.0000	58.0000	47.0000	3.0000
4	144.0000	91.0000	18.0000	72.0000	54.0000	19.0000
5	188.0000	90.0000	18.0000	119.0000	51.0000	29.0000
6	197.0000	129.0000	26.0000	119.0000	52.0000	9.0000
7	198.0000	257.0000	51.0000	109.0000	37.0000	1.0000
8	167.0000	95.0000	19.0000	111.0000	37.0000	13.0000
9	148.0000	70.0000	14.0000	88.0000	46.0000	1.0000
10	172.0000	122.0000	24.0000	88.0000	60.0000	1.0000
11	168.0000	45.0000	9.0000	107.0000	51.0000	1.0000
12	200.0000	106.0000	21.0000	128.0000	51.0000	16.0000
13	176.0000	167.0000	33.0000	93.0000	49.0000	1.0000
14	156.0000	105.0000	21.0000	95.0000	40.0000	4.0000
15	169.0000	99.0000	20.0000	98.0000	52.0000	33.0000
16	115.0000	86.0000	17.0000	57.0000	41.0000	3.0000
17	133.0000	36.0000	7.0000	83.0000	43.0000	18.0000
18	125.0000	46.0000	9.0000	69.0000	46.0000	3.0000
19	170.0000	178.0000	36.0000	90.0000	44.0000	2.0000
20	135.0000	83.0000	17.0000	72.0000	46.0000	1.0000
21	148.0000	74.0000	15.0000	82.0000	51.0000	15.0000
22	213.0000	102.0000	20.0000	133.0000	59.0000	2.0000
23	159.0000	88.0000	18.0000	80.0000	61.0000	4.0000
24	168.0000	98.0000	20.0000	102.0000	46.0000	1.0000
25	152.0000	105.0000	21.0000	73.0000	58.0000	7.0000
26	181.0000	151.0000	30.0000	91.0000	60.0000	1.0000
27	134.0000	38.0000	8.0000	74.0000	52.0000	14.0000
28	215.0000	99.0000	20.0000	146.0000	49.0000	12.0000
29	144.0000	42.0000	8.0000	70.0000	65.0000	1.0000
30	222.0000	96.0000	19.0000	143.0000	60.0000	1.0000
31	119.0000	40.0000	8.0000	60.0000	52.0000	15.0000
32	199.0000	89.0000	18.0000	101.0000	81.0000	28.0000
33	164.0000	81.0000	16.0000	93.0000	55.0000	18.0000
34	162.0000	49.0000	10.0000	80.0000	72.0000	39.0000
35	200.0000	104.0000	21.0000	130.0000	49.0000	35.0000
36	128.0000	90.0000	18.0000	41.0000	69.0000	1.0000
37	150.0000	81.0000	16.0000	92.0000	42.0000	6.0000
38	266.0000	113.0000	23.0000	201.0000	42.0000	28.0000
39	189.0000	86.0000	17.0000	105.0000	67.0000	84.0000
40	206.0000	138.0000	28.0000	140.0000	39.0000	4.0000
41	199.0000	167.0000	33.0000	134.0000	31.0000	8.0000
42	136.0000	39.0000	8.0000	73.0000	56.0000	3.0000
43	165.0000	216.0000	43.0000	91.0000	31.0000	71.0000
44	162.0000	84.0000	17.0000	108.0000	38.0000	6.0000
45	167.0000	58.0000	12.0000	106.0000	49.0000	55.0000
46	230.0000	153.0000	31.0000	144.0000	55.0000	5.0000

	TC(W)	TG(W)	VLDL-C(W)	LDL-C(W)	HDL-C(W)	Lp(a)-W
47	245.0000	137.0000	27.0000	164.0000	53.0000	25.0000
48	211.0000	69.0000	14.0000	89.0000	108.0000	2.0000
49	187.0000	224.0000	45.0000	113.0000	29.0000	3.0000
50	159.0000	85.0000	17.0000	98.0000	43.0000	1.0000
51	272.0000	211.0000	42.0000	192.0000	38.0000	3.0000
52	178.0000	211.0000	42.0000	105.0000	30.0000	60.0000
53	143.0000	51.0000	10.0000	84.0000	49.0000	40.0000
54	172.0000	121.0000	24.0000	87.0000	61.0000	
55	197.0000	110.0000	22.0000	108.0000	67.0000	1.0000
56	186.0000	117.0000	23.0000	128.0000	35.0000	79.0000
57	178.0000	123.0000	25.0000	88.0000	66.0000	13.0000
58	160.0000	37.0000	7.0000	89.0000	64.0000	3.0000
59	210.0000	87.0000	17.0000	135.0000	58.0000	111.0000
60	144.0000	64.0000	13.0000	74.0000	57.0000	24.0000
61	161.0000	40.0000	8.0000	96.0000	57.0000	20.0000
62	136.0000	51.0000	10.0000	92.0000	33.0000	7.0000
63	208.0000	47.0000	9.0000	144.0000	55.0000	1.0000
64	196.0000	63.0000	13.0000	111.0000	72.0000	3.0000
65	166.0000	79.0000	16.0000	109.0000	41.0000	80.0000
66	199.0000	226.0000	45.0000	106.0000	48.0000	21.0000
67	122.0000	64.0000	13.0000	52.0000	57.0000	22.0000
68	265.0000	105.0000	21.0000	191.0000	54.0000	22.0000
69	189.0000	126.0000	25.0000	119.0000	45.0000	6.0000
70	150.0000	95.0000	19.0000	81.0000	50.0000	9.0000
71	155.0000	179.0000	36.0000	88.0000	31.0000	12.0000
72	192.0000	108.0000	22.0000	92.0000	79.0000	13.0000
73	158.0000	81.0000	16.0000	90.0000	51.0000	69.0000
74	176.0000	89.0000	18.0000	104.0000	54.0000	19.0000
75	152.0000	117.0000	23.0000	75.0000	54.0000	2.0000
76	142.0000	78.0000	16.0000	83.0000	43.0000	43.0000
77	155.0000	121.0000	24.0000	92.0000	39.0000	29.0000
78	196.0000	98.0000	20.0000	134.0000	43.0000	41.0000
79	203.0000	220.0000	44.0000	121.0000	38.0000	1.0000
80	197.0000	153.0000	31.0000	127.0000	39.0000	105.0000
81	187.0000	128.0000	26.0000	117.0000	44.0000	60.0000
82	162.0000	90.0000	18.0000	99.0000	44.0000	10.0000
83	145.0000	45.0000	9.0000	73.0000	63.0000	7.0000
84	194.0000	211.0000	42.0000	117.0000	35.0000	4.0000
85	225.0000	284.0000	57.0000	129.0000	40.0000	2.0000
86	184.0000	144.0000	29.0000	103.0000	52.0000	34.0000
87	254.0000	158.0000	32.0000	167.0000	55.0000	37.0000
88	179.0000	131.0000	26.0000	114.0000	38.0000	15.0000
89	157.0000	62.0000	12.0000	82.0000	62.0000	1.0000
90	173.0000	107.0000	21.0000	92.0000	60.0000	11.0000
91	202.0000	65.0000	13.0000	143.0000	46.0000	20.0000

	TC(W)	TG(W)	VLDL-C(W)	LDL-C(W)	HDL-C(W)	Lp(a)-W
92	168.0000	61.0000	12.0000	114.0000	42.0000	54.0000
93	165.0000	87.0000	17.0000	105.0000	43.0000	4.0000
94	178.0000	81.0000	16.0000	113.0000	48.0000	7.0000
95	206.0000	72.0000	14.0000	150.0000	41.0000	47.0000
96	213.0000	102.0000	20.0000	138.0000	54.0000	20.0000
97	151.0000	55.0000	11.0000	75.0000	65.0000	10.0000
98	207.0000	116.0000	23.0000	143.0000	41.0000	16.0000
99	186.0000	95.0000	19.0000	130.0000	37.0000	16.0000
100	193.0000	207.0000	41.0000	121.0000	30.0000	1.0000

	OMOCYSTEI(W	AGE(B)	EDUC(B)	SYST. BP(B)	DIAS.BP(B)	HEIGHT(m)-B
1	9.0600	37.0000	15.0000	119.0000	79.0000	1.6500
2	7.8900	46.0000	12.0000	140.0000	81.0000	1.5900
3	9.4600	35.0000	14.5000	125.0000	63.0000	1.7000
4	7.9100	44.0000	16.0000	115.0000	91.0000	1.5900
5	7.4400	24.0000	12.0000	109.0000	68.0000	1.6600
6	13.0800	28.0000	14.0000	92.0000	61.0000	1.6400
7	8.8400	37.0000	14.0000	99.0000	61.0000	1.6500
8	8.4500	30.0000	14.0000	143.0000	91.0000	1.6800
9	7.4500	45.0000	18.0000	139.0000	88.0000	1.6500
10	7.1900	44.0000	14.0000	154.0000	107.0000	1.5600
11	6.0500	39.0000	18.0000	118.0000	87.0000	1.5800
12	8.4500	33.0000	14.0000	113.0000	81.0000	1.6800
13	9.0600	46.0000	14.0000	153.0000	128.0000	1.6500
14	5.7900	25.0000	11.0000	114.0000	75.0000	1.6000
15	8.3500	35.0000	14.0000	122.0000	75.0000	1.6000
16	5.3600	40.0000	15.0000	155.0000	117.0000	1.6900
17	6.4400	31.0000	14.0000	128.0000	82.0000	1.6900
18	9.0600	35.0000	12.0000	99.0000	61.0000	1.6300
19	6.3900	34.0000	12.0000	143.0000	93.0000	1.6400
20	4.8000	25.0000	16.0000	109.0000	61.0000	1.5500
21	3.7200	35.0000	15.0000	131.0000	81.0000	1.5500
22	14.5500	37.0000	14.0000	117.0000	80.0000	1.7400
23	4.6800	41.0000	16.0000	121.0000	89.0000	1.5700
24	6.0500	33.0000	14.0000	101.0000	62.0000	1.5600
25	3.9400	35.0000	16.0000	135.0000	92.0000	1.6500
26	6.1700	26.0000	13.0000	101.0000	63.0000	1.6500
27	6.4600	38.0000	17.0000	144.0000	99.0000	1.6700
28	9.4000	34.0000	16.0000	96.0000	59.0000	1.7500
29	6.7900	32.0000	18.0000	122.0000	82.0000	1.6200
30	9.1300	25.0000	16.0000	130.0000	83.0000	1.6900
31	10.6800	45.0000	13.0000	120.0000	89.0000	1.6600
32	6.9600	43.0000	13.0000	129.0000	92.0000	1.5900
33	8.0800	45.0000	12.0000	121.0000	80.0000	1.5200
34	9.1000	42.0000	13.0000	131.0000	80.0000	1.6800
35	6.4600	28.0000	14.0000	113.0000	70.0000	1.6400
36	7.0000	37.0000	15.0000	121.0000	82.0000	1.7000
37	5.0300	39.0000	15.0000	123.0000	74.0000	1.5700
38	9.2900	32.0000	17.0000	129.0000	83.0000	1.5700
39	5.6400	38.0000	14.0000	123.0000	82.0000	1.6800
40	8.0700	38.0000	11.0000	132.0000	79.0000	1.8300
41	9.6000	43.0000	12.0000	185.0000	113.0000	1.6000
42	5.1700	41.0000	10.0000	126.0000	91.0000	1.6800
43	6.3900	38.0000	16.0000	131.0000	81.0000	1.6500
44	4.4200	27.0000	16.0000	119.0000	69.0000	1.6300
45	6.5000	35.0000	18.0000	119.0000	81.0000	1.7200
46	4.8000	38.0000	14.0000	138.0000	95.0000	1.5700

	OMOCYSTEI(W	AGE(B)	EDUC(B)	SYST. BP(B)	DIAS.BP(B)	HEIGHT(m)-B
47	13.3100	30.0000	14.0000	121.0000	71.0000	1.5700
48	14.8600	34.0000	15.0000	119.0000	71.0000	1.6500
49	7.5800	30.0000	18.0000	97.0000	67.0000	1.6000
50	8.0500	25.0000	17.0000	114.0000	80.0000	1.6400
51	5.6900	35.0000	9.0000	131.0000	96.0000	1.7000
52	6.7400	40.0000	14.0000	171.0000	105.0000	1.7400
53	7.4500	42.0000	14.0000	109.0000	72.0000	1.5600
54	9.0100	24.0000	12.0000	119.0000	90.0000	1.6500
55	7.4300	20.0000	14.0000	121.0000	72.0000	1.6800
56	8.6400	37.0000	15.0000	143.0000	90.0000	1.6200
57	8.1600	41.0000	14.0000	123.0000	90.0000	1.6500
58	5.5000	38.0000	12.0000	116.0000	83.0000	1.5800
59	6.3500	23.0000	16.0000	102.0000	59.0000	1.6100
60	5.8800	30.0000	14.0000	139.0000	80.0000	1.7600
61	6.9400	24.0000	15.0000	145.0000	91.0000	1.7200
62	5.7200	22.0000	12.0000	121.0000	52.0000	1.7100
63	7.0700	38.0000	14.0000	116.0000	71.0000	1.5700
64	6.7100	33.0000	13.0000	101.0000	68.0000	1.7100
65	16.7000	31.0000	12.0000	127.0000	69.0000	1.6600
66	8.0700	38.0000	14.0000	108.0000	78.0000	1.6300
67	11.3200	29.0000	13.0000	115.0000	80.0000	1.5500
68	3.8700	41.0000	21.0000	90.0000	64.0000	1.5200
69	5.2000	24.0000	16.0000	109.0000	58.0000	1.6500
70	5.4600	19.0000	14.0000	136.0000	78.0000	1.6800
71	8.1100	33.0000	15.0000	128.0000	87.0000	1.5900
72	7.2900	22.0000	15.0000	132.0000	88.0000	1.6300
73	8.8400	38.0000	15.0000	148.0000	99.0000	1.7800
74	6.6400	38.0000	16.0000	119.0000	83.0000	1.6300
75	7.7500	28.0000	16.0000	108.0000	67.0000	1.6200
76	6.5400	30.0000	11.0000	115.0000	56.0000	1.6400
77	9.0900	27.0000	12.0000	120.0000	75.0000	1.6300
78	17.4800	25.0000	14.0000	119.0000	67.0000	1.7900
79	7.9400	39.0000	18.0000	110.0000	67.0000	1.7300
80	13.4900	40.0000	15.0000	153.0000	87.0000	1.6800
81		46.0000	15.0000	125.0000	70.0000	1.5800
82	8.5600	43.0000	15.0000	148.0000	93.0000	1.6300
83	13.7600	42.0000	18.0000	148.0000	94.0000	1.6500
84	8.5800	24.0000	11.0000	124.0000	87.0000	1.6900
85	7.4700	22.0000	16.0000	124.0000	67.0000	1.6200
86	5.2000	42.0000	14.0000	152.0000	78.0000	1.6900
87	8.7300	39.0000	14.0000	115.0000	70.0000	1.6900
88	8.3000	29.0000	14.0000	124.0000	56.0000	1.5700
89	6.6900	43.0000	14.0000	157.0000	101.0000	1.6200
90	6.5000	38.0000	13.0000	133.0000	77.0000	1.6500
91	8.2000	40.0000	12.0000	109.0000	60.0000	1.5500

	OMOCYSTEI(W	AGE(B)	EDUC(B)	SYST. BP(B)	DIAS.BP(B)	HEIGHT(m)-B
92	7.0500	20.0000	11.0000	146.0000	80.0000	1.6800
93	9.0700	30.0000	11.0000	137.0000	86.0000	1.6700
94	5.8500	21.0000	15.0000	101.0000	52.0000	1.5200
95	5.8800	34.0000	14.0000	109.0000	62.0000	1.6000
96	10.0900	20.0000	13.0000	99.0000	60.0000	1.6000
97	6.8900	38.0000	14.0000	114.0000	58.0000	1.6100
98	6.3200	25.0000	13.0000	117.0000	79.0000	1.6200
99	6.7000	21.0000	14.0000	130.0000	83.0000	1.5100
100	8.2300					

	WT(kg)-B	BMI(B)	:SI SCORE(B)	CHO(B)	ETOH(B)	SALT(B)
1	109.1000	40.1000	43.0000	64.0000	4.0000	19.0000
2	97.3000	38.5000	77.0000	35.4000	5.0000	13.0000
3	103.0000	35.6000	48.8000	45.7000	5.0000	13.0000
4	81.6000	32.3000	52.0000	34.7000	5.0000	8.0000
5	56.5000	20.5000	34.0000	148.9000	5.0000	11.0000
6	50.7000	18.9000	44.5000	79.5000	5.0000	10.0000
7	72.5000	26.6000	59.0000	42.4000	5.0000	10.0000
8	105.6000	37.4000	40.0000	40.2000	5.0000	10.0000
9	76.1000	28.0000	74.5000	93.1000	4.0000	25.0000
10	109.4000	45.0000	44.0000	81.6000	5.0000	10.0000
11	60.0000	24.0000	71.0000	107.4000	5.0000	15.0000
12	62.6000	22.2000	56.4000	60.1000	5.0000	16.5000
13	100.5000	36.9000	59.8000	54.7000	5.0000	9.0000
14	155.9000	60.9000	43.0000	76.7000	5.0000	17.0000
15	111.6000	43.6000	51.7000	58.8000	5.0000	17.0000
16	102.4000	35.9000	51.2000	44.9000	2.0000	8.0000
17	56.9000	19.9000	58.0000	52.5000	5.0000	10.0000
18	66.4000	25.0000	34.3000	34.8000	5.0000	7.0000
19	71.8000	26.7000	55.0000	31.5000	4.0000	10.0000
20	52.0000	21.7000	38.5000	71.1000	3.0000	9.0000
21	93.9000	39.1000	54.2000	58.7000	5.0000	5.0000
22	61.1000	20.2000	57.2000	56.3000	2.0000	15.5000
23	59.3000	24.1000	62.4000	111.2000	5.0000	14.0000
24	64.3000	26.4000	55.9000	22.4000	5.0000	12.0000
25	106.6000	39.2000	59.5000	89.1000	5.0000	13.0000
26	70.5000	25.9000	61.3000	81.0000	5.0000	20.0000
27	88.7000	31.8000	59.3000	47.6000	5.0000	25.0000
28	68.5000	22.4000	50.0000	110.8000	3.0000	15.0000
29	81.9000	31.2000	78.8000	69.6000	5.0000	12.0000
30	84.4000	29.5000	51.7000	81.1000	5.0000	7.0000
31	83.0000	30.1000	52.2000	79.2000	5.0000	14.0000
32	88.9000	35.2000	52.3000	51.5000	5.0000	10.0000
33	77.7000	33.6000	69.7000	78.2000	4.0000	13.0000
34	68.4000	24.2000	54.0000	44.4000	4.0000	16.0000
35	77.0000	28.6000	54.5000	62.0000	5.0000	12.0000
36	119.5000	41.4000	62.0000	80.9000	5.0000	13.0000
37	63.4000	25.7000	44.8000	50.0000	5.0000	11.0000
38	83.4000	33.9000	38.7000	40.1000	5.0000	8.0000
39	127.7000	45.3000	42.7000	60.4000	5.0000	14.0000
40	96.6000	28.8000	47.7000	50.5000	5.0000	15.0000
41	114.5000	44.7000	51.4000	104.8000	5.0000	13.0000
42	62.8000	22.3000	86.5000	82.0000	1.0000	8.3000
43	99.1000	36.4000	67.5000	57.1000	5.0000	14.0000
44	94.3000	35.5000	52.6000	60.8000	5.0000	17.0000
45	93.0000	31.5000	59.0000	86.2000	5.0000	11.0000
46	105.9000	43.0000	68.5000	89.1000	5.0000	21.0000

	WT(kg)-B	BMI(B)	:SI SCORE(B)	CHO(B)	ETOH(B)	SALT(B)
47	107.5000	43.6000	43.0000	24.0000	5.0000	6.0000
48	66.2000	24.3000	70.0000	79.6000	2.0000	7.0000
49	54.0000	21.3000	59.5000	66.4000	5.0000	12.0000
50	76.2000	28.3000	51.2000	79.3000	5.0000	8.0000
51	108.0000	37.4000	57.7000	81.8000	5.0000	11.5000
52	107.9000	35.6000	66.0000	70.8000	3.0000	17.0000
53	69.3000	28.5000	67.8000	41.1000	4.0000	17.0000
54	85.4000	31.4000	43.0000	39.5000	5.0000	10.0000
55	73.7000	26.1000	47.9000	41.4000	5.0000	13.0000
56	184.1000	70.1000	49.2000	50.1000	5.0000	14.0000
57	87.6000	32.2000	52.1000	56.4000	3.0000	15.5000
58	66.8000	26.7000	46.0000	52.3000	5.0000	10.0000
59	80.5000	31.1000	71.8000	81.3000	5.0000	12.0000
60	144.7000	46.7000	50.1000	46.0000	4.0000	9.0000
61	153.0000	51.7000	94.5000	78.3000	5.0000	20.0000
62	64.8000	22.2000	45.1000	84.9000	5.0000	14.0000
63	84.3000	34.2000	52.1000	30.0000	5.0000	11.0000
64	61.4000	21.0000	37.9000	57.3000	3.0000	10.0000
65	69.0000	25.0000	54.2000	40.2000	2.0000	10.0000
66	48.0000	18.1000	53.0000	36.5000	1.0000	14.0000
67	84.8000	35.3000	52.3000	46.6000	5.0000	7.0000
68	58.3000	25.2000	63.7000	124.7000	5.0000	21.0000
69	60.4000	22.2000	68.2000	68.1000	5.0000	25.0000
70	85.3000	30.2000	88.5000	42.7000	2.0000	22.0000
71	98.1000	38.8000	53.0000	62.0000	5.0000	11.0000
72	68.5000	25.8000	37.0000	52.4000	5.0000	8.0000
73	142.5000	45.0000	49.0000	47.7000	5.0000	10.5000
74	68.3000	25.7000	43.8000	22.4000	4.5000	12.0000
75	53.3000	20.3000	75.7000	48.6000	4.0000	15.0000
76	103.5000	38.5000	45.0000	77.3000	5.0000	14.0000
77	59.3000	22.3000	45.9000	62.1000	5.0000	9.0000
78	101.5000	31.7000	44.5000	99.7000	4.0000	6.0000
79	85.6000	28.6000	57.6000	59.8000	5.0000	13.0000
80	107.2000	38.0000	53.6000	31.1000	3.0000	16.0000
81	68.0000	27.2000	74.2000	68.4000	4.0000	16.0000
82	89.4000	33.6000	51.7000	50.1000	5.0000	18.0000
83	95.0000	34.9000	80.9000	56.5000	5.0000	15.0000
84	102.8000	36.0000	45.0000	56.3000	2.0000	9.0000
85	58.4000	22.6000	48.6000	50.9000	5.0000	17.0000
86	136.5000	47.8000	48.0000	114.8000	5.0000	8.0000
87	108.4000	38.0000	61.9000	59.3000	4.0000	14.0000
88	96.4000	39.1000	57.0000	95.0000	4.0000	18.0000
89	107.2000	40.8000	63.5000	10.3000	5.0000	21.0000
90	114.1000	41.9000	46.9000	48.5000	4.0000	10.0000
91	62.1000	25.8000	73.0000	28.0000	1.0000	12.0000

	WT(kg)-B	BMI(B)	:SI SCORE(B)	CHO(B)	ETOH(B)	SALT(B)
92	122.3000	43.3000	41.5000	88.9000	5.0000	12.0000
93	85.4000	30.6000	42.0000	24.2000	5.0000	13.0000
94	63.0000	27.3000	80.0000	130.5000	4.0000	15.0000
95	78.4000	30.6000	56.5000	29.3000	4.0000	9.0000
96	66.2000	25.9000	39.0000	33.2000	5.0000	10.0000
97	59.4000	22.9000	53.2000	77.5000	5.0000	12.0000
98	66.1000	25.2000	42.2000	25.7000	5.0000	7.0000
99	56.0000	24.6000	44.3000	46.3000	5.0000	15.7000

	OTAL SCORE-	TC(B)	TG(B)	VLDL-C(B)	LDL-C(B)	HDL-C(B)
1	162.5000	175.0000	57.0000	11.0000	113.0000	50.0000
2	168.4000	145.0000	96.0000	19.0000	77.0000	49.0000
3	138.0000	183.0000	91.0000	18.0000	118.0000	47.0000
4	124.7000	189.0000	67.0000	13.0000	123.0000	52.0000
5	231.9000	147.0000	74.0000	15.0000	78.0000	54.0000
6	167.0000	151.0000	47.0000	9.0000	83.0000	59.0000
7	138.4000	183.0000	82.0000	16.0000	115.0000	51.0000
8	121.7000	130.0000	51.0000	10.0000	73.0000	47.0000
9	225.1000	154.0000	63.0000	13.0000	87.0000	54.0000
10	165.6000	214.0000	143.0000	29.0000	136.0000	49.0000
11	233.4000	130.0000	42.0000	8.0000	64.0000	58.0000
12	163.3000	160.0000	46.0000	9.0000	97.0000	54.0000
13	157.5000	193.0000	133.0000	27.0000	120.0000	46.0000
14	178.0000	126.0000	72.0000	14.0000	70.0000	42.0000
15	168.0000	200.0000	84.0000	17.0000	140.0000	44.0000
16	126.1000	197.0000	53.0000	11.0000	111.0000	76.0000
17	156.0000	209.0000	64.0000	13.0000	123.0000	73.0000
18	107.1000	204.0000	49.0000	10.0000	128.0000	66.0000
19	131.5000	194.0000	65.0000	13.0000	133.0000	48.0000
20	144.1000	175.0000	121.0000	24.0000	87.0000	63.0000
21	155.9000	142.0000	85.0000	17.0000	82.0000	43.0000
22	150.3000	209.0000	111.0000	22.0000	126.0000	61.0000
23	221.6000	244.0000	109.0000	22.0000	163.0000	59.0000
24	118.3000	160.0000	30.0000	6.0000	85.0000	68.0000
25	194.6000	190.0000	80.0000	16.0000	131.0000	42.0000
26	203.8000	146.0000	51.0000	10.0000	94.0000	42.0000
27	162.4000	169.0000	64.0000	13.0000	106.0000	50.0000
28	208.8000	234.0000	81.0000	16.0000	158.0000	60.0000
29	201.4000	180.0000	46.0000	9.0000	103.0000	68.0000
30	173.3000	211.0000	52.0000	10.0000	126.0000	75.0000
31	178.4000	200.0000	68.0000	14.0000	120.0000	66.0000
32	145.8000	196.0000	81.0000	16.0000	140.0000	40.0000
33	200.4000	204.0000	156.0000	31.0000	129.0000	44.0000
34	148.4000	180.0000	77.0000	15.0000	98.0000	66.0000
35	162.0000	133.0000	48.0000	10.0000	88.0000	36.0000
36	192.4000	281.0000	49.0000	10.0000	174.0000	98.0000
37	134.8000	170.0000	48.0000	10.0000	87.0000	73.0000
38	120.3000	188.0000	119.0000	24.0000	116.0000	48.0000
39	154.1000	286.0000	242.0000	48.0000	199.0000	39.0000
40	144.7000	156.0000	95.0000	19.0000	102.0000	35.0000
41	199.2000	236.0000	157.0000	31.0000	165.0000	39.0000
42	210.8000	158.0000	119.0000	24.0000	86.0000	48.0000
43	179.6000	188.0000	72.0000	14.0000	126.0000	48.0000
44	168.9000	153.0000	81.0000	16.0000	73.0000	64.0000
45	192.7000	171.0000	51.0000	10.0000	117.0000	44.0000
46	218.1000	163.0000	91.0000	18.0000	106.0000	39.0000

	OTAL SCORE-	TC(B)	TG(B)	VLDL-C(B)	LDL-C(B)	HDL-C(B)
47	99.0000	117.0000	78.0000	16.0000	56.0000	46.0000
48	198.9000	172.0000	46.0000	9.0000	79.0000	83.0000
49	169.4000	171.0000	71.0000	14.0000	105.0000	51.0000
50	168.5000	206.0000	77.0000	15.0000	137.0000	54.0000
51	184.0000	200.0000	71.0000	14.0000	128.0000	58.0000
52	180.8000	181.0000	87.0000	17.0000	90.0000	74.0000
53	148.9000	175.0000	42.0000	8.0000	100.0000	66.0000
54	113.5000	190.0000	202.0000	40.0000	118.0000	31.0000
55	126.6000	151.0000	71.0000	14.0000	78.0000	59.0000
56	145.3000	163.0000	60.0000	2.0000	120.0000	42.0000
57	161.0000	120.0000	57.0000	20.0000	76.0000	48.0000
58	141.3000	159.0000	56.0000	11.0000	86.0000	61.0000
59	200.1000	174.0000	55.0000	11.0000	117.0000	46.0000
60	138.6000	179.0000	87.0000	17.0000	122.0000	39.0000
61	232.8000	143.0000	283.0000	57.0000	57.0000	29.0000
62	176.5000	240.0000	51.0000	10.0000	165.0000	64.0000
63	125.6000	193.0000	96.0000	19.0000	122.0000	51.0000
64	125.2000	167.0000	53.0000	11.0000	88.0000	69.0000
65	125.4000	150.0000	74.0000	15.0000	75.0000	61.0000
66	131.5000	225.0000	58.0000	12.0000	126.0000	87.0000
67	136.9000	150.0000	82.0000	16.0000	83.0000	51.0000
68	250.9000	154.0000	52.0000	10.0000	93.0000	50.0000
69	191.3000	163.0000	72.0000	14.0000	103.0000	45.0000
70	192.2000	222.0000	70.0000	14.0000	68.0000	47.0000
71	159.0000	228.0000	92.0000	18.0000	169.0000	41.0000
72	129.9000	175.0000	76.0000	15.0000	114.0000	46.0000
73	137.7000	120.0000	97.0000	19.0000	64.0000	37.0000
74	107.2000	140.0000	68.0000	14.0000	77.0000	49.0000
75	174.8000	206.0000	62.0000	12.0000	117.0000	76.0000
76	167.3000	184.0000	63.0000	13.0000	124.0000	48.0000
77	148.3000	156.0000	52.0000	10.0000	101.0000	44.0000
78	174.7000	157.0000	49.0000	10.0000	113.0000	34.0000
79	169.9000	145.0000	83.0000	17.0000	64.0000	64.0000
80	138.7000	191.0000	113.0000	23.0000	113.0000	56.0000
81	193.6000	195.0000	66.0000	13.0000	100.0000	83.0000
82	156.8000	210.0000	63.0000	13.0000	136.0000	61.0000
83	190.9000	206.0000	121.0000	24.0000	150.0000	32.0000
84	138.3000	197.0000	181.0000	36.0000	118.0000	43.0000
85	150.5000	210.0000	41.0000	8.0000	131.0000	71.0000
86	201.3000	248.0000	116.0000	23.0000	180.0000	45.0000
87	170.2000	223.0000	68.0000	14.0000	156.0000	54.0000
88	196.0000	165.0000	63.0000	13.0000	114.0000	38.0000
89	75.8000	187.0000	79.0000	16.0000	110.0000	61.0000
90	139.4000	225.0000	82.0000	16.0000	161.0000	48.0000
91	142.0000	140.0000	87.0000	17.0000	66.0000	57.0000

	OTAL SCORE-	TC(B)	TG(B)	VLDL-C(B)	LDL-C(B)	HDL-C(B)
92	182.4000	147.0000	35.0000	7.0000	93.0000	47.0000
93	113.7000	105.0000	158.0000	32.0000	28.0000	45.0000
94	260.5000	116.0000	93.0000	19.0000	56.0000	41.0000
95	122.8000	167.0000	52.0000	10.0000	94.0000	63.0000
96	113.2000	125.0000	36.0000	7.0000	79.0000	39.0000
97	174.2000	274.0000	65.0000	13.0000	196.0000	65.0000
98	99.9000	189.0000	36.0000	7.0000	123.0000	59.0000
99	134.3000	185.0000	80.0000	16.0000	115.0000	54.0000

	Lp(a)-(B)	HOMOCYST(B)	meanbp-w	meanbp-b	LOG-TG-W
1	86.0000	13.8900	94.6653	92.3320	2.2923
2	45.0000	7.8500	97.9988	100.6647	2.0934
3	52.0000	6.7300	73.6654	83.6646	1.8195
4	65.0000	7.3900	80.9991	98.9992	1.9590
5	11.0000	7.4500	85.3317	81.6653	1.9542
6	23.0000	13.3800	84.3320	71.3323	2.1106
7	37.0000	10.2600	97.9983	73.6654	2.4099
8	15.0000	12.3800	104.3319	108.3316	1.9777
9	68.0000	7.6500	74.9987	104.9983	1.8451
10	11.0000	6.0400	116.3317	122.6651	2.0864
11	9.0000	7.5800	73.6654	97.3323	1.6532
12	38.0000	6.0500	85.6652	91.6656	2.0253
13	38.0000	6.5900	84.6654	136.3325	2.2227
14	6.0000	10.2100	80.6656	87.9987	2.0212
15	73.0000	11.2600	80.9989	90.6651	1.9956
16	15.0000	7.7400	87.9987	129.6654	1.9345
17	60.0000	13.0800	69.3328	97.3318	1.5563
18	15.0000	11.2000	80.9990	73.6654	1.6628
19	116.0000	12.5300	94.9986	109.6650	2.2504
20	86.0000	9.1100	82.9987	76.9984	1.9191
21	63.0000	8.5400	77.9989	97.6650	1.8692
22	28.0000	6.6400	86.6656	92.3321	2.0086
23	70.0000	8.6400	82.9988	99.6656	1.9445
24	6.0000	6.7400	97.9987	74.9987	1.9912
25	80.0000	7.9700	91.9984	106.3319	2.0212
26	85.0000	6.9000	78.6655	75.6654	2.1790
27	50.0000	10.5300	73.3321	113.9985	1.5798
28	118.0000	6.9300	84.9988	71.3321	1.9956
29	15.0000	6.7100	89.6657	95.3320	1.6232
30	34.0000	7.2800	91.9988	98.6651	1.9823
31	88.0000	9.0200	80.9990	99.3323	1.6021
32	116.0000	11.7900	81.3319	104.3321	1.9494
33	90.0000	14.9100	73.9986	93.6653	1.9085
34	1.0000	18.3900	77.6655	96.9983	1.6902
35	30.0000	6.8100	80.9984	84.3319	2.0170
36	35.0000	11.6000	83.3320	94.9987	1.9542
37	18.0000	12.5600	106.3317	90.3317	1.9085
38	1.0000	6.0400	89.6653	98.3318	2.0531
39	18.0000	7.5900	82.9987	95.6653	1.9345
40	45.0000	10.0700	84.9986	96.6649	2.1399
41	126.0000	16.4100	99.9986	136.9976	2.2227
42	6.0000	5.1800	84.6653	102.6655	1.5911
43	7.0000	7.3800	106.6653	97.6650	2.3345
44	39.0000	8.9100	94.9989	85.6650	1.9243
45	35.0000	8.3400	94.9984	93.6654	1.7634
46	42.0000	7.8600	78.3322	109.3319	2.1847

	Lp(a)-(B)	HOMOCYST(B)	meanbp-w	meanbp-b	LOG-TG-W
47	54.0000	6.7900	99.9984	87.6650	2.1367
48	68.0000	6.4200	95.3320	86.9984	1.8388
49	36.0000	8.6300	114.6658	76.9990	2.3502
50	26.0000	6.0300	123.6653	91.3322	1.9294
51	6.0000	7.0700	91.3321	107.6655	2.3243
52	20.0000	11.4600	102.3320	126.9978	2.3243
53	9.0000		66.9987	84.3321	1.7076
54	20.0000	6.3500	75.3320	99.6657	2.0828
55	24.0000	6.2200	83.9986	88.3317	2.0414
56		8.2100	89.6652	107.6649	2.0682
57	125.0000	7.4300	84.6654	100.9989	2.0899
58	26.0000	28.9500	98.6650	93.9989	1.5682
59	14.0000	7.2800	86.9985	73.3319	1.9395
60		5.0400	73.9987	99.6647	1.8062
61	45.0000	8.5700	91.3318	108.9982	1.6021
62	5.0000	7.8900	82.6653	74.9977	1.7076
63	51.0000		82.3317	85.9985	1.6721
64	92.0000	5.8700	81.9990	78.9989	1.7993
65	46.0000	9.3900	98.6652	88.3314	1.8976
66	72.0000	8.9300	91.3321	87.9990	2.3541
67	19.0000	7.2000	78.3320	91.6655	1.8062
68	39.0000	7.9300	102.9986	72.6658	2.0212
69	55.0000	8.0100	80.3321	74.9983	2.1004
70	11.0000	10.7400	70.6655	97.3314	1.9777
71	78.0000	6.2200	98.9989	100.6653	2.2529
72	5.0000	7.0700	93.6650	102.6652	2.0334
73	13.0000	7.5500	74.6655	115.3317	1.9085
74	13.0000	7.1700	85.6653	94.9988	1.9494
75	19.0000	9.5200	101.6652	80.6653	2.0682
76	21.0000	6.7900	76.3320	75.6647	1.8921
77	49.0000	6.5100	103.9984	89.9985	2.0828
78	23.0000	4.4300	92.3320	84.3316	1.9912
79	25.0000	6.2200	109.9981	81.3319	2.3424
80	43.0000	11.5500	94.9987	108.9978	2.1847
81	4.0000	8.2400	107.3322	88.3315	2.1072
82	1.0000	8.9600	93.6653	111.3315	1.9542
83	43.0000	6.5000	79.9989	111.9982	1.6532
84	36.0000	9.3900	92.9985	99.3321	2.3243
85	28.0000	10.1200	89.6640	85.9981	2.4533
86	52.0000	5.5300	101.6655	102.6642	2.1584
87	104.0000	6.2100	104.3316	84.9985	2.1987
88	42.0000	10.0000	90.3323	78.6644	2.1173
89	16.0000	9.9700	76.9990	119.6648	1.7924
90	61.0000	15.7300	90.9989	95.6648	2.0294
91	41.0000	5.6300	98.6656	76.3317	1.8129

	Lp(a)-(B)	HOMOCYST(B)	meanbp-w	meanbp-b	LOG-TG-W
92	49.0000	12.5800	96.6652	101.9978	1.7853
93	9.0000	10.4100	90.6658	102.9983	1.9395
94	7.0000	4.1900	64.9981	68.3317	1.9085
95	23.0000	8.9500	79.6654	77.6651	1.8573
96	16.0000	6.9300	75.6660	72.9987	2.0086
97	64.0000	8.5200	80.3323	76.6648	1.7404
98	10.0000	5.4900	82.6650	91.6654	2.0645
99	27.0000	8.3700	97.6655	98.6651	1.9777
100			85.3310		2.3160

	LOG-TG-B	LOG-HCY-W	LOG-HCY-B	DHS-W-34	DHS-W-35	DHS-W-36
1	1.7559	0.9571	1.1427	5.0000	1.5000	4.0000
2	1.9823	0.8971	0.8949	5.0000	5.0000	5.0000
3	1.9590	0.9759	0.8280	5.0000	5.0000	4.0000
4	1.8261	0.8982	0.8686	5.0000	4.0000	2.0000
5	1.8692	0.8716	0.8722	5.0000	5.0000	4.0000
6	1.6721	1.1166	1.1265	5.0000	5.0000	5.0000
7	1.9138	0.9465	1.0111	5.0000	4.0000	3.0000
8	1.7076	0.9269	1.0927	5.0000	5.0000	4.0000
9	1.7993	0.8722	0.8837	5.0000	5.0000	4.0000
10	2.1553	0.8567	0.7810	5.0000	4.0000	2.0000
11	1.6232	0.7818	0.8797	5.0000	4.0000	3.0000
12	1.6628	0.9269	0.7818	2.0000	4.0000	2.0000
13	2.1239	0.9571	0.8189	5.0000	4.0000	3.0000
14	1.8573	0.7627	1.0090	5.0000	5.0000	5.0000
15	1.9243	0.9217	1.0515	3.0000	3.0000	1.0000
16	1.7243	0.7292	0.8887	5.0000	5.0000	3.5000
17	1.8062	0.8089	1.1166	5.0000	5.0000	4.0000
18	1.6902	0.9571	1.0492	5.0000	5.0000	4.0000
19	1.8129	0.8055	1.0980	5.0000	5.0000	3.0000
20	2.0828	0.6812	0.9595	5.0000	4.0000	3.0000
21	1.9294	0.5705	0.9315	5.0000	4.0000	4.0000
22	2.0453	1.1629	0.8222	5.0000	3.0000	2.0000
23	2.0374	0.6702	0.9365	2.0000	4.0000	2.0000
24	1.4771	0.7818	0.8287	3.0000	4.0000	3.0000
25	1.9031	0.5955	0.9015	5.0000	4.0000	3.0000
26	1.7076	0.7903	0.8388	5.0000	4.0000	3.0000
27	1.8062	0.8102	1.0224	5.0000	4.0000	4.0000
28	1.9085	0.9731	0.8407	5.0000	4.0000	5.0000
29	1.6628	0.8319	0.8267	5.0000	5.0000	4.0000
30	1.7160	0.9605	0.8621	5.0000	5.0000	3.0000
31	1.8325	1.0286	0.9552	2.0000	2.0000	2.0000
32	1.9085	0.8426	1.0715	3.0000	4.0000	2.0000
33	2.1931	0.9074	1.1735	5.0000	3.0000	2.0000
34	1.8865	0.9590	1.2646	3.0000	4.0000	2.0000
35	1.6812	0.8102	0.8331	3.0000	5.0000	2.0000
36	1.6902	0.8451	1.0645	5.0000	2.0000	4.0000
37	1.6812	0.7016	1.0990	3.0000	4.0000	4.0000
38	2.0755	0.9680	0.7810	3.0000	4.0000	2.0000
39	2.3838	0.7513	0.8802	3.0000	5.0000	3.0000
40	1.9777	0.9069	1.0030	5.0000	5.0000	3.0000
41	2.1959	0.9823	1.2151	5.0000	1.0000	4.0000
42	2.0755	0.7135	0.7143	5.0000	5.0000	3.0000
43	1.8573	0.8055	0.8681	5.0000	5.0000	4.0000
44	1.9085	0.6454	0.9499	5.0000	4.0000	5.0000
45	1.7076	0.8129	0.9212	5.0000	4.0000	3.0000
46	1.9590	0.6812	0.8954	5.0000	5.0000	4.0000

	LOG-TG-B	LOG-HCY-W	LOG-HCY-B	DHS-W-34	DHS-W-35	DHS-W-36
47	1.8921	1.1242	0.8319	5.0000	3.0000	3.0000
48	1.6628	1.1720	0.8075	5.0000	4.0000	2.0000
49	1.8513	0.8797	0.9360	3.0000	1.0000	1.0000
50	1.8865	0.9058	0.7803	3.0000	5.0000	1.0000
51	1.8513	0.7551	0.8494	5.0000	5.0000	4.0000
52	1.9395	0.8287	1.0592	5.0000	5.0000	4.0000
53	1.6232	0.8722		5.0000	5.0000	5.0000
54	2.3054	0.9547	0.8028	5.0000	4.0000	5.0000
55	1.8513	0.8710	0.7938	5.0000	5.0000	3.5000
56	1.7782	0.9365	0.9143	3.0000	3.0000	5.0000
57	1.7559	0.9117	0.8710	5.0000	4.0000	4.0000
58	1.7482	0.7404	1.4616			
59	1.7404	0.8028	0.8621	3.0000	5.0000	4.0000
60	1.9395	0.7694	0.7024	5.0000	5.0000	5.0000
61	2.4518	0.8414	0.9330	5.0000	4.0000	4.0000
62	1.7076	0.7574	0.8971	5.0000	5.0000	4.0000
63	1.9823	0.8494		5.0000	5.0000	4.0000
64	1.7243	0.8267	0.7686	3.0000	4.0000	3.0000
65	1.8692	1.2227	0.9727	5.0000	4.0000	3.0000
66	1.7634	0.9069	0.9509	5.0000	5.0000	4.0000
67	1.9138	1.0538	0.8573	2.0000	4.0000	2.0000
68	1.7160	0.5877	0.8993			
69	1.8573	0.7160	0.9036	5.0000	3.0000	2.0000
70	1.8451	0.7372	1.0310	5.0000	5.0000	5.0000
71	1.9638	0.9090	0.7938	5.0000	5.0000	5.0000
72	1.8808	0.8627	0.8494	5.0000	4.0000	3.0000
73	1.9868	0.9465	0.8779	5.0000	2.0000	5.0000
74	1.8325	0.8222	0.8555	5.0000	4.0000	2.0000
75	1.7924	0.8893	0.9786	5.0000	5.0000	4.0000
76	1.7993	0.8156	0.8319	3.0000	4.0000	3.0000
77	1.7160	0.9586	0.8136	5.0000	4.0000	4.0000
78	1.6902	1.2425	0.6464	3.0000	2.0000	5.0000
79	1.9191	0.8998	0.7938	5.0000	3.0000	2.0000
80	2.0531	1.1300	1.0626	5.0000	4.0000	3.0000
81	1.8195		0.9159	5.0000	3.0000	3.0000
82	1.7993	0.9325	0.9523	5.0000	5.0000	4.0000
83	2.0828	1.1386	0.8129	5.0000	2.0000	3.0000
84	2.2577	0.9335	0.9727	5.0000	3.0000	4.0000
85	1.6128	0.8733	1.0052	2.0000	3.0000	2.0000
86	2.0645	0.7160	0.7427	5.0000	5.0000	4.0000
87	1.8325	0.9410	0.7931	5.0000	5.0000	5.0000
88	1.7993	0.9191	1.0000	5.0000	3.0000	5.0000
89	1.8976	0.8254	0.9987	2.0000	3.0000	2.0000
90	1.9138	0.8129	1.1967	5.0000	4.0000	3.0000
91	1.9395	0.9138	0.7505	5.0000	2.0000	4.0000

	LOG-TG-B	LOG-HCY-W	LOG-HCY-B	DHS-W-34	DHS-W-35	DHS-W-36
92	1.5441	0.8482	1.0997	5.0000	3.0000	4.0000
93	2.1987	0.9576	1.0175	3.0000	3.0000	4.0000
94	1.9685	0.7672	0.6222	5.0000	3.0000	2.0000
95	1.7160	0.7694	0.9518	5.0000	5.0000	5.0000
96	1.5563	1.0039	0.8407	5.0000	4.0000	3.0000
97	1.8129	0.8382	0.9304	3.0000	4.5000	5.0000
98	1.5563	0.8007	0.7396	5.0000	5.0000	2.0000
99	1.9031	0.8261	0.9227	3.0000	3.0000	2.0000
100		0.9154		5.0000	3.0000	3.0000

	DHS-W-37	DHS-W-38	DHS-B-34	DHS-B-35	DHS-B-36	DHS-B-37
1	3.0000	1.0000	3.0000	3.0000	4.0000	3.0000
2	4.0000	1.0000	5.0000	5.0000	5.0000	4.0000
3	2.0000	5.0000	5.0000	3.0000	4.0000	2.0000
4	2.0000	3.0000	5.0000	3.0000	4.0000	2.0000
5	3.0000	4.0000	5.0000	4.0000	2.0000	3.0000
6	2.0000	3.0000	5.0000	3.0000	4.0000	1.0000
7	3.0000	3.0000	5.0000	4.5000	5.0000	1.0000
8	3.0000	1.0000	5.0000	5.0000	4.0000	0.0000
9	2.0000	1.0000	5.0000	3.0000	1.0000	4.0000
10	4.0000	2.0000	5.0000	3.0000	4.0000	1.0000
11	4.0000	3.0000	5.0000	5.0000	5.0000	4.0000
12	4.0000	5.0000	1.0000	3.0000	4.0000	2.0000
13	4.0000	2.0000	5.0000	4.0000	3.0000	1.0000
14	3.0000	4.0000	5.0000	5.0000	5.0000	5.0000
15	3.0000	1.0000	5.0000	5.0000	5.0000	3.0000
16	3.0000	3.0000	1.0000	2.0000	1.0000	3.0000
17	4.0000	3.0000	5.0000	5.0000	5.0000	2.0000
18	3.0000	5.0000	5.0000	2.0000	1.0000	2.0000
19	5.0000	4.0000	3.0000	4.0000	4.0000	3.0000
20	3.0000	4.0000	5.0000	3.0000	2.0000	1.0000
21	5.0000	4.0000	5.0000	3.0000	5.0000	3.0000
22	3.0000	3.0000	5.0000	3.0000	4.0000	2.0000
23	5.0000	5.0000	5.0000	5.0000	5.0000	2.0000
24	3.0000	2.0000	5.0000	3.0000	1.0000	2.0000
25	5.0000	3.0000	5.0000	4.0000	3.0000	2.0000
26	2.0000	2.0000	5.0000	4.0000	5.0000	3.0000
27	4.0000	3.0000	3.0000	3.0000	3.0000	4.0000
28	3.0000	3.0000	5.0000	5.0000	3.0000	2.0000
29	3.0000	2.0000	5.0000	5.0000	5.0000	5.0000
30	4.0000	3.0000	5.0000	3.0000	3.0000	2.0000
31	3.0000	1.0000	5.0000	3.0000	5.0000	1.0000
32	4.0000	1.0000	5.0000	4.0000	3.0000	1.0000
33	4.0000	3.0000	5.0000	5.0000	5.0000	3.0000
34	4.0000	5.0000	5.0000	5.0000	5.0000	1.0000
35	5.0000	3.0000	5.0000	4.0000	4.0000	1.0000
36	4.0000	2.0000	5.0000	5.0000	5.0000	2.0000
37	4.0000	5.0000	5.0000	3.0000	3.0000	2.0000
38	4.0000	2.0000	5.0000	5.0000	4.0000	2.0000
39	5.0000	4.0000	5.0000	3.0000	5.0000	1.0000
40	1.0000	1.0000	5.0000	4.0000	3.0000	1.0000
41	1.0000	1.0000	3.0000	3.0000	3.0000	2.0000
42	2.0000	2.0000	5.0000	5.0000	5.0000	5.0000
43	4.0000	2.0000	5.0000	5.0000	5.0000	5.0000
44	4.0000	3.0000	4.0000	5.0000	2.0000	4.0000
45	4.0000	1.0000	5.0000	5.0000	3.0000	3.0000
46	3.0000	4.0000	5.0000	4.0000	4.0000	2.0000

	DHS-W-37	DHS-W-38	DHS-B-34	DHS-B-35	DHS-B-36	DHS-B-37
47	2.0000	1.0000	2.0000	4.0000	1.0000	1.0000
48	2.0000	1.0000	5.0000	5.0000	4.0000	4.0000
49	1.0000	2.0000	5.0000	2.0000	2.0000	2.0000
50	2.0000	2.0000	5.0000	5.0000	4.0000	1.0000
51	5.0000	5.0000	5.0000	3.0000	3.0000	1.0000
52	1.0000	3.0000	4.0000	2.0000	3.0000	1.0000
53	2.0000	5.0000	2.0000	5.0000	3.0000	2.0000
54	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
55	2.0000	2.0000	5.0000	3.0000	2.0000	1.0000
56	3.0000	2.0000	5.0000	5.0000	3.5000	2.0000
57	3.0000	2.0000	5.0000	5.0000	5.0000	2.0000
58			4.0000	5.0000	5.0000	2.0000
59	1.0000	1.0000	3.0000	5.0000	4.0000	3.0000
60	4.0000	4.0000	5.0000	5.0000	4.0000	3.0000
61	5.0000	2.0000	5.0000	5.0000	4.0000	2.0000
62	3.0000	2.0000	3.0000	5.0000	4.0000	2.0000
63	2.0000	1.0000	5.0000	5.0000	4.0000	1.0000
64	2.0000	2.0000	3.0000	3.0000	2.0000	2.0000
65	3.0000	3.0000				
66	5.0000	5.0000	5.0000	3.0000	5.0000	2.0000
67	3.0000	2.0000	5.0000	4.0000	2.0000	1.0000
68			5.0000	4.0000	3.0000	5.0000
69	3.0000	1.0000	5.0000	3.0000	5.0000	2.0000
70	3.0000	4.0000	2.0000	4.0000	5.0000	2.0000
71	5.0000	5.0000	5.0000	5.0000	4.0000	2.0000
72	3.0000	3.0000	5.0000	4.0000	4.0000	1.0000
73	3.0000	4.0000	5.0000	1.0000	4.0000	1.0000
74	4.0000	1.0000	3.0000	3.0000	2.0000	2.0000
75	2.0000	1.0000	5.0000	3.5000	5.0000	2.0000
76	5.0000	4.0000	5.0000	4.0000	3.0000	1.0000
77	2.0000	2.0000	5.0000	3.0000	4.0000	1.0000
78	1.0000	2.0000	2.0000	3.0000	1.0000	2.0000
79	1.0000	1.0000	5.0000	5.0000	3.0000	3.0000
80	4.0000	5.0000	5.0000	5.0000	5.0000	5.0000
81	1.0000	1.0000	3.0000	3.0000	2.0000	3.0000
82	3.0000	3.0000	5.0000	5.0000	5.0000	2.0000
83	3.0000	1.0000	5.0000	3.0000	3.0000	5.0000
84	1.0000	1.0000	5.0000	5.0000	4.0000	2.0000
85	3.0000	1.0000	5.0000	3.0000	3.0000	3.0000
86	4.0000	5.0000	5.0000	1.0000	2.0000	2.0000
87	2.0000	4.0000	5.0000	4.5000	3.0000	3.0000
88	3.0000	2.0000	3.0000	3.0000	2.0000	2.0000
89	2.0000	1.0000	1.0000	3.0000	1.0000	2.0000
90	3.0000	4.0000	5.0000	3.0000	3.0000	2.0000
91	2.0000	1.0000	5.0000	5.0000	4.0000	1.0000

	DHS-W-37	DHS-W-38	DHS-B-34	DHS-B-35	DHS-B-36	DHS-B-37
92	1.0000	1.0000	5.0000	5.0000	5.0000	5.0000
93	4.0000	1.0000	5.0000	5.0000	5.0000	1.0000
94	2.0000	1.0000	3.0000	4.0000	3.0000	5.0000
95	5.0000	1.0000	5.0000	4.0000	3.0000	1.0000
96	1.0000	1.0000	5.0000	4.0000	4.0000	1.0000
97	4.0000	1.0000	3.0000	3.0000	2.0000	3.0000
98	4.0000	5.0000	5.0000	3.0000	5.0000	1.0000
99	2.0000	1.0000	3.0000	1.0000	2.0000	4.0000
100	3.0000	1.0000				

	DHS-B-38	SMOKING
1	5.0000	0.0000
2	5.0000	0.0000
3	2.0000	0.0000
4	1.0000	0.0000
5	3.0000	0.0000
6	1.0000	0.0000
7	1.0000	0.0000
8	1.0000	0.0000
9	1.0000	0.0000
10	1.0000	0.0000
11	4.0000	0.0000
12	1.0000	0.0000
13	2.0000	0.0000
14	1.0000	0.0000
15	2.0000	0.0000
16	1.0000	0.0000
17	1.0000	0.0000
18	2.0000	0.0000
19	2.0000	0.0000
20	1.0000	0.0000
21	5.0000	0.0000
22	1.0000	0.0000
23	2.0000	0.0000
24	1.0000	0.0000
25	1.0000	0.0000
26	2.0000	0.0000
27	2.0000	0.0000
28	1.0000	0.0000
29	1.0000	0.0000
30	2.0000	0.0000
31	1.0000	0.0000
32	2.0000	0.0000
33	2.0000	0.0000
34	2.0000	0.0000
35	1.0000	0.0000
36	2.0000	0.0000
37	1.0000	0.0000
38	1.0000	0.0000
39	1.0000	0.0000
40	2.0000	0.0000
41	1.0000	0.0000
42	1.0000	0.0000
43	2.0000	0.0000
44	2.0000	0.0000
45	2.0000	0.0000
46	5.0000	0.0000

	DHS-B-38	SMOKING
47	1.0000	0.0000
48	5.0000	0.0000
49	1.0000	0.0000
50	2.0000	0.0000
51	3.0000	0.0000
52	3.0000	0.0000
53	1.0000	0.0000
54	4.0000	0.0000
55	1.0000	0.0000
56	1.0000	0.0000
57	5.0000	0.0000
58	1.0000	0.0000
59	2.0000	0.0000
60	2.0000	0.0000
61	5.0000	0.0000
62	1.0000	0.0000
63	1.0000	0.0000
64	1.0000	0.0000
65		0.0000
66	1.0000	0.0000
67	2.0000	0.0000
68	5.0000	0.0000
69	1.0000	0.0000
70	5.0000	0.0000
71	2.0000	0.0000
72	1.0000	0.0000
73	2.0000	0.0000
74	3.0000	0.0000
75	3.0000	0.0000
76	1.0000	0.0000
77	1.0000	0.0000
78	1.0000	0.0000
79	2.0000	0.0000
80	2.0000	0.0000
81	3.0000	0.0000
82	2.0000	0.0000
83	3.0000	0.0000
84	1.0000	0.0000
85	1.0000	0.0000
86	2.0000	0.0000
87	3.0000	0.0000
88	1.0000	1.0000
89	1.0000	1.0000
90	2.0000	1.0000
91	1.0000	1.0000

	DHS-B-38	SMOKING
92	1.0000	1.0000
93	1.0000	1.0000
94	4.0000	1.0000
95	1.0000	1.0000
96	1.0000	1.0000
97	2.0000	1.0000
98	1.0000	1.0000
99	1.0000	1.0000
100		1.0000
101		0.0000
102		0.0000
103		0.0000
104		0.0000
105		0.0000
106		0.0000
107		0.0000
108		0.0000
109		0.0000
110		0.0000
111		0.0000
112		0.0000
113		0.0000
114		0.0000
115		0.0000
116		0.0000
117		0.0000
118		0.0000
119		0.0000
120		0.0000
121		0.0000
122		0.0000
123		0.0000
124		0.0000
125		0.0000
126		0.0000
127		0.0000
128		0.0000
129		0.0000
130		0.0000
131		0.0000
132		0.0000
133		0.0000
134		0.0000
135		0.0000
136		0.0000

	DHS-B-38 SMOKING
137	0.0000
138	0.0000
139	0.0000
140	0.0000
141	0.0000
142	0.0000
143	0.0000
144	0.0000
145	0.0000
146	0.0000
147	0.0000
148	0.0000
149	0.0000
150	0.0000
151	0.0000
152	0.0000
153	0.0000
154	0.0000
155	0.0000
156	0.0000
157	0.0000
158	0.0000
159	0.0000
160	0.0000
161	0.0000
162	0.0000
163	0.0000
164	0.0000
165	0.0000
166	0.0000
167	0.0000
168	0.0000
169	0.0000
170	0.0000
171	0.0000
172	0.0000
173	0.0000
174	0.0000
175	0.0000
176	0.0000
177	0.0000
178	0.0000
179	0.0000
180	0.0000
181	0.0000

	DHS-B-38	SMOKING
182		0.0000
183		0.0000
184		0.0000
185		0.0000
186		0.0000
187		0.0000
188		0.0000
189		1.0000
190		1.0000
191		1.0000
192		1.0000
193		1.0000
194		1.0000
195		1.0000
196		1.0000
197		1.0000
198		1.0000
199		1.0000

Appendix B

PLASMA TOTAL HOMOCYSTEINE, FOLATE, AND VITAMIN B_{12} LEVELS IN PREMENOPAUSAL WHITE WOMEN AND BLACK WOMEN

W-RACE	W-HCYST	W-MVI	W-FOLATE	W-B12	W-FRUIT
1White	6.6400	NO	4.2000	506.0000	10.0000
2White	7.4400	NO	3.9000	459.0000	10.0000
3White	8.6400	NO	5.3000	614.0000	5.0000
4White	8.3000	NO	3.2000	478.0000	10.0000
5White	7.9100	NO	3.4000	311.0000	12.5000
6White	8.7300	NO	2.7000	333.0000	25.0000
7White	7.4500	NO	2.3000	230.0000	20.0000
8White	5.8500	NO	5.0000	352.0000	10.0000
9White	8.4500	NO	4.4000	294.0000	10.0000
10White	13.0800	NO	1.6000	233.0000	20.0000
11White	9.0100	NO	1.8000	112.0000	5.0000
12White	9.4000	NO	2.1000	382.0000	5.0000
13White	8.1600	NO	2.9000	517.0000	2.5000
14White	13.7600	NO	1.6000	352.0000	5.0000
15White	5.8800	NO	2.6000	189.0000	10.0000
16White	6.7000	NO	5.9000	465.0000	10.0000
17White	8.3500	NO	6.1000	222.0000	5.0000
18White	7.4300	NO	3.5000	213.0000	15.0000
19White	9.6000	NO	4.8000	275.0000	10.0000
20White	9.0600	NO	2.2000	385.0000	10.0000
21White	7.7500	NO	6.8000	404.0000	10.0000
22White	8.8400	NO	4.1000	234.0000	10.0000
23White	8.0500	NO	3.6000	289.0000	10.0000
24White	5.6400	NO	6.6000	326.0000	10.0000
25White	8.5600	NO	1.9000	393.0000	15.0000
26White	9.1300	NO	2.9000	540.0000	5.0000
27White	6.1700	NO	4.3000	240.0000	20.0000
28White	10.0900	NO	1.7000	338.0000	15.0000
29White	7.9400	NO	2.9000	417.0000	5.0000
30White	8.8400	NO	6.8000	330.0000	5.0000
31White	8.1100	NO	2.8000	871.0000	25.0000
32White	14.5500	NO	1.4000	187.0000	15.0000
33White	6.7900	NO	8.7000	555.0000	10.0000
34White	6.3900	NO	6.2000	639.0000	15.0000
35White	7.1900	NO	14.1000	656.0000	10.0000
36White	7.0000	NO	9.1000	696.0000	5.0000
37White	6.8900	NO	7.0000	500.0000	15.0000
38White	16.7000	NO	1.6000	464.0000	10.0000
39White	13.4900	NO	2.2000	328.0000	15.0000
40White	11.3200	NO	3.0000	263.0000	20.0000
41White	17.4800	NO	1.9000	352.0000	10.0000
42White	7.0500	NO	2.3000	527.0000	5.0000
43White	6.5400	NO	4.3000	392.0000	10.0000
44White	8.2000	NO	6.3000	369.0000	5.0000
45White	10.6800	NO	2.7000	310.0000	5.0000
46White	6.3200	NO	2.6000	214.0000	10.0000

W-RACE	W-HCYST	W-MVI	W-FOLATE	W-B12	W-FRUIT
47White	7.5800	NO	1.7000	352.0000	5.0000
48White	8.2300	NO	1.6000	405.0000	5.0000
49White	9.0900	NO	3.4000	567.0000	5.0000
50White	9.4600	NO	12.1000	387.0000	20.0000
51White	6.9600	NO	12.9000	712.0000	15.0000
52White	8.0700	NO	4.1000	530.0000	10.0000
53White	4.4200	YES	11.2000	491.0000	10.0000
54White	5.7200	YES	6.3000	719.0000	15.0000
55White	5.7900	YES	2.2000	136.0000	5.0000
56White	4.6800	YES	3.1000	531.0000	15.0000
57White	5.8800	YES	5.8000	306.0000	7.5000
58White	5.6900	YES	5.1000	238.0000	20.0000
59White	6.7400	YES	3.1000	237.0000	5.0000
60White	7.4700	YES	2.7000	373.0000	10.0000
61White	8.0700	YES	9.9000	171.0000	10.0000
62White	6.6900	YES	4.9000	809.0000	5.0000
63White	6.0500	YES	3.9000	480.0000	5.0000
64White	5.2000	YES	12.1000	420.0000	5.0000
65White	6.5000	YES	6.0000	240.0000	15.0000
66White	7.8900	YES	7.2000	282.0000	5.0000
67White	3.9400	YES	12.4000	153.0000	30.0000
68White	5.3600	YES	6.7000	643.0000	17.5000
69White	5.4600	YES	4.0000	441.0000	10.0000
70White	6.4600	YES	7.5000	293.0000	10.0000
71White	5.0300	YES	15.6000	509.0000	10.0000
72White	4.8000	YES	10.6000	1022.0000	17.5000
73White	9.0600	YES	1.9000	233.0000	10.0000
74White	7.0700	YES	4.8000	592.0000	5.0000
75White	5.2000	YES	7.4000	429.0000	12.5000
76White	6.4600	YES	9.9000	376.0000	10.0000
77White	9.2900	YES	9.2000	766.0000	0.7000
78White	6.3900	YES	8.4000	630.0000	25.0000
79White	14.8600	YES	2.5000	596.0000	0.7000
80White	8.0800	YES	7.1000	609.0000	2.5000
81White	6.7100	YES	2.9000	471.0000	5.0000
82White	8.4500	YES	3.7000	295.0000	10.0000
83White	6.0500	YES	6.8000	329.0000	2.5000
84White	13.3100	YES	6.4000	373.0000	5.0000
85White	6.3500	YES	5.2000	476.0000	0.0000
86White	5.1700	YES	7.6000	461.0000	7.5000
87White	6.5000	YES	12.1000	418.0000	10.0000
88White	8.5800	YES	4.1000	508.0000	20.0000
89White	7.2900	YES	5.1000	411.0000	10.0000
90White	6.9400	YES	2.3000	374.0000	10.0000

	W-VEGGIE	W-MEAT	B-RACE	-HOMOCYSTEI
1	5.0000	5.0000	Black	7.0700
2	13.8000	3.0000	Black	12.5800
3	12.5000	1.0000	Black	9.5200
4	12.5000	3.0000	Black	12.5600
5	7.5000	4.0000	Black	11.2000
6	15.0000	3.0000	Black	7.5900
7	17.5000	5.0000	Black	5.4900
8	2.5000	3.0000	Black	7.1700
9	10.0000	4.0000	Black	10.4100
10	10.0000	2.0000	Black	6.9300
11	5.0000	5.0000	Black	10.2100
12	22.5000	4.0000	Black	8.3700
13	5.0000	4.0000	Black	5.5300
14	10.0000	4.0000	Black	8.5700
15	10.0000	3.0000	Black	18.3900
16	5.0000	3.0000	Black	6.0400
17	5.0000	3.0000	Black	6.3500
18	10.0000	5.0000	Black	6.7900
19	10.0000	4.0000	Black	4.1900
20	12.5000	3.0000	Black	7.2000
21	10.0000	2.0000	Black	7.8900
22	10.0000	4.0000	Black	8.2100
23	7.5000	2.0000	Black	10.5300
24	12.5000	3.0000	Black	10.0700
25	20.0000	3.0000	Black	11.5500
26	5.0000	4.0000	Black	10.0000
27	15.0000	4.0000	Black	6.5000
28	10.0000	4.0000	Black	8.9600
29	10.0000	3.0000	Black	6.5100
30	10.0000	3.0000	Black	12.5300
31	12.5000	5.0000	Black	7.9700
32	10.0000	4.0000	Black	6.9000
33	5.0000	4.0000	Black	6.5900
34	20.0000	4.0000	Black	9.1100
35	10.0000	3.0000	Black	12.3800
36	10.0000	4.0000	Black	7.3800
37	10.0000	4.0000	Black	9.3900
38	5.0000	3.0000	Black	28.9500
39	10.0000	5.0000	Black	7.0700
40	15.0000	3.0000	Black	8.9500
41	10.0000	3.0000	Black	6.9300
42	5.0000	4.0000	Black	6.0300
43	15.0000	5.0000	Black	9.0200
44	10.0000	2.0000	Black	16.4100
45	12.5000	4.0000	Black	6.7400
46	15.0000	5.0000	Black	6.7900

	W-VEGGIE	W-MEAT	B-RACE	-HOMOCYSTEI
47	15.0000	2.0000	Black	6.2200
48	12.5000	3.0000	Black	7.2800
49	10.0000	4.0000	Black	15.7300
50	10.0000	5.0000	Black	11.7900
51	5.0000	4.0000	Black	8.5200
52	15.0000	3.0000	Black	10.7400
53	10.0000	4.0000	Black	7.4300
54	20.0000	3.0000	Black	13.0800
55	10.0000	4.0000	Black	7.5800
56	20.0000	5.0000	Black	7.6500
57	10.0000	3.0000	Black	14.9100
58	15.0000	5.0000	Black	6.2200
59	5.0000	3.0000	Black	8.6400
60	7.5000	1.0000	Black	7.2800
61	5.0000	5.0000	Black	7.8600
62	5.0000	4.0000	Black	6.0400
63	5.0000	5.0000	Black	8.9300
64	5.0000	3.0000	Black	10.2600
65	15.0000	5.0000	Black	11.4600
66	17.5000	3.0000	Black	5.8700
67	20.0000	5.0000	Black	7.5500
68	5.0000	4.5000	Black	7.9300
69	5.0000	5.0000	Black	5.6300
70	10.0000	4.0000	Black	6.2100
71	10.0000	4.0000	Black	11.2600
72	10.0000	3.5000	Black	8.9100
73	2.5000	3.0000	Black	8.6300
74	30.0000	4.0000	Black	10.1200
75	37.5000	5.0000	Black	8.5400
76	5.0000	4.0000	Black	8.0100
77	5.0000	4.0000	Black	9.9700
78	10.0000	4.0000	Black	4.4300
79	1.4000	3.0000	Black	5.1800
80	15.0000	3.0000	Black	6.6400
81	5.0000	2.0000	Black	11.6000
82	5.0000	5.0000	Black	6.4200
83	5.0000	5.0000	Black	7.7400
84	22.5000	4.0000	Black	8.2400
85	5.0000	4.0000	Black	6.2200
86	10.0000	3.0000	Black	8.3400
87	20.0000	4.0000	Black	5.0400
88	5.0000	1.0000	Black	6.0500
89	10.0000	5.0000	Black	9.3900
90	17.5000	5.0000		

	B-MVI	B-FOLATE	B-B12	B-FRUIT	B-VEGGIE	B-MEAT
1	NO	2.4000	829.0000	0.0000	5.0000	2.0000
2	NO	2.3000	431.0000	10.0000	10.0000	3.0000
3	NO	2.5000	631.0000	7.5000	10.0000	3.0000
4	NO	2.4000	680.0000	5.0000	25.0000	2.0000
5	NO	1.6000	630.0000	5.0000	5.0000	3.0000
6	NO	2.4000	745.0000	10.0000	5.0000	3.0000
7	NO	3.3000	449.0000	5.0000	5.0000	3.0000
8	NO	2.7000	633.0000	5.0000	2.5000	4.0000
9	NO	3.6000	653.0000	2.5000	5.0000	1.0000
10	NO	4.0000	752.0000	5.0000	5.0000	3.0000
11	NO	2.1000	650.0000	15.0000	5.0000	1.0000
12	NO	2.0000	433.0000	10.0000	5.0000	4.0000
13	NO	5.7000	682.0000	10.0000	5.0000	3.0000
14	NO	2.7000	564.0000	25.0000	15.0000	5.0000
15	NO	2.5000	870.0000	10.0000	5.0000	3.0000
16	NO	3.1000	1000.0000	5.0000	10.0000	1.0000
17	NO	2.7000	411.0000	5.0000	10.0000	2.0000
18	NO	1.7000	434.0000	5.0000	5.0000	2.0000
19	NO	6.2000	556.0000	50.0000	10.0000	5.0000
20	NO	2.6000	321.0000	7.5000	5.0000	4.0000
21	NO	1.4000	288.0000	15.0000	15.0000	3.0000
22	NO	3.8000	764.0000	20.0000	5.0000	4.0000
23	NO	2.4000	931.0000	15.0000	10.0000	4.0000
24	NO	1.4000	544.0000	10.0000	15.0000	2.0000
25	NO	1.5000	207.0000	7.5000	7.5000	5.0000
26	NO	1.6000	513.0000	15.0000	15.0000	4.0000
27	NO	4.5000	504.0000	10.0000	5.0000	4.0000
28	NO	1.5000	434.0000	5.0000	15.0000	4.0000
29	NO	1.7000	459.0000	10.0000	10.0000	3.0000
30	NO	2.2000	549.0000	5.0000	7.5000	4.0000
31	NO	3.4000	450.0000	50.0000	15.0000	3.0000
32	NO	5.4000	301.0000	10.0000	20.0000	3.0000
33	NO	5.5000	427.0000	5.0000	7.5000	3.0000
34	NO	0.8000	303.0000	20.0000	1.3000	1.0000
35	NO	1.3000	367.0000	10.0000	10.0000	3.0000
36	NO	2.1000	236.0000	15.0000	15.0000	3.0000
37	NO	3.8000	445.0000	15.0000	10.0000	4.0000
38	NO	5.0000	136.0000	5.0000	10.0000	3.0000
39	NO	3.4000	567.0000	10.0000	5.0000	1.0000
40	NO	1.9000	339.0000	5.0000	5.0000	3.0000
41	NO	3.6000	290.0000	50.0000	30.0000	3.0000
42	NO	5.3000	210.0000	5.0000	10.0000	3.0000
43	NO	2.8000	555.0000	15.0000	10.0000	2.0000
44	NO	1.6000	311.0000	15.0000	30.0000	3.0000
45	NO	3.0000	431.0000	5.0000	0.0000	4.0000
46	NO	1.2000	487.0000	17.5000	5.0000	2.0000

	B-MVI	B-FOLATE	B-B12	B-FRUIT	B-VEGGIE	B-MEAT
47	NO	20.0000	706.0000	20.0000	5.0000	3.0000
48	NO	1.9000	524.0000	20.0000	15.0000	3.0000
49	NO	1.4000	456.0000	5.0000	5.0000	2.0000
50	NO	1.6000	451.0000	5.0000	7.5000	4.0000
51	NO	2.8000	433.0000	25.0000	10.0000	3.0000
52	NO	0.8000	403.0000	10.0000	10.0000	5.0000
53	NO	2.0000	460.0000	10.0000	10.0000	5.0000
54	NO	6.2000	573.0000	5.0000	5.0000	5.0000
55	NO	4.1000	388.0000	15.0000	10.0000	5.0000
56	NO	8.0000	173.0000	12.5000	15.0000	2.0000
57	NO	2.7000	610.0000	15.0000	15.0000	5.0000
58	NO	3.7000	614.0000	20.0000	5.0000	3.0000
59	NO	5.2000	536.0000	30.0000	25.0000	5.0000
60	NO	1.9000	332.0000	10.0000	15.0000	3.0000
61	NO	3.6000	688.0000	20.0000	10.0000	3.0000
62	NO	4.4000	944.0000	10.0000	10.0000	2.0000
63	NO	3.7000	524.0000	3.8000	7.5000	2.5000
64	NO	2.6000	582.0000	10.0000	2.5000	4.0000
65	NO	3.7000	326.0000	20.0000	5.0000	3.0000
66	NO	2.6000	438.0000	17.1000	7.5000	3.0000
67	NO	1.3000	263.0000	1.4000	5.0000	3.5000
68	YES	3.3000	580.0000	20.0000	20.0000	5.0000
69	YES	11.9000	520.0000	0.3000	1.4000	5.0000
70	YES	6.4000	328.0000	20.0000	5.0000	2.0000
71	YES	1.2000	191.0000	5.0000	10.0000	3.0000
72	YES	2.5000	334.0000	15.0000	15.0000	5.0000
73	YES	1.6000	610.0000	2.5000	10.0000	3.0000
74	YES	1.7000	567.0000	10.0000	5.0000	3.0000
75	YES	3.0000	246.0000	10.0000	20.0000	3.0000
76	YES	3.3000	500.0000	25.0000	22.5000	5.0000
77	YES	2.1000	249.0000	0.0000	0.0000	2.0000
78	YES	6.6000	713.0000	15.0000	10.0000	2.0000
79	YES	10.4000	953.0000	15.0000	15.0000	5.0000
80	YES	3.8000	757.0000	5.0000	15.0000	2.0000
81	YES	3.1000	458.0000	25.0000	12.5000	4.0000
82	YES	8.0000	646.0000	15.0000	15.0000	3.0000
83	YES	8.0000	652.0000	0.0000	7.5000	3.0000
84	YES	3.7000	482.0000	15.0000	17.5000	5.0000
85	YES	2.6000	453.0000	20.0000	5.0000	2.0000
86	YES	3.7000	959.0000	25.0000	15.0000	3.0000
87	YES	5.3000	508.0000	10.0000	5.0000	3.0000
88	YES	3.2000	1345.0000	15.0000	12.5000	5.0000
89	YES	2.9000	605.0000			

	log-hcy-w	log-hcy-b	log-fol-w	log-fol-b	log-B12-w
1	0.8222	0.8494	0.6232	0.3802	2.7042
2	0.8716	1.0997	0.5911	0.3617	2.6618
3	0.9365	0.9786	0.7243	0.3979	2.7882
4	0.9191	1.0990	0.5051	0.3802	2.6794
5	0.8982	1.0492	0.5315	0.2041	2.4928
6	0.9410	0.8802	0.4314	0.3802	2.5224
7	0.8722	0.7396	0.3617	0.5185	2.3617
8	0.7672	0.8555	0.6990	0.4314	2.5465
9	0.9269	1.0175	0.6435	0.5563	2.4683
10	1.1166	0.8407	0.2041	0.6021	2.3674
11	0.9547	1.0090	0.2553	0.3222	2.0492
12	0.9731	0.9227	0.3222	0.3010	2.5821
13	0.9117	0.7427	0.4624	0.7559	2.7135
14	1.1386	0.9330	0.2041	0.4314	2.5465
15	0.7694	1.2646	0.4150	0.3979	2.2765
16	0.8261	0.7810	0.7709	0.4914	2.6675
17	0.9217	0.8028	0.7853	0.4314	2.3464
18	0.8710	0.8319	0.5441	0.2304	2.3284
19	0.9823	0.6222	0.6812	0.7924	2.4393
20	0.9571	0.8573	0.3424	0.4150	2.5855
21	0.8893	0.8971	0.8325	0.1461	2.6064
22	0.9465	0.9143	0.6128	0.5798	2.3692
23	0.9058	1.0224	0.5563	0.3802	2.4609
24	0.7513	1.0030	0.8195	0.1461	2.5132
25	0.9325	1.0626	0.2788	0.1761	2.5944
26	0.9605	1.0000	0.4624	0.2041	2.7324
27	0.7903	0.8129	0.6335	0.6532	2.3802
28	1.0039	0.9523	0.2304	0.1761	2.5289
29	0.8998	0.8136	0.4624	0.2304	2.6201
30	0.9465	1.0980	0.8325	0.3424	2.5185
31	0.9090	0.9015	0.4472	0.5315	2.9400
32	1.1629	0.8388	0.1461	0.7324	2.2718
33	0.8319	0.8189	0.9395	0.7404	2.7443
34	0.8055	0.9595	0.7924	-0.0969	2.8055
35	0.8567	1.0927	1.1492	0.1139	2.8169
36	0.8451	0.8681	0.9590	0.3222	2.8426
37	0.8382	0.9727	0.8451	0.5798	2.6990
38	1.2227	1.4616	0.2041	0.6990	2.6665
39	1.1300	0.8494	0.3424	0.5315	2.5159
40	1.0538	0.9518	0.4771	0.2788	2.4200
41	1.2425	0.8407	0.2788	0.5563	2.5465
42	0.8482	0.7803	0.3617	0.7243	2.7218
43	0.8156	0.9552	0.6335	0.4472	2.5933
44	0.9138	1.2151	0.7993	0.2041	2.5670
45	1.0286	0.8287	0.4314	0.4771	2.4914
46	0.8007	0.8319	0.4150	0.0792	2.3304

	log-hcy-w	log-hcy-b	log-fol-w	log-fol-b	log-B12-w
47	0.8797	0.7938	0.2304	1.3010	2.5465
48	0.9154	0.8621	0.2041	0.2788	2.6075
49	0.9586	1.1967	0.5315	0.1461	2.7536
50	0.9759	1.0715	1.0828	0.2041	2.5877
51	0.8426	0.9304	1.1106	0.4472	2.8525
52	0.9069	1.0310	0.6128	-0.0969	2.7243
53	0.6454	0.8710	1.0492	0.3010	2.6911
54	0.7574	1.1166	0.7993	0.7924	2.8567
55	0.7627	0.8797	0.3424	0.6128	2.1335
56	0.6702	0.8837	0.4914	0.9031	2.7251
57	0.7694	1.1735	0.7634	0.4314	2.4857
58	0.7551	0.7938	0.7076	0.5682	2.3766
59	0.8287	0.9365	0.4914	0.7160	2.3747
60	0.8733	0.8621	0.4314	0.2788	2.5717
61	0.9069	0.8954	0.9956	0.5563	2.2330
62	0.8254	0.7810	0.6902	0.6435	2.9079
63	0.7818	0.9509	0.5911	0.5682	2.6812
64	0.7160	1.0111	1.0828	0.4150	2.6232
65	0.8129	1.0592	0.7782	0.5682	2.3802
66	0.8971	0.7686	0.8573	0.4150	2.4502
67	0.5955	0.8779	1.0934	0.1139	2.1847
68	0.7292	0.8993	0.8261	0.5185	2.8082
69	0.7372	0.7505	0.6021	1.0755	2.6444
70	0.8102	0.7931	0.8751	0.8062	2.4669
71	0.7016	1.0515	1.1931	0.0792	2.7067
72	0.6812	0.9499	1.0253	0.3979	3.0095
73	0.9571	0.9360	0.2788	0.2041	2.3674
74	0.8494	1.0052	0.6812	0.2304	2.7723
75	0.7160	0.9315	0.8692	0.4771	2.6325
76	0.8102	0.9036	0.9956	0.5185	2.5752
77	0.9680	0.9987	0.9638	0.3222	2.8842
78	0.8055	0.6464	0.9243	0.8195	2.7993
79	1.1720	0.7143	0.3979	1.0170	2.7752
80	0.9074	0.8222	0.8513	0.5798	2.7846
81	0.8267	1.0645	0.4624	0.4914	2.6730
82	0.9269	0.8075	0.5682	0.9031	2.4698
83	0.7818	0.8887	0.8325	0.9031	2.5172
84	1.1242	0.9159	0.8062	0.5682	2.5717
85	0.8028	0.7938	0.7160	0.4150	2.6776
86	0.7135	0.9212	0.8808	0.5682	2.6637
87	0.8129	0.7024	1.0828	0.7243	2.6212
88	0.9335	0.7818	0.6128	0.5051	2.7059
89	0.8627	0.9727	0.7076	0.4624	2.6138
90	0.8414		0.3617		2.5729

	log-B12-b	cumf-hcy-w	cumf-hcy-b	RACE
1	2.9186	0.0110	0.0110	0.0000
2	2.6345	0.0220	0.0220	0.0000
3	2.8000	0.0330	0.0330	0.0000
4	2.8325	0.0440	0.0440	0.0000
5	2.7993	0.0550	0.0550	0.0000
6	2.8722	0.0660	0.0660	0.0000
7	2.6522	0.0770	0.0770	0.0000
8	2.8014	0.0880	0.0880	0.0000
9	2.8149	0.0990	0.0990	0.0000
10	2.8762	0.1100	0.1100	0.0000
11	2.8129	0.1210	0.1210	0.0000
12	2.6365	0.1340	0.1340	0.0000
13	2.8338	0.1450	0.1450	0.0000
14	2.7513	0.1560	0.1560	0.0000
15	2.9395	0.1670	0.1670	0.0000
16	3.0000	0.1780	0.1780	0.0000
17	2.6138	0.1890	0.1890	0.0000
18	2.6375	0.2000	0.2000	0.0000
19	2.7451	0.2110	0.2110	0.0000
20	2.5065	0.2220	0.2220	0.0000
21	2.4594	0.2330	0.2330	0.0000
22	2.8831	0.2440	0.2440	0.0000
23	2.9689	0.2550	0.2550	0.0000
24	2.7356	0.2660	0.2660	0.0000
25	2.3160	0.2770	0.2770	0.0000
26	2.7101	0.2880	0.2880	0.0000
27	2.7024	0.2990	0.2990	0.0000
28	2.6375	0.3100	0.3100	0.0000
29	2.6618	0.3210	0.3210	0.0000
30	2.7396	0.3330	0.3330	0.0000
31	2.6532	0.3440	0.3440	0.0000
32	2.4786	0.3550	0.3550	0.0000
33	2.6304	0.3660	0.3660	0.0000
34	2.4814	0.3770	0.3770	0.0000
35	2.5647	0.3880	0.3880	0.0000
36	2.3729	0.3990	0.3990	0.0000
37	2.6484	0.4100	0.4100	0.0000
38	2.1335	0.4210	0.4210	0.0000
39	2.7536	0.4320	0.4320	0.0000
40	2.5302	0.4430	0.4430	0.0000
41	2.4624	0.4540	0.4540	0.0000
42	2.3222	0.4650	0.4650	0.0000
43	2.7443	0.4760	0.4760	0.0000
44	2.4928	0.4870	0.4870	0.0000
45	2.6345	0.4980	0.4980	0.0000
46	2.6875	0.5090	0.5090	0.0000

	log-B12-b	cumf-hcy-w	cumf-hcy-b	RACE
47	2.8488	0.5200	0.5200	0.0000
48	2.7193	0.5310	0.5310	0.0000
49	2.6590	0.5420	0.5420	0.0000
50	2.6542	0.5530	0.5530	0.0000
51	2.6365	0.5640	0.5640	0.0000
52	2.6053	0.5750	0.5750	0.0000
53	2.6628	0.5860	0.5860	0.0000
54	2.7582	0.5970	0.5970	0.0000
55	2.5888	0.6080	0.6080	0.0000
56	2.2380	0.6190	0.6190	0.0000
57	2.7853	0.6300	0.6300	0.0000
58	2.7882	0.6410	0.6410	0.0000
59	2.7292	0.6520	0.6520	0.0000
60	2.5211	0.6630	0.6630	0.0000
61	2.8376	0.6740	0.6740	0.0000
62	2.9750	0.6850	0.6850	0.0000
63	2.7193	0.6960	0.6960	0.0000
64	2.7649	0.7070	0.7070	0.0000
65	2.5132	0.7180	0.7180	0.0000
66	2.6415	0.7290	0.7290	0.0000
67	2.4200	0.7400	0.7400	0.0000
68	2.7634	0.7510	0.7510	0.0000
69	2.7160	0.7620	0.7620	0.0000
70	2.5159	0.7730	0.7730	0.0000
71	2.2810	0.7840	0.7840	0.0000
72	2.5237	0.7950	0.7950	0.0000
73	2.7853	0.8060	0.8060	0.0000
74	2.7536	0.8170	0.8170	0.0000
75	2.3909	0.8280	0.8280	0.0000
76	2.6990	0.8390	0.8390	0.0000
77	2.3962	0.8500	0.8500	0.0000
78	2.8531	0.8610	0.8610	0.0000
79	2.9791	0.8720	0.8720	0.0000
80	2.8791	0.8830	0.8830	0.0000
81	2.6609	0.8940	0.8940	0.0000
82	2.8102	0.9050	0.9050	0.0000
83	2.8142	0.9160	0.9160	0.0000
84	2.6830	0.9270	0.9270	0.0000
85	2.6561	0.9380	0.9380	0.0000
86	2.9818	0.9490	0.9490	0.0000
87	2.7059	0.9600	0.9600	0.0000
88	3.1287	0.9710	0.9710	0.0000
89	2.7818	0.9820	0.9820	0.0000
90		0.9930		0.0000
91				1.0000

	log-B12-b	cumf-hcy-w	cumf-hcy-b	RACE
92				1.0000
93				1.0000
94				1.0000
95				1.0000
96				1.0000
97				1.0000
98				1.0000
99				1.0000
100				1.0000
101				1.0000
102				1.0000
103				1.0000
104				1.0000
105				1.0000
106				1.0000
107				1.0000
108				1.0000
109				1.0000
110				1.0000
111				1.0000
112				1.0000
113				1.0000
114				1.0000
115				1.0000
116				1.0000
117				1.0000
118				1.0000
119				1.0000
120				1.0000
121				1.0000
122				1.0000
123				1.0000
124				1.0000
125				1.0000
126				1.0000
127				1.0000
128				1.0000
129				1.0000
130				1.0000
131				1.0000
132				1.0000
133				1.0000
134				1.0000
135				1.0000
136				1.0000

	log-B12-b	cumf-hcy-w	cumf-hcy-b	RACE
137				1.0000
138				1.0000
139				1.0000
140				1.0000
141				1.0000
142				1.0000
143				1.0000
144				1.0000
145				1.0000
146				1.0000
147				1.0000
148				1.0000
149				1.0000
150				1.0000
151				1.0000
152				1.0000
153				1.0000
154				1.0000
155				1.0000
156				1.0000
157				1.0000
158				1.0000
159				1.0000
160				1.0000
161				1.0000
162				1.0000
163				1.0000
164				1.0000
165				1.0000
166				1.0000
167				1.0000
168				1.0000
169				1.0000
170				1.0000
171				1.0000
172				1.0000
173				1.0000
174				1.0000
175				1.0000
176				1.0000
177				1.0000
178				1.0000
179				1.0000

	MVI	HCYSTE	FOLATE	B-12	LOG-HCYSTE	LOG-FOL
1	0.0000	6.6400	4.2000	506.0000	0.8222	0.6232
2	0.0000	7.4400	3.9000	459.0000	0.8716	0.5911
3	0.0000	8.6400	5.3000	614.0000	0.9365	0.7243
4	0.0000	8.3000	3.2000	478.0000	0.9191	0.5051
5	0.0000	7.9100	3.4000	311.0000	0.8982	0.5315
6	0.0000	8.7300	2.7000	333.0000	0.9410	0.4314
7	0.0000	7.4500	2.3000	230.0000	0.8722	0.3617
8	0.0000	5.8500	5.0000	352.0000	0.7672	0.6990
9	0.0000	8.4500	4.4000	294.0000	0.9269	0.6435
10	0.0000	13.0800	1.6000	233.0000	1.1166	0.2041
11	0.0000	9.0100	1.8000	112.0000	0.9547	0.2553
12	0.0000	9.4000	2.1000	382.0000	0.9731	0.3222
13	0.0000	8.1600	2.9000	517.0000	0.9117	0.4624
14	0.0000	13.7600	1.6000	352.0000	1.1386	0.2041
15	0.0000	5.8800	2.6000	189.0000	0.7694	0.4150
16	0.0000	6.7000	5.9000	465.0000	0.8261	0.7709
17	0.0000	8.3500	6.1000	222.0000	0.9217	0.7853
18	0.0000	7.4300	3.5000	213.0000	0.8710	0.5441
19	0.0000	9.6000	4.8000	275.0000	0.9823	0.6812
20	0.0000	9.0600	2.2000	385.0000	0.9571	0.3424
21	0.0000	7.7500	6.8000	404.0000	0.8893	0.8325
22	0.0000	8.8400	4.1000	234.0000	0.9465	0.6128
23	0.0000	8.0500	3.6000	289.0000	0.9058	0.5563
24	0.0000	5.6400	6.6000	326.0000	0.7513	0.8195
25	0.0000	8.5600	1.9000	393.0000	0.9325	0.2788
26	0.0000	9.1300	2.9000	540.0000	0.9605	0.4624
27	0.0000	6.1700	4.3000	240.0000	0.7903	0.6335
28	0.0000	10.0900	1.7000	338.0000	1.0039	0.2304
29	0.0000	7.9400	2.9000	417.0000	0.8998	0.4624
30	0.0000	8.8400	6.8000	330.0000	0.9465	0.8325
31	0.0000	8.1100	2.8000	871.0000	0.9090	0.4472
32	0.0000	14.5500	1.4000	187.0000	1.1629	0.1461
33	0.0000	6.7900	8.7000	555.0000	0.8319	0.9395
34	0.0000	6.3900	6.2000	639.0000	0.8055	0.7924
35	0.0000	7.1900	14.1000	656.0000	0.8567	1.1492
36	0.0000	7.0000	9.1000	696.0000	0.8451	0.9590
37	0.0000	6.8900	7.0000	500.0000	0.8382	0.8451
38	0.0000	16.7000	1.6000	464.0000	1.2227	0.2041
39	0.0000	13.4900	2.2000	328.0000	1.1300	0.3424
40	0.0000	11.3200	3.0000	263.0000	1.0538	0.4771
41	0.0000	17.4800	1.9000	352.0000	1.2425	0.2788
42	0.0000	7.0500	2.3000	527.0000	0.8482	0.3617
43	0.0000	6.5400	4.3000	392.0000	0.8156	0.6335
44	0.0000	8.2000	6.3000	369.0000	0.9138	0.7993
45	0.0000	10.6800	2.7000	310.0000	1.0286	0.4314
46	0.0000	6.3200	2.6000	214.0000	0.8007	0.4150

	MVI	HCYSTE	FOLATE	B-12	LOG-HCYSTE	LOG-FOL
47	0.0000	7.5800	1.7000	352.0000	0.8797	0.2304
48	0.0000	8.2300	1.6000	405.0000	0.9154	0.2041
49	0.0000	9.0900	3.4000	567.0000	0.9586	0.5315
50	0.0000	9.4600	12.1000	387.0000	0.9759	1.0828
51	0.0000	6.9600	12.9000	712.0000	0.8426	1.1106
52	0.0000	8.0700	4.1000	530.0000	0.9069	0.6128
53	1.0000	4.4200	11.2000	491.0000	0.6454	1.0492
54	1.0000	5.7200	6.3000	719.0000	0.7574	0.7993
55	1.0000	5.7900	2.2000	136.0000	0.7627	0.3424
56	1.0000	4.6800	3.1000	531.0000	0.6702	0.4914
57	1.0000	5.8800	5.8000	306.0000	0.7694	0.7634
58	1.0000	5.6900	5.1000	238.0000	0.7551	0.7076
59	1.0000	6.7400	3.1000	237.0000	0.8287	0.4914
60	1.0000	7.4700	2.7000	373.0000	0.8733	0.4314
61	1.0000	8.0700	9.9000	171.0000	0.9069	0.9956
62	1.0000	6.6900	4.9000	809.0000	0.8254	0.6902
63	1.0000	6.0500	3.9000	480.0000	0.7818	0.5911
64	1.0000	5.2000	12.1000	420.0000	0.7160	1.0828
65	1.0000	6.5000	6.0000	240.0000	0.8129	0.7782
66	1.0000	7.8900	7.2000	282.0000	0.8971	0.8573
67	1.0000	3.9400	12.4000	153.0000	0.5955	1.0934
68	1.0000	5.3600	6.7000	643.0000	0.7292	0.8261
69	1.0000	5.4600	4.0000	441.0000	0.7372	0.6021
70	1.0000	6.4600	7.5000	293.0000	0.8102	0.8751
71	1.0000	5.0300	15.6000	509.0000	0.7016	1.1931
72	1.0000	4.8000	10.6000	1022.0000	0.6812	1.0253
73	1.0000	9.0600	1.9000	233.0000	0.9571	0.2788
74	1.0000	7.0700	4.8000	592.0000	0.8494	0.6812
75	1.0000	5.2000	7.4000	429.0000	0.7160	0.8692
76	1.0000	6.4600	9.9000	376.0000	0.8102	0.9956
77	1.0000	9.2900	9.2000	766.0000	0.9680	0.9638
78	1.0000	6.3900	8.4000	630.0000	0.8055	0.9243
79	1.0000	14.8600	2.5000	596.0000	1.1720	0.3979
80	1.0000	8.0800	7.1000	609.0000	0.9074	0.8513
81	1.0000	6.7100	2.9000	471.0000	0.8267	0.4624
82	1.0000	8.4500	3.7000	295.0000	0.9269	0.5682
83	1.0000	6.0500	6.8000	329.0000	0.7818	0.8325
84	1.0000	13.3100	6.4000	373.0000	1.1242	0.8062
85	1.0000	6.3500	5.2000	476.0000	0.8028	0.7160
86	1.0000	5.1700	7.6000	461.0000	0.7135	0.8808
87	1.0000	6.5000	12.1000	418.0000	0.8129	1.0828
88	1.0000	8.5800	4.1000	508.0000	0.9335	0.6128
89	1.0000	7.2900	5.1000	411.0000	0.8627	0.7076
90	1.0000	6.9400	2.3000	374.0000	0.8414	0.3617
91	0.0000	7.0700	2.4000	829.0000	0.8494	0.3802

	MVI	HCYSTE	FOLATE	B-12	LOG-HCYSTE	LOG-FOL
92	0.0000	12.5800	2.3000	431.0000	1.0997	0.3617
93	0.0000	9.5200	2.5000	631.0000	0.9786	0.3979
94	0.0000	12.5600	2.4000	680.0000	1.0990	0.3802
95	0.0000	11.2000	1.6000	630.0000	1.0492	0.2041
96	0.0000	7.5900	2.4000	745.0000	0.8802	0.3802
97	0.0000	5.4900	3.3000	449.0000	0.7396	0.5185
98	0.0000	7.1700	2.7000	633.0000	0.8555	0.4314
99	0.0000	10.4100	3.6000	653.0000	1.0175	0.5563
100	0.0000	6.9300	4.0000	752.0000	0.8407	0.6021
101	0.0000	10.2100	2.1000	650.0000	1.0090	0.3222
102	0.0000	8.3700	2.0000	433.0000	0.9227	0.3010
103	0.0000	5.5300	5.7000	682.0000	0.7427	0.7559
104	0.0000	8.5700	2.7000	564.0000	0.9330	0.4314
105	0.0000	18.3900	2.5000	870.0000	1.2646	0.3979
106	0.0000	6.0400	3.1000	1000.0000	0.7810	0.4914
107	0.0000	6.3500	2.7000	411.0000	0.8028	0.4314
108	0.0000	6.7900	1.7000	434.0000	0.8319	0.2304
109	0.0000	4.1900	6.2000	556.0000	0.6222	0.7924
110	0.0000	7.2000	2.6000	321.0000	0.8573	0.4150
111	0.0000	7.8900	1.4000	288.0000	0.8971	0.1461
112	0.0000	8.2100	3.8000	764.0000	0.9143	0.5798
113	0.0000	10.5300	2.4000	931.0000	1.0224	0.3802
114	0.0000	10.0700	1.4000	544.0000	1.0030	0.1461
115	0.0000	11.5500	1.5000	207.0000	1.0626	0.1761
116	0.0000	10.0000	1.6000	513.0000	1.0000	0.2041
117	0.0000	6.5000	4.5000	504.0000	0.8129	0.6532
118	0.0000	8.9600	1.5000	434.0000	0.9523	0.1761
119	0.0000	6.5100	1.7000	459.0000	0.8136	0.2304
120	0.0000	12.5300	2.2000	549.0000	1.0980	0.3424
121	0.0000	7.9700	3.4000	450.0000	0.9015	0.5315
122	0.0000	6.9000	5.4000	301.0000	0.8388	0.7324
123	0.0000	6.5900	5.5000	427.0000	0.8189	0.7404
124	0.0000	9.1100	0.8000	303.0000	0.9595	-0.0969
125	0.0000	12.3800	1.3000	367.0000	1.0927	0.1139
126	0.0000	7.3800	2.1000	236.0000	0.8681	0.3222
127	0.0000	9.3900	3.8000	445.0000	0.9727	0.5798
128	0.0000	28.9500	5.0000	136.0000	1.4616	0.6990
129	0.0000	7.0700	3.4000	567.0000	0.8494	0.5315
130	0.0000	8.9500	1.9000	339.0000	0.9518	0.2788
131	0.0000	6.9300	3.6000	290.0000	0.8407	0.5563
132	0.0000	6.0300	5.3000	210.0000	0.7803	0.7243
133	0.0000	9.0200	2.8000	555.0000	0.9552	0.4472
134	0.0000	16.4100	1.6000	311.0000	1.2151	0.2041
135	0.0000	6.7400	3.0000	431.0000	0.8287	0.4771
136	0.0000	6.7900	1.2000	487.0000	0.8319	0.0792

	MVI	HCYSTE	FOLATE	B-12	LOG-HCYSTE	LOG-FOL
137	0.0000	6.2200	20.0000	706.0000	0.7938	1.3010
138	0.0000	7.2800	1.9000	524.0000	0.8621	0.2788
139	0.0000	15.7300	1.4000	456.0000	1.1967	0.1461
140	0.0000	11.7900	1.6000	451.0000	1.0715	0.2041
141	0.0000	8.5200	2.8000	433.0000	0.9304	0.4472
142	0.0000	10.7400	0.8000	403.0000	1.0310	-0.0969
143	0.0000	7.4300	2.0000	460.0000	0.8710	0.3010
144	0.0000	13.0800	6.2000	573.0000	1.1166	0.7924
145	0.0000	7.5800	4.1000	388.0000	0.8797	0.6128
146	0.0000	7.6500	8.0000	173.0000	0.8837	0.9031
147	0.0000	14.9100	2.7000	610.0000	1.1735	0.4314
148	0.0000	6.2200	3.7000	614.0000	0.7938	0.5682
149	0.0000	8.6400	5.2000	536.0000	0.9365	0.7160
150	0.0000	7.2800	1.9000	332.0000	0.8621	0.2788
151	0.0000	7.8600	3.6000	688.0000	0.8954	0.5563
152	0.0000	6.0400	4.4000	944.0000	0.7810	0.6435
153	0.0000	8.9300	3.7000	524.0000	0.9509	0.5682
154	0.0000	10.2600	2.6000	582.0000	1.0111	0.4150
155	0.0000	11.4600	3.7000	326.0000	1.0592	0.5682
156	0.0000	5.8700	2.6000	438.0000	0.7686	0.4150
157	0.0000	7.5500	1.3000	263.0000	0.8779	0.1139
158	1.0000	7.9300	3.3000	580.0000	0.8993	0.5185
159	1.0000	5.6300	11.9000	520.0000	0.7505	1.0755
160	1.0000	6.2100	6.4000	328.0000	0.7931	0.8062
161	1.0000	11.2600	1.2000	191.0000	1.0515	0.0792
162	1.0000	8.9100	2.5000	334.0000	0.9499	0.3979
163	1.0000	8.6300	1.6000	610.0000	0.9360	0.2041
164	1.0000	10.1200	1.7000	567.0000	1.0052	0.2304
165	1.0000	8.5400	3.0000	246.0000	0.9315	0.4771
166	1.0000	8.0100	3.3000	500.0000	0.9036	0.5185
167	1.0000	9.9700	2.1000	249.0000	0.9987	0.3222
168	1.0000	4.4300	6.6000	713.0000	0.6464	0.8195
169	1.0000	5.1800	10.4000	953.0000	0.7143	1.0170
170	1.0000	6.6400	3.8000	757.0000	0.8222	0.5798
171	1.0000	11.6000	3.1000	458.0000	1.0645	0.4914
172	1.0000	6.4200	8.0000	646.0000	0.8075	0.9031
173	1.0000	7.7400	8.0000	652.0000	0.8887	0.9031
174	1.0000	8.2400	3.7000	482.0000	0.9159	0.5682
175	1.0000	6.2200	2.6000	453.0000	0.7938	0.4150
176	1.0000	8.3400	3.7000	959.0000	0.9212	0.5682
177	1.0000	5.0400	5.3000	508.0000	0.7024	0.7243
178	1.0000	6.0500	3.2000	1345.0000	0.7818	0.5051
179	1.0000	9.3900	2.9000	605.0000	0.9727	0.4624

	LOG-B12	F+V-W	F+V-B	F+V-ALL
1	2.7042	15.0000	5.0000	15.0000
2	2.6618	23.8000	20.0000	23.8000
3	2.7882	17.5000	17.5000	17.5000
4	2.6794	22.5000	30.0000	22.5000
5	2.4928	20.0000	10.0000	20.0000
6	2.5224	40.0000	15.0000	40.0000
7	2.3617	37.5000	10.0000	37.5000
8	2.5465	12.5000	7.5000	12.5000
9	2.4683	20.0000	7.5000	20.0000
10	2.3674	30.0000	10.0000	30.0000
11	2.0492	10.0000	20.0000	10.0000
12	2.5821	27.5000	15.0000	27.5000
13	2.7135	7.5000	15.0000	7.5000
14	2.5465	15.0000	40.0000	15.0000
15	2.2765	20.0000	15.0000	20.0000
16	2.6675	15.0000	15.0000	15.0000
17	2.3464	10.0000	15.0000	10.0000
18	2.3284	25.0000	10.0000	25.0000
19	2.4393	20.0000	60.0000	20.0000
20	2.5855	22.5000	12.5000	22.5000
21	2.6064	20.0000	30.0000	20.0000
22	2.3692	20.0000	25.0000	20.0000
23	2.4609	17.5000	25.0000	17.5000
24	2.5132	22.5000	25.0000	22.5000
25	2.5944	35.0000	15.0000	35.0000
26	2.7324	10.0000	30.0000	10.0000
27	2.3802	35.0000	15.0000	35.0000
28	2.5289	25.0000	20.0000	25.0000
29	2.6201	15.0000	20.0000	15.0000
30	2.5185	15.0000	12.5000	15.0000
31	2.9400	37.5000	65.0000	37.5000
32	2.2718	25.0000	30.0000	25.0000
33	2.7443	15.0000	12.5000	15.0000
34	2.8055	35.0000	21.3000	35.0000
35	2.8169	20.0000	20.0000	20.0000
36	2.8426	15.0000	30.0000	15.0000
37	2.6990	25.0000	25.0000	25.0000
38	2.6665	15.0000	15.0000	15.0000
39	2.5159	25.0000	15.0000	25.0000
40	2.4200	35.0000	10.0000	35.0000
41	2.5465	20.0000	80.0000	20.0000
42	2.7218	10.0000	15.0000	10.0000
43	2.5933	25.0000	25.0000	25.0000
44	2.5670	15.0000	45.0000	15.0000
45	2.4914	17.5000	5.0000	17.5000
46	2.3304	25.0000	22.5000	25.0000

	LOG-B12	F+V-W	F+V-B	F+V-ALL
47	2.5465	20.0000	25.0000	20.0000
48	2.6075	17.5000	35.0000	17.5000
49	2.7536	15.0000	10.0000	15.0000
50	2.5877	30.0000	12.5000	30.0000
51	2.8525	20.0000	35.0000	20.0000
52	2.7243	25.0000	20.0000	25.0000
53	2.6911	20.0000	20.0000	20.0000
54	2.8567	35.0000	10.0000	35.0000
55	2.1335	15.0000	25.0000	15.0000
56	2.7251	35.0000	27.5000	35.0000
57	2.4857	17.5000	30.0000	17.5000
58	2.3766	35.0000	25.0000	35.0000
59	2.3747	10.0000	55.0000	10.0000
60	2.5717	17.5000	25.0000	17.5000
61	2.2330	15.0000	30.0000	15.0000
62	2.9079	10.0000	20.0000	10.0000
63	2.6812	10.0000	11.3000	10.0000
64	2.6232	10.0000	12.5000	10.0000
65	2.3802	30.0000	25.0000	30.0000
66	2.4502	22.5000	24.6000	22.5000
67	2.1847	50.0000	6.4000	50.0000
68	2.8082	22.5000	40.0000	22.5000
69	2.6444	15.0000	1.7000	15.0000
70	2.4669	20.0000	25.0000	20.0000
71	2.7067	20.0000	15.0000	20.0000
72	3.0095	27.5000	30.0000	27.5000
73	2.3674	12.5000	12.5000	12.5000
74	2.7723	35.0000	15.0000	35.0000
75	2.6325	50.0000	30.0000	50.0000
76	2.5752	15.0000	47.5000	15.0000
77	2.8842	5.7000	0.0000	5.7000
78	2.7993	35.0000	25.0000	35.0000
79	2.7752	2.1000	30.0000	2.1000
80	2.7846	17.5000	20.0000	17.5000
81	2.6730	10.0000	37.5000	10.0000
82	2.4698	15.0000	30.0000	15.0000
83	2.5172	7.5000	7.5000	7.5000
84	2.5717	27.5000	32.5000	27.5000
85	2.6776	5.0000	25.0000	5.0000
86	2.6637	17.5000	40.0000	17.5000
87	2.6212	30.0000	15.0000	30.0000
88	2.7059	25.0000	27.5000	25.0000
89	2.6138	20.0000		20.0000
90	2.5729	27.5000		27.5000
91	2.9186			5.0000

	LOG-B12	F+V-W	F+V-B	F+V-ALL
92	2.6345			20.0000
93	2.8000			17.5000
94	2.8325			30.0000
95	2.7993			10.0000
96	2.8722			15.0000
97	2.6522			10.0000
98	2.8014			7.5000
99	2.8149			7.5000
100	2.8762			10.0000
101	2.8129			20.0000
102	2.6365			15.0000
103	2.8338			15.0000
104	2.7513			40.0000
105	2.9395			15.0000
106	3.0000			15.0000
107	2.6138			15.0000
108	2.6375			10.0000
109	2.7451			60.0000
110	2.5065			12.5000
111	2.4594			30.0000
112	2.8831			25.0000
113	2.9689			25.0000
114	2.7356			25.0000
115	2.3160			15.0000
116	2.7101			30.0000
117	2.7024			15.0000
118	2.6375			20.0000
119	2.6618			20.0000
120	2.7396			12.5000
121	2.6532			65.0000
122	2.4786			30.0000
123	2.6304			12.5000
124	2.4814			21.3000
125	2.5647			20.0000
126	2.3729			30.0000
127	2.6484			25.0000
128	2.1335			15.0000
129	2.7536			15.0000
130	2.5302			10.0000
131	2.4624			80.0000
132	2.3222			15.0000
133	2.7443			25.0000
134	2.4928			45.0000
135	2.6345			5.0000
136	2.6875			22.5000

	LOG-B12	F+V-W	F+V-B	F+V-ALL
137	2.8488			25.0000
138	2.7193			35.0000
139	2.6590			10.0000
140	2.6542			12.5000
141	2.6365			35.0000
142	2.6053			20.0000
143	2.6628			20.0000
144	2.7582			10.0000
145	2.5888			25.0000
146	2.2380			27.5000
147	2.7853			30.0000
148	2.7882			25.0000
149	2.7292			55.0000
150	2.5211			25.0000
151	2.8376			30.0000
152	2.9750			20.0000
153	2.7193			11.3000
154	2.7649			12.5000
155	2.5132			25.0000
156	2.6415			24.6000
157	2.4200			6.4000
158	2.7634			40.0000
159	2.7160			1.7000
160	2.5159			25.0000
161	2.2810			15.0000
162	2.5237			30.0000
163	2.7853			12.5000
164	2.7536			15.0000
165	2.3909			30.0000
166	2.6990			47.5000
167	2.3962			0.0000
168	2.8531			25.0000
169	2.9791			30.0000
170	2.8791			20.0000
171	2.6609			37.5000
172	2.8102			30.0000
173	2.8142			7.5000
174	2.6830			32.5000
175	2.6561			25.0000
176	2.9818			40.0000
177	2.7059			15.0000
178	3.1287			27.5000
179	2.7818			

	CHO- W	CHO- B	OCP	b-12-ocp
1	52.9000	81.8000	0.0000	506.0000
2	81.2000	88.9000	0.0000	459.0000
3	68.0000	48.6000	0.0000	614.0000
4	85.5000	50.0000	0.0000	478.0000
5	55.3000	34.8000	0.0000	311.0000
6	103.9000	60.4000	0.0000	333.0000
7	89.1000	25.7000	0.0000	230.0000
8	38.9000	22.4000	0.0000	352.0000
9	44.6000	24.2000	0.0000	294.0000
10	58.9000	33.2000	0.0000	233.0000
11	22.6000	76.7000	0.0000	112.0000
12	80.7000	46.3000	0.0000	382.0000
13	41.8000	114.8000	0.0000	517.0000
14	61.3000	78.3000	0.0000	352.0000
15	44.6000	44.4000	0.0000	189.0000
16	45.7000	40.1000	0.0000	465.0000
17	49.7000	39.5000	0.0000	222.0000
18	70.5000	24.0000	0.0000	213.0000
19	45.6000	130.5000	0.0000	275.0000
20	34.4000	46.6000	0.0000	385.0000
21	65.1000	84.9000	0.0000	404.0000
22	53.1000	50.1000	0.0000	234.0000
23	41.1000	47.6000	0.0000	289.0000
24	79.3000	50.5000	0.0000	326.0000
25	72.8000	31.1000	0.0000	393.0000
26	34.2000	95.0000	0.0000	540.0000
27	68.2000	56.5000	0.0000	240.0000
28	69.9000	50.1000	0.0000	338.0000
29	38.6000	62.1000	0.0000	417.0000
30	64.9000	31.5000	0.0000	330.0000
31	111.5000	89.1000	0.0000	871.0000
32	57.9000	81.0000	0.0000	187.0000
33	52.0000	54.7000	0.0000	555.0000
34	79.1000	71.1000	0.0000	639.0000
35	64.4000	40.2000	0.0000	656.0000
36	64.3000	57.1000	0.0000	696.0000
37	48.2000	56.3000	0.0000	500.0000
38	46.4000	52.3000	0.0000	464.0000
39	58.0000	52.4000	0.0000	328.0000
40	84.1000	29.3000	0.0000	263.0000
41	68.2000	110.8000	0.0000	352.0000
42	35.6000	79.3000	0.0000	527.0000
43	105.3000	79.2000	0.0000	392.0000
44	46.7000	104.8000	0.0000	369.0000
45	47.7000	22.4000	0.0000	310.0000
46	78.3000	77.3000	0.0000	214.0000

	CHO- W	CHO- B	OCP	b-12-ocp
47	68.1000	62.0000	0.0000	352.0000
48	53.6000	81.3000	0.0000	405.0000
49	78.5000	48.5000	0.0000	567.0000
50	82.0000	51.5000	0.0000	387.0000
51	65.0000	77.5000	0.0000	712.0000
52	83.4000	65.3000	0.0000	530.0000
53	52.5000	56.4000	0.0000	491.0000
54	70.7000	52.5000	0.0000	719.0000
55	60.4000	107.4000	0.0000	136.0000
56	130.4000	93.1000	0.0000	531.0000
57	50.5000	78.2000	0.0000	306.0000
58	110.1000	41.4000	0.0000	238.0000
59	68.3000	111.2000	0.0000	237.0000
60	57.1000	81.1000	0.0000	373.0000
61	82.1000	89.1000	0.0000	171.0000
62	36.9000	81.6000	0.0000	809.0000
63	44.1000	36.5000	0.0000	480.0000
64	73.7000	42.4000	0.0000	420.0000
65	61.3000	70.8000	0.0000	240.0000
66	72.3000	57.3000	0.0000	282.0000
67	103.9000	47.7000	0.0000	153.0000
68	71.1000	124.7000	0.0000	643.0000
69	97.3000	28.0000	1.0000	441.0000
70	75.7000	59.3000	1.0000	293.0000
71	48.2000	58.8000	1.0000	509.0000
72	76.1000	60.8000	1.0000	1022.0000
73	65.9000	66.4000	1.0000	233.0000
74	53.8000	50.9000	1.0000	592.0000
75	163.1000	58.7000	1.0000	429.0000
76	42.9000	68.1000	1.0000	376.0000
77	38.6000	10.3000	1.0000	766.0000
78	88.5000	99.7000	1.0000	630.0000
79	17.6000	82.0000	1.0000	596.0000
80	51.1000	56.3000	1.0000	609.0000
81	33.3000	80.9000	1.0000	471.0000
82	63.9000	79.6000	1.0000	295.0000
83	53.8000	44.9000	1.0000	329.0000
84	60.4000	68.4000	1.0000	373.0000
85	27.6000	59.8000	1.0000	476.0000
86	53.9000	86.2000	1.0000	461.0000
87	75.1000	46.0000	1.0000	418.0000
88	73.7000	60.1000	1.0000	508.0000
89	55.3000	40.2000	1.0000	411.0000
90	58.0000		1.0000	374.0000
91			0.0000	829.0000

	CHO- W	CHO- B	OCP	b-12-ocp
92			0.0000	431.0000
93			0.0000	631.0000
94			0.0000	680.0000
95			0.0000	630.0000
96			0.0000	745.0000
97			0.0000	449.0000
98			0.0000	633.0000
99			0.0000	653.0000
100			0.0000	752.0000
101			0.0000	650.0000
102			0.0000	433.0000
103			0.0000	682.0000
104			0.0000	564.0000
105			0.0000	870.0000
106			0.0000	1000.0000
107			0.0000	411.0000
108			0.0000	434.0000
109			0.0000	556.0000
110			0.0000	321.0000
111			0.0000	288.0000
112			0.0000	764.0000
113			0.0000	931.0000
114			0.0000	544.0000
115			0.0000	207.0000
116			0.0000	513.0000
117			0.0000	504.0000
118			0.0000	434.0000
119			0.0000	459.0000
120			0.0000	549.0000
121			0.0000	450.0000
122			0.0000	301.0000
123			0.0000	427.0000
124			0.0000	303.0000
125			0.0000	367.0000
126			0.0000	236.0000
127			0.0000	445.0000
128			0.0000	136.0000
129			0.0000	567.0000
130			0.0000	339.0000
131			0.0000	290.0000
132			0.0000	210.0000
133			0.0000	555.0000
134			0.0000	311.0000
135			0.0000	431.0000
136			0.0000	487.0000

	CHO- W	CHO- B	OCP	b-12-ocp
137			0.0000	706.0000
138			0.0000	524.0000
139			0.0000	456.0000
140			0.0000	451.0000
141			0.0000	433.0000
142			0.0000	403.0000
143			0.0000	460.0000
144			0.0000	573.0000
145			0.0000	388.0000
146			0.0000	173.0000
147			0.0000	610.0000
148			0.0000	614.0000
149			0.0000	536.0000
150			0.0000	332.0000
151			0.0000	688.0000
152			0.0000	944.0000
153			0.0000	524.0000
154			0.0000	582.0000
155			0.0000	326.0000
156			0.0000	438.0000
157			0.0000	263.0000
158			0.0000	580.0000
159			0.0000	520.0000
160			0.0000	328.0000
161			0.0000	191.0000
162			0.0000	334.0000
163			0.0000	610.0000
164			0.0000	567.0000
165			0.0000	246.0000
166			0.0000	500.0000
167			0.0000	249.0000
168			0.0000	713.0000
169			0.0000	953.0000
170			0.0000	757.0000
171			0.0000	458.0000
172			0.0000	646.0000
173			0.0000	652.0000
174			1.0000	482.0000
175			1.0000	453.0000
176			1.0000	959.0000
177			1.0000	508.0000
178			1.0000	1345.0000
179			1.0000	605.0000

	lg-b12-ocp	EDUC-W	EDUC-B	SMOKE-W	SMOKE-B
1	2.7042	15.0000	9.0000	0.0000	0.0000
2	2.6618	17.0000	11.0000	0.0000	0.0000
3	2.7882	14.0000	16.0000	0.0000	0.0000
4	2.6794	14.0000	15.0000	1.0000	0.0000
5	2.4928	16.0000	12.0000	0.0000	0.0000
6	2.5224	16.0000	14.0000	0.0000	0.0000
7	2.3617	18.0000	13.0000	0.0000	0.0000
8	2.5465	13.0000	16.0000	0.0000	1.0000
9	2.4683	14.0000	11.0000	0.0000	1.0000
10	2.3674	15.0000	13.0000	1.0000	0.0000
11	2.0492	14.0000	11.0000	1.0000	0.0000
12	2.5821	13.0000	14.0000	0.0000	0.0000
13	2.7135	15.0000	14.0000	0.0000	1.0000
14	2.5465	14.0000	15.0000	0.0000	0.0000
15	2.2765	14.0000	13.0000	1.0000	0.0000
16	2.6675	13.0000	17.0000	0.0000	0.0000
17	2.3464	17.0000	12.0000	0.0000	1.0000
18	2.3284	19.0000	14.0000	0.0000	0.0000
19	2.4393	12.0000	15.0000	1.0000	0.0000
20	2.5855	12.0000	13.0000	1.0000	0.0000
21	2.6064	13.0000	12.0000	0.0000	0.0000
22	2.3692	14.0000	15.0000	0.0000	0.0000
23	2.4609	19.0000	17.0000	0.0000	0.0000
24	2.5132	20.0000	11.0000	0.0000	0.0000
25	2.5944	13.0000	15.0000	0.0000	0.0000
26	2.7324	16.0000	14.0000	0.0000	1.0000
27	2.3802	16.0000	18.0000	0.0000	0.0000
28	2.5289	12.0000	15.0000	0.0000	0.0000
29	2.6201	13.0000	12.0000	0.0000	0.0000
30	2.5185	15.0000	12.0000	0.0000	0.0000
31	2.9400	16.0000	16.0000	0.0000	0.0000
32	2.2718	14.0000	13.0000	0.0000	0.0000
33	2.7443	16.0000	14.0000	0.0000	0.0000
34	2.8055	16.0000	16.0000	0.0000	0.0000
35	2.8169	18.0000	14.0000	0.0000	0.0000
36	2.8426	18.0000	16.0000	0.0000	0.0000
37	2.6990	15.0000	11.0000	0.0000	0.0000
38	2.6665	15.0000	12.0000	0.0000	0.0000
39	2.5159	13.0000	15.0000	0.0000	0.0000
40	2.4200	14.0000	14.0000	0.0000	0.0000
41	2.5465	13.0000	16.0000	0.0000	0.0000
42	2.7218	8.0000	17.0000	0.0000	0.0000
43	2.5933	13.0000	13.0000	0.0000	0.0000
44	2.5670	12.0000	12.0000	0.0000	0.0000
45	2.4914	16.0000	14.0000	0.0000	0.0000
46	2.3304	13.0000	11.0000	0.0000	0.0000

	lg-b12-ocp	EDUC-W	EDUC-B	SMCKE-W	SMOKE-B
47	2.5465	12.0000	15.0000	0.0000	0.0000
48	2.6075	17.0000	16.0000	0.0000	0.0000
49	2.7536	14.0000	13.0000	0.0000	0.0000
50	2.5877	12.0000	13.0000	0.0000	0.0000
51	2.8525	16.0000	14.0000	0.0000	0.0000
52	2.7243	12.0000	14.0000	0.0000	0.0000
53	2.6911	16.0000	14.0000	0.0000	1.0000
54	2.8567	13.0000	14.0000	0.0000	0.0000
55	2.1335	13.0000	18.0000	0.0000	0.0000
56	2.7251	16.0000	18.0000	0.0000	0.0000
57	2.4857	16.0000	12.0000	0.0000	0.0000
58	2.3766	16.0000	14.0000	0.0000	0.0000
59	2.3747	16.0000	16.0000	1.0000	0.0000
60	2.5717	13.0000	16.0000	0.0000	0.0000
61	2.2330	21.0000	14.0000	0.0000	0.0000
62	2.9079	14.0000	14.0000	1.0000	0.0000
63	2.6812	12.0000	14.0000	0.0000	1.0000
64	2.6232	12.0000	14.0000	0.0000	0.0000
65	2.3802	16.0000	14.0000	0.0000	0.0000
66	2.4502	16.0000	13.0000	0.0000	1.0000
67	2.1847	16.0000	15.0000	0.0000	0.0000
68	2.8082	16.0000	21.0000	0.0000	0.0000
69	2.6444	15.0000	12.0000	0.0000	0.0000
70	2.4669	16.0000	14.0000	0.0000	0.0000
71	2.7067	14.0000	14.0000	0.0000	0.0000
72	3.0095	12.0000	16.0000	1.0000	0.0000
73	2.3674	15.0000	18.0000	0.0000	0.0000
74	2.7723	12.0000	16.0000	0.0000	0.0000
75	2.6325	9.0000	15.0000	0.0000	0.0000
76	2.5752	16.0000	16.0000	0.0000	0.0000
77	2.8842	16.0000	14.0000	1.0000	0.0000
78	2.7993	14.0000	14.0000	0.0000	0.0000
79	2.7752	19.0000	10.0000	1.0000	0.0000
80	2.7846	19.0000	14.0000	0.0000	1.0000
81	2.6730	16.0000	15.0000	0.0000	0.0000
82	2.4698	16.0000	15.0000	0.0000	0.0000
83	2.5172	16.0000	15.0000	0.0000	0.0000
84	2.5717	18.0000	15.0000	0.0000	0.0000
85	2.6776	12.0000	18.0000	1.0000	0.0000
86	2.6637	18.0000	18.0000	0.0000	0.0000
87	2.6212	12.0000	14.0000	0.0000	0.0000
88	2.7059	14.0000	14.0000	0.0000	0.0000
89	2.6138	13.0000	12.0000	1.0000	1.0000
90	2.5729	16.0000		0.0000	
91	2.9186				

	lg-b12-ocp	EDUC-W	EDUC-B	SMOKE-W	SMOKE-B
92	2.6345				
93	2.8000				
94	2.8325				
95	2.7993				
96	2.8722				
97	2.6522				
98	2.8014				
99	2.8149				
100	2.8762				
101	2.8129				
102	2.6365				
103	2.8338				
104	2.7513				
105	2.9395				
106	3.0000				
107	2.6138				
108	2.6375				
109	2.7451				
110	2.5065				
111	2.4594				
112	2.8831				
113	2.9689				
114	2.7356				
115	2.3160				
116	2.7101				
117	2.7024				
118	2.6375				
119	2.6618				
120	2.7396				
121	2.6532				
122	2.4786				
123	2.6304				
124	2.4814				
125	2.5647				
126	2.3729				
127	2.6484				
128	2.1335				
129	2.7536				
130	2.5302				
131	2.4624				
132	2.3222				
133	2.7443				
134	2.4928				
135	2.6345				
136	2.6875				

	lg-b12-ocp	EDUC-W	EDUC-B	SMOKE-W	SMOKE-B
137	2.8488				
138	2.7193				
139	2.6590				
140	2.6542				
141	2.6365				
142	2.6053				
143	2.6628				
144	2.7582				
145	2.5888				
146	2.2380				
147	2.7853				
148	2.7882				
149	2.7292				
150	2.5211				
151	2.8376				
152	2.9750				
153	2.7193				
154	2.7649				
155	2.5132				
156	2.6415				
157	2.4200				
158	2.7634				
159	2.7160				
160	2.5159				
161	2.2810				
162	2.5237				
163	2.7853				
164	2.7536				
165	2.3909				
166	2.6990				
167	2.3962				
168	2.8531				
169	2.9791				
170	2.8791				
171	2.6609				
172	2.8102				
173	2.8142				
174	2.6830				
175	2.6561				
176	2.9818				
177	2.7059				
178	3.1287				
179	2.7818				

	ETOH-W	ETOH-B	CEREAL-W	CEREAL-B	BEANS-W	BEANS-B
1	3.0000	5.0000	10.0000	0.0000	5.0000	0.0000
2	2.0000	5.0000	10.0000	4.0000	10.0000	15.0000
3	5.0000	4.0000	5.0000	0.0000	5.0000	15.0000
4	5.0000	5.0000	8.0000	0.0000	12.5000	0.0000
5	5.0000	5.0000	6.0000	0.0000	7.5000	5.0000
6	5.0000	5.0000	0.0000	0.0000	0.0000	5.0000
7	5.0000	5.0000	2.0000	7.0000	25.0000	0.0000
8	5.0000	4.5000	6.0000	1.0000	10.0000	0.0000
9	5.0000	5.0000	1.0000	0.0000	2.5000	5.0000
10	5.0000	5.0000	0.0000	6.0000	1.3000	0.0000
11	5.0000	5.0000	0.0000	14.5000	0.0000	5.0000
12	5.0000	5.0000	1.5000	2.0000	10.0000	2.5000
13	5.0000	5.0000	1.5000	4.0000	2.5000	10.0000
14	5.0000	5.0000	2.0000	5.0000	20.0000	10.0000
15	5.0000	4.0000	5.0000	1.0000	2.5000	10.0000
16	5.0000	5.0000	0.0000	2.0000	2.5000	5.0000
17	5.0000	5.0000	10.0000	2.0000	2.5000	10.0000
18	4.5000	5.0000	5.0000	1.5000	5.0000	0.0000
19	5.0000	4.0000	6.0000	6.0000	0.0000	30.0000
20	5.0000	5.0000	2.0000	4.0000	0.0000	7.5000
21	5.0000	5.0000	8.0000	5.0000	10.0000	10.0000
22	5.0000	5.0000	1.0000	0.0000	15.0000	15.0000
23	5.0000	5.0000	6.0000	1.0000	0.0000	5.0000
24	4.0000	5.0000	10.0000	0.0000	10.0000	5.0000
25	5.0000	3.0000	2.0000	0.0000	10.0000	0.0000
26	3.0000	4.0000	1.5000	6.0000	1.3000	20.0000
27	5.0000	5.0000	5.0000	7.0000	5.0000	10.0000
28	5.0000	5.0000	2.5000	1.0000	15.0000	10.0000
29	5.0000	5.0000	1.0000	3.0000	5.0000	10.0000
30	5.0000	4.0000	10.0000	1.0000	0.0000	0.0000
31	5.0000	5.0000	2.0000	2.0000	5.0000	5.0000
32	3.0000	5.0000	0.0000	3.0000	5.0000	10.0000
33	3.0000	5.0000	3.0000	0.0000	10.0000	10.0000
34	5.0000	3.0000	0.0000	0.0000	5.0000	5.0000
35	5.0000	5.0000	5.0000	2.0000	5.0000	0.0000
36	4.0000	5.0000	8.0000	3.0000	20.0000	5.0000
37	5.0000	2.0000	5.0000	5.0000	5.0000	5.0000
38	5.0000	5.0000	0.0000	4.0000	5.0000	5.0000
39	4.0000	5.0000	14.0000	0.0000	5.0000	5.0000
40	3.0000	4.0000	4.0000	1.0000	15.0000	0.0000
41	5.0000	3.0000	12.0000	5.0000	5.0000	2.5000
42	4.0000	5.0000	3.0000	2.0000	5.0000	25.0000
43	5.0000	5.0000	4.0000	2.0000	35.0000	10.0000
44	5.0000	5.0000	4.5000	0.0000	7.5000	15.0000
45	4.5000	5.0000	0.0000	0.0000	5.0000	0.0000
46	4.0000	5.0000	0.0000	0.0000	25.0000	0.9000

	ETOH-W	ETOH-B	CEREAL-W	CEREAL-B	BEANS-W	BEANS-B
47	5.0000	5.0000	2.0000	10.0000	5.0000	5.0000
48	5.0000	5.0000	2.0000	8.0000	7.5000	15.0000
49	5.0000	4.0000	1.0000	0.0000	35.0000	10.0000
50	4.0000	5.0000	9.0000	1.5000	15.0000	0.0000
51	2.0000	5.0000	0.0000		15.0000	5.0000
52	5.0000	2.0000	0.0000	0.0000	15.0000	8.8000
53	5.0000	3.0000	5.0000	1.0000	10.0000	10.0000
54	3.0000	5.0000	0.5000	10.0000	15.0000	0.0000
55	5.0000	5.0000	3.0000	3.0000	0.0000	15.0000
56	5.0000	4.0000	0.0000	3.0000	50.0000	5.0000
57	4.0000	4.0000	3.0000	0.0000	5.0000	10.0000
58	5.0000	5.0000	10.0000	3.0000	15.0000	0.0000
59	5.0000	5.0000	0.0000	3.0000	35.0000	25.0000
60	5.0000	5.0000	2.0000	5.5000	10.0000	5.0000
61	5.0000	5.0000	6.0000	10.0000	42.5000	5.0000
62	3.0000	5.0000	0.0000	10.0000	5.0000	10.0000
63	5.0000	1.0000	1.0000	0.0000	5.0000	0.0000
64	5.0000	5.0000	1.0000	0.5000	25.0000	12.5000
65	5.0000	3.0000	2.0000	0.0000	0.0000	0.0000
66	5.0000	3.0000	5.0000	1.0000	12.5000	0.0000
67	2.0000	5.0000	1.0000	0.0000	15.0000	12.5000
68	5.0000	5.0000	10.0000	0.0000	15.0000	30.0000
69	5.0000	1.0000	1.0000	0.0000	60.0000	5.0000
70	5.0000	4.0000	6.0000	0.0000	20.0000	0.0000
71	3.0000	5.0000	3.0000	1.0000	5.0000	5.0000
72	1.0000	5.0000	10.5000	0.0000	15.0000	5.0000
73	5.0000	5.0000	0.0000	0.0000	25.0000	5.0000
74	5.0000	5.0000	0.0000	0.0000	5.0000	10.0000
75	5.0000	5.0000	2.0000	3.0000	20.0000	0.0000
76	4.0000	5.0000	8.0000	0.2500	0.0000	5.0000
77	3.0000	5.0000	4.0000	0.0000	5.0000	0.0000
78	5.0000	4.0000	5.0000	4.0000	15.0000	25.0000
79	1.0000	1.0000	0.0000	0.0000	0.0000	30.0000
80	5.0000	2.0000	0.0000	0.0000	15.0000	10.0000
81	4.0000	5.0000	0.0000	2.0000	5.0000	15.0000
82	5.0000	2.0000	0.0000	2.0000	10.0000	15.0000
83	5.0000	2.0000	3.0000	0.0000	5.0000	15.0000
84	3.0000	4.0000	1.0000	0.0000	10.0000	10.0000
85	5.0000	5.0000	2.0000	0.0000	0.0000	10.0000
86	3.0000	5.0000	5.0000	1.0000	5.0000	10.0000
87	4.0000	4.0000	5.5000	5.0000	5.0000	5.0000
88	5.0000	5.0000	3.0000	0.0000	0.0000	10.0000
89	5.0000	2.0000	1.0000		5.0000	
90	5.0000		3.0000		10.0000	

	SCREEN-W	SCREEN-B	CR-W	CR-B
1	CRC	CRC	0.9000	1.1000
2	ALBINA	CRC		0.5000
3	CRC	CRC	1.0000	0.6000
4	CRC	ALBINA	0.7000	0.9000
5	ALBINA	ALBINA		0.8000
6	CRC	ALBINA	0.8000	0.8000
7	ALBINA	CRC	0.8000	0.7000
8	CRC	CRC	0.6000	0.8000
9	ALBINA	CRC		0.8000
10	ALBINA	CRC		0.6000
11	CRC	ALBINA	0.7000	0.8000
12	CRC	CRC	0.7000	0.5000
13	CRC	CRC	0.8000	
14	CRC	CRC	0.8000	
15	CRC	ALBINA	0.5000	0.9000
16	CRC	ALBINA	0.6000	0.6000
17	CRC	CRC		0.7000
18	CRC	ALBINA	0.7000	
19	CRC	CRC	0.7000	0.7000
20	ALBINA	CRC		0.7000
21	CRC	CRC	0.8000	
22	ALBINA	CRC		
23	CRC	CRC	0.7000	0.8000
24	ALBINA	ALBINA	0.7000	0.8000
25	CRC	CRC	0.8000	0.8000
26	CRC	CRC		0.7000
27	CRC	CRC	0.7000	0.7000
28	CRC	CRC	0.6000	0.7000
29	CRC	CRC	0.7000	0.7000
30	CRC	ALBINA	0.8000	0.9000
31	CRC	ALBINA	0.7000	0.7000
32	CRC	ALBINA		0.9000
33	CRC	CRC	0.9000	0.7000
34	CRC	ALBINA		0.7000
35	ALBINA	ALBINA		
36	CRC	ALBINA	0.9000	0.7000
37	CRC	CRC	0.8000	0.9000
38	CRC	CRC	0.7000	0.4000
39	CRC	CRC	0.9000	
40	CRC	CRC	0.7000	0.6000
41	CRC	CRC	0.8000	0.8000
42	CRC	CRC	1.1000	0.8000
43	CRC	CRC	0.6000	0.6000
44	CRC	ALBINA	0.8000	
45	CRC	ALBINA	0.5000	0.8000
46	CRC	CRC	0.6000	0.8000

SCREEN-W	SCREEN-B	CR-W	CR-B
47CRC	CRC	0.9000	0.7000
48CRC	CRC	0.6000	0.8000
49CRC	CRC	0.8000	1.3000
50ALBINA	ALBINA		0.9000
51CRC	CRC	0.9000	0.5000
52CRC	CRC	0.7000	
53CRC	CRC	0.7000	0.7000
54CRC	CRC	0.7000	0.4000
55CRC	CRC		
56CRC	ALBINA		
57CRC	ALBINA	0.7000	0.9000
58CRC	CRC	0.7000	0.7000
59ALBINA	ALBINA	0.9000	0.9000
60CRC	CRC		0.7000
61CRC	ALBINA	0.7000	0.6000
62CRC	ALBINA	0.7000	
63CRC	CRC		0.8000
64CRC	ALBINA	0.7000	
65CRC	CRC	0.8000	1.0000
66ALBINA	CRC		
67CRC	CRC	0.9000	
68CRC	CRC		0.9000
69CRC	CRC	0.6000	0.7000
70CRC	CRC	0.7000	0.7000
71CRC	CRC	0.8000	0.9000
72CRC	ALBINA	0.7000	0.6000
73CRC	CRC		0.9000
74CRC	CRC	0.6000	0.6000
75CRC	ALBINA	0.6000	0.8000
76CRC	CRC	0.6000	0.8000
77CRC	CRC	0.7000	
78CRC	CRC		0.6000
79CRC	CRC	0.7000	0.5000
80CRC	ALBINA	0.8000	0.7000
81CRC	ALBINA	0.6000	0.8000
82CRC	CRC	0.7000	0.9000
83CRC	CRC	1.0000	0.8000
84CRC	CRC	1.2000	0.7000
85CRC	CRC	0.7000	0.7000
86CRC	ALBINA	0.8000	
87CRC	CRC	0.9000	
88CRC	CRC	0.5000	
89CRC	CRC	0.6000	0.7000
90CRC		0.7000	