COMPARISON OF THE BODY COMPOSITION AMONG SMOKERS, NON-SMOKERS, AND EX-SMOKERS

By

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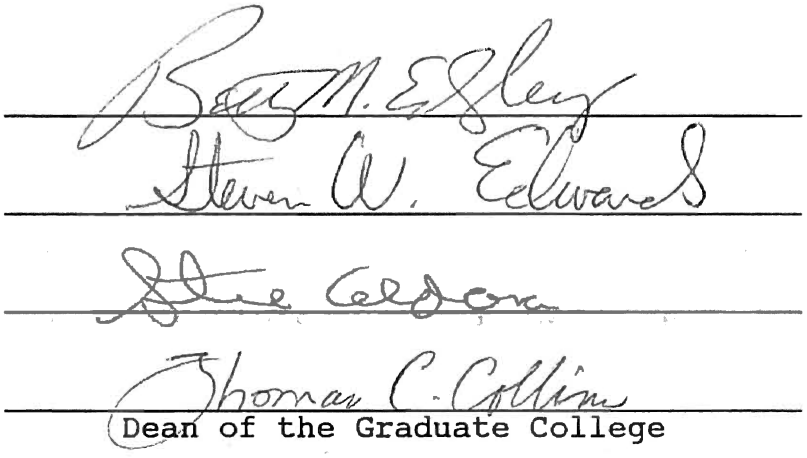

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CHAPTER I

INTRODUCTION

Well documented research and established literature has led health care experts and professionals to agree on the numerous ill effects of cigarette smoking. Cigarette smoking accounts for over 350,000 preventable deaths per year (Bates, 1987; Klesges & Meyers, 1991). It is a proven risk factor for the three leading causes of death in the United States, namely, heart disease, malignant neoplasms, and stroke (Klesges, Meyers, Klesges, & Vasque, 1989). Cigarette smoking is also correlated to the rising incidence of emphysema, hypertension, various cancers, and chronic obstructive lung disease (Conway & Cronan, 1992). In addition, it is proven that health care costs are greater for smokers than non-smokers. Klesges et al. (1989) estimated 56 billion dollars per year are spent on health care costs for problems related to smoking including medical care, absenteeism, decrease work productivity, and accidents.

Despite the growing body of information and knowledge on the health consequences of smoking, 26.5%, slightly over one in four, adults in the United States continue to smoke (Klesges et al., 1989; Williamson et al., 1991). Many

individuals are either unable or unwilling to quit. Although there are no known measures to determine exactly why people continue to smoke, researchers are currently making progress in documenting some of the reasons. In 1991, the United States Department of Health and Human Services examined various populations to hypothesize why some people smoke. Reasons for the lack of smoking cessation in the black population includes reliance on cigarettes as a way to deal with life stresses, social disadvantages, limited access to health care, and lack of confidence in their ability to quit (USDHHS, 1991). The reasons Hispanic populations continue to smoke include little or no awareness of cessation programs, unemployment, lack of education, and most importantly, the social acceptance of smoking within their culture (USDHHS, 1991). Other reasons include underestimation of health risks, concerns about physical appearance, and usage of smoking as a coping mechanism for stress (USDHHS, 1991). Klesges et al. (1989) theorized individuals may continue to smoke because of the time difference between experiencing the negative effects and positive effects of smoking cessation. For instance, weight gain, a disadvantage of smoking cessation, occurs almost immediately after one stops smoking. However, decreased risk of heart disease, a positive effect of smoking cessation occurs in the distant future, if at all (Klesges et al., 1989; Williamson et al., 1991). Other disadvantages such as nicotine withdrawal

symptoms, increased coughing and sputum, and cigarette craving may also impede cessation. Finally, further clouding the issues of smoking cessation, is that smokers may or may not develop smoking related diseases, such as heart disease, emphysema, and various cancers, while non-smokers may also develop the same problems (Klesges et al., 1989).

Another possible barrier to smoking cessation is that there appears to be an inverse relationship between smoking and body weight (Klesges et al., 1989). Some people smoke for weight control purposes and therefore do not quit because of the possibility of weight gain. Williamson et al. (1991) determined "the mean weight gain attributable to the cessation of smoking, as adjusted for age, race, level of education, alcohol use, illness related to changes in weight, base-line weight, and physical activity, was 2.8 kilograms in men and 3.8 kilograms in women." The weight gain experienced was a function of the number of cigarettes smoked, age, sex, ethnicity, and the time since cessation. After reviewing over 70 cross-sectional studies. Klesges et al. (1989) concluded older smokers, women, and those smoking at least one package of cigarettes a day experience the greatest amount of benefits of smoking, in terms of weight maintenance and loses. While younger men who smoke less than one package of cigarettes per day were not able to maintain or lose weight as easily.

Studies conducted on the mechanisms attributed to weight gain associated with smoking cessation yields inconclusive evidence. Although it has not been accepted as a cause of the weight gain, it has been documented that smokers and non-smokers dietary habits are different (Larking, Basiotis, Riddick, Sykes, & Pao, 1990). Other possible factors include increases in 24 hour energy expenditure during smoking (Hoffstetter, Schutz, Jequier, & Wahren, 1986), and increases in caloric intake and decreases in resting metabolic rate during smoking cessation (Perkins, Epstein, & Pastor, 1990). Perkins, Epstein, Stiller, Mark, & Jacob (1989) suggested that nicotine's effect on resting metabolic rate during smoking and cessation plays a major role in body weight changes.

It is likely that, if one quits smoking, weight gain occurs (Klesges et al., 1989; Klesges et al., 1991; Moffat & Owens, 1991; Williamson et al., 1991). However, little research has been done to ascertain the body composition of former smokers. Smoking is positively associated with waist/hip ratios when cigarettes smoked per day were divided into tertiles (after adjusting for age and body mass index (BMI)(Selby et al., 1990; Troisi, Heinhold, Bokonas, & Weiss, 1991). In addition, recent findings suggests current smokers have a greater mean abdomen-hip ratio than former smokers or people who have never smoked, regardless of age and BMI (Troisi et al., 1991). Also, others have found marginally significant differences in body composition

between smokers and non-smokers, with the former having a lower percentage body fat (Conway & Cronan, 1992). Furthermore, it has been documented that smoking has some effects on body fat distribution by increasing waist circumferences (Seidell et al., 1991; Selby et al., 1990).

Justification

It is well-documented (Klesges et al., 1989; Williams et al., 1991) that weight gain is inversely related to smoking cessation. However, the type of weight gain, body fat or lean body mass, is not well proven. There are differing consequences for the various types of weight gain. If it is revealed that lean body mass in increased in former smokers, then there will be less concern. However, since total weight gain is the only factor considered in most literature, it is necessary to determine the effects of smoking on body composition in order to determine if, in addition to other harmful effects, smoking affects the percentage of lean body mass.

In recent studies on the body composition of smokers, non-smokers, and ex-smokers very few, if any, of the possible confounding variables have been controlled. There are a number of variables that may affect body composition that need to be accounted for so that body composition and its link to smoking may be more accurately determined. In this study, these variables will be considered.

Statement of Problem

In today's society there is an emphasis on slenderness. It is documented by Klesges et al. (1989) that in general, smokers weight less than non-smokers, smokers who quit gain weight, and those who start smoking lose weight. These effects are likely to override the long term benefits of smoking cessation, thus preventing smokers from abstaining from their habit (Klesges & Klesges, 1988; Williamson et al., 1991). Little research has studied the effects of smoking on body composition. The purpose of this study is to determine if there are differences among the body compositions of smokers, non-smokers, and ex-smokers, after controlling for age, ethnicity, family income, diet, physical activity, marital status, menopause, oral contraceptive usage, and alcohol intake.

Hypothesis

The purpose of this research study is to determine if there is a significant difference among the percentage of body fat in smokers, non-smokers, and ex-smokers after controlling for possible confounding variables.

Extent of Study

Delimitations of Study

1. The subjects will be limited to females who fully completed a CIGNA health risk appraisal.
2. All subjects have residence in the Southwestern United States.
3. Generalizations about other populations cannot be made from the results of this research.

Limitations of the Study

1. A larger sample size may have been selected which encompassed the entire United States.
2. No attempt was made to randomly select the sample subjects.
3. Information on participants smoking habits were self-reported.
4. Body composition was measured using a three site protocol.

Assumptions

1. Subjects completed the CIGNA health risk appraisal honestly and accurately.
2. Data collectors were knowledgeable and qualified in their various areas.

Definition of Terms

The following are terms, both functional and conceptual, that are used in this study:

Functional: The following are defined for their intent within the realms of this study

Smoker - A person who currently smokes cigarettes, regardless of the number smoked per day.

Non-smoker - A person who does not, and never has, smoked cigarettes.

Ex-smoker - A person who had quit smoking at the time the questionnaire was completed and testing was accomplished.

Smoking Cessation - The act of discontinuing smoking behaviors.

Conceptual: The following terms are specific definitions used in a general way.

Body Composition - The proportion of fat, muscle, and bone making up the body. Usually expressed as percent of body fat and percent of lean body mass (Neiman, 1990).

Body Fat - Essential fat, that is necessary in certain body structures, such as the brain and bone marrow, plus storage fat, a depot for excess energy (Williams, 1992).

Body Mass Index (BMI) - An index used to access weight relative to height by dividing body weight, in kilograms, by height, in meters squared [wt/ht^2]. Considered a good indicator of total body composition (American College of Sports Medicine [ACSM], 1991).

Lean Body Mass - The body weight minus the body fat, composed primarily of muscle, bone, and other non-fat tissue (Williams, 1992).

Skinfold Measurement - The most widely used method for determination of obesity based on the thickness of a double fold of skin at various sites (ACSM, 1991).

Waist/hip Ratio - A measure of regional fat distribution which is the abdominal or waist circumference (measured at the narrowest section of the waist as seen from the front) divided by the gluteal or hip circumference (measured at the largest circumference including the buttocks).

CHAPTER II

REVIEW OF THE LITERATURE

An extensive review of the literature revealed numerous studies relating body weight in smokers, non-smokers, and ex-smokers. However, research on body composition and these groups is less prevalent. The proceeding literature review contains pertinent research on the topic of concern.

Smoking Status and Body Composition

Using Swedish women, Lissner et al. (1992) found that smokers were significantly less obese than non-smokers with the same body mass index (BMI). Selby et al. (1990) measured subscapular/triceps ratios, waist/hip ratios, regression adjusted subscapular skinfolds, and waist circumference indices for participants in the Third Examination of the National Heart, Lung, and Blood Institute's Twin study. Among the behaviors studied, cigarette smoking was related to waist/hip ratio and adjusted waist circumference index with pack-years of smoking expressed in tertiles. However, no relation with either skinfold index was discovered. A study by Klesges et al. (1990) showed different results when evaluating the relationship between smoking status and body fatness, after

controlling for dietary intake and physical activity in adults. Researchers measured triceps, subscapular, and chest skinfold thickness and waist and hip girth measurements. Findings indicated that smokers had a lower estimated body fat when calculated by the multiple skinfold thickness assessment. However, smokers reported the same total energy intakes and lower levels of physical activity as non-smokers. Similarly, Klesges, Meyers, and Klesges (1991) evaluated the relationship between smoking status and BMI while controlling for dietary intake, physical activity and demographics. Results showed that body fat levels for non-smokers, long term quitters, and low-rate current smokers were not significantly different. Both medium and high-rate current smokers body composition's were not significantly different from non-smokers. However, medium and high-rate current smokers weighed less than both non-smokers and low-rate smokers. A U-shaped relationship existed between smoking and BMI in males, and L-shaped relationship among females with medium and high-rate smokers associated with lower relative body weight. Another study by Troisi et al. (1991) found consistent findings in which current smokers had more central adipose tissue as measured by abdomen/hip circumference ratio, than non-smokers and ex-smokers after controlling for age, BMI, dietary and alcohol intakes, and physical activity. When cigarettes per day were divided into tertiles, abdomen/hip ratio was significantly greater in subjects smoking 36-60 cigarettes

per day, than those smoking less than 30 cigarettes per day. Even though smokers have increased central adipose tissue, a decrease in relative adiposity was revealed.

Moffat and Owens (1991) examined smoking's effect on body weight, body fat, resting metabolic rate (RMR), and caloric consumption. After weight was determined by a balance scale and body fat was calculated by hydrostatic weighing, non-smokers weighed more, but were not fatter than smokers. It was determined that smoking cessation leads to increased body weight due to decreased RMR and increased caloric intake, with the resultant body weight gain attributable to increases in body fat.

Seidel et al. (1991) examined 512 European men and found smoking habits not related to BMI. However, heavy smokers had larger waist circumferences and waist/hip ratios than non-smokers, after adjusting for BMI and educational levels. An examination of the behavioral and psychosocial correlates of middle-aged women who were participants in the Healthy Women's Study. Researchers found that upper body fat was associated with smoking, thus, showing a correlation between waist/hip ratio and number of cigarettes smoked per day.

Finally, Conway and Cronan (1992) showed evidence of an association between smoking and exercise activities, and the independent effect of these factors of general fitness. Only a small difference between percentage body fat and

smoking was revealed, with the largest difference among current and non-smokers and former smokers.

Smoking Status and Weight Gain

A large percentage of the literature available on smoking status and weight gain came to the conclusion that as one quits smoking there is a tendency to gain weight. However, the extent of the weight gain is not universally accepted. A research article by Klesges et al. (1989) reviewed 70 cross-sectional and longitudinal investigations to determine the relationship between smoking and body weight and its effect on smoking initiation, maintenance, and relapse. It was concluded that smokers weigh less than non-smokers, those who quit smoking gain weight, and those who start smoking lose weight. However, the determinants of the changes in body weight were not established.

When examining possible determinants, Winder and Grundberg (1990) studied the effect of nicotine on albino male rats. Due to nicotine's effect on body fat stores, the study concluded that the administration of nicotine was associated with decreasing weight, and that cessation accelerated weight gains. Hall, Ginsberg, & Jones (1986) studied nicotine intake, history of high body weight, and eating behaviors as determents of weight gain. Research yielded no correlation among the above variables, and subjects abstaining for one year gained more that relapsers. Also, the number of cigarettes smoked and past maximal body

weight correlated positively with weight gain, while scores on the Disinhibition scale (measure for uncontrolled eating) did not. Finally, Williamson et al. (1991) related changes in body weight to changes in smoking status for participants in the First National Health and Nutrition Examination Survey (NHANES 1). After controlling for age, race, level of education, alcohol use, illness related to change in weight, baseline weight, and physical activity, the mean weight gain associated with smoking cessation was established as 2.8 kilograms in men and 3.8 kilograms in women. Subjects of either sex, blacks, people under age 55, people who smoked 15 cigarettes or more per day, sustained quitters, underweight smokers, and sedentary subjects are at higher risk for weight gain. It was concluded that major weight gain (>13kg) was related to smoking cessation, but occurred only in a small percentage of those who stopped smoking.

Mechanisms Related to Weight Gain

Research on the mechanisms related to the weight gain experienced upon smoking cessation has not yielded a widely accepted theory. Perkins et al. (1989) studied the effects of nicotine on resting metabolic rate (RMR) as a determinant of weight gain. They concluded nicotine significantly affected RMR, increasing it six percent above baseline values. Differences were found with the administration of low and moderate doses of nicotine, but the differences

between the two doses was not significant. Perkins et al. (1989) determined that with the administration of approximately 20 cigarettes per day, RMR increased by six percent. They established that the change could be due to nicotine's affect on RMR. Therefore, upon cessation, when nicotine's affect on RMR is no longer present, weight gain may occur.

Hofstetter et al. (1986) studied eight cigarette smokers and concluded that there exists a 24 hour increase in energy expenditure following administration of nicotine. Researchers observed a 10 percent increase in energy expenditure and 20 percent increase in heart rate (HR), even though there was no change in physical activity or mean basal metabolic rate. In accordance with Perkins et al. (1986), when subjects stopped smoking, RMR, HR, and energy expenditure dropped to normal values. This return to baseline values may be attributed to ex-smokers weight gain.

Another study on the changes in energy balance following smoking cessation was conducted by Perkins et al. (1990). Energy balance increased during smoking and decreased, usually to baseline values, during cessation. After smokers quit, caloric intake increased, RMR decreased, physical activity remained constant, and, in all but one case, sensitivity to or preference for sweet or bitter foods stayed constant.

Dietary patterns of smokers and non-smokers were examined by Larking et al. (1990) to determine if there was

a difference in the two groups that may contribute to smoking cessation weight gain. There was no significant difference in kilocalorie intake among smokers, non-smokers, and ex-smokers. All groups ate the same mean amounts of the four basic food groups, however, quitters ate more candy and drank more alcoholic and non-alcoholic beverages, excluding carbonated beverages.

General Reference

In addition to literature on smoking status, weight gain and body composition, general aspects of smoking were reviewed by the researcher. Bates (1987) reviewed updated literature on smoking and health in order to describe a stress-cigarette model and successful components to use in smoking cessation programs. The article documented that weight gain is a major rationalization used by quitters for relapse and, in general, smokers weigh 7 to 10 pounds less than non-smokers. Sorenson and Pechacek (1987) also examined smoking cessation by looking at sex differences in attitudes toward smoking cessation. No sex difference was found in the percent of smokers who attempted to quit at least once in the past. However, since women express a greater concern with post cessation weight gain, and worry less about health benefits of stopping, men were more interested in quitting. The study suggests that strategies for cessation need to assist women with weight maintenance

during and after they quit smoking, as well as acceptance of small weight gains.

Similarly, Waldron (1991) showed evidence suggesting that both the general emphasis on appearance of females and the ideal beauty being slender, resulted in increased numbers of women smoking cigarettes to control body weight. Klesges & Klesges (1988), concluded that weight gain following smoking cessation, particularly among females, plays a role in relapse and barrier to smoking cessation. Researchers determined that 10 percent of males and 15 percent of females began to smoke for weight control purposes, thus 32.5 percent of all smokers use smoking as a weight loss strategy.

Summary

Of the literature reviewed, most authorities agree that there exists an inverse relationship between smoking and body weight. However, the extent of this relationship has not been established. On the other hand, the relationship between smoking and body composition is not widely accepted. This area is understudied, especially in terms of controlling for possible confounding variables. Studies on the mechanisms responsible for changes in body weight, or possible changes in body composition, have been researched. These studies concluded that changes in heart rate, resting metabolic rate, energy expenditure, and energy balance are linked to changes in body weight and composition.

CHAPTER III

PROCEDURES FOR RESEARCH

The research is a cross-sectional study investigating the body compositions of smokers, non-smokers, and ex-smokers. This section discusses the methods and procedures used in this study.

Population and Sampling

The subjects sample consisted of 773 females drawn from a population of over 2,000 participants in a corporate health promotion program. All subjects were adult working women in a large corporation in the Southwestern United States. Each participant was required to complete a personal health risk appraisal (HRA) prior to a laboratory examination (see Appendix A).

Methods and Procedures

Information on each subject's age, ethnicity, family income, diet, smoking habits, alcohol consumption, marital status, menopause and oral contraceptive usage was collected from self-reported answers on the HRA questionnaire.

The HRA questionnaire asked the participants to fill in their date of birth and age in years. Subjects indicated

their race by selecting one of the following cultural groups: 1) Black, 2) White, 3) American Indian, 4) Oriental, 5) Hispanic, 6) Other. Family income information asked subjects to select one of the following income levels: 1) Under $10,000/ year, 2) $10,000-$20,000/ year, 3) $20,001-$40,000/ year, 4) More than $40,000/ year. Marital Status categories include: 1) Single, 2) Married, 3) Divorced, 4) Widowed, 5) Separated.

Dietary information was gathered on how many times per week subjects consumed the following items: 1) Pie, cake, doughnuts, sweet rolls, 2) Whole milk, 3) Butter, margarine (teaspoon), 4) Potato chips, corn chips, french fries, 5) Pork, bacon, sausage, 6) Hot dogs, lunchmeats, processed meats, 7) Eggs, 8) Hard cheese, cottage cheese, soft cheese, 9) Salad oil, sourcream, mayonnaise. Subjects were asked to indicate their smoking status by checking one of the following categories: 1) I do not smoke and never have, 2) I currently smoke cigarettes, 3) I used to smoke cigarettes, but I stopped. Alcohol categories include: 1) I do not drink alcohol and never have, 2) I consume 0-2 drinks per day, 3) I consume more than two drinks per day. Information on menopause and use of oral contraceptives was also gathered.

Biological data for body composition and physical fitness levels were determined through laboratory examinations. Body composition was calculated using Harpenden skin calipers and a three site protocol. The

three sites in which skinfold thickness was measured, in millimeters, was the chest, iliac crest and thigh. Age, gender, and the sum of the three skinfolds, was used to determine percentage body fat.

Physical fitness was determined using a Biogard 990 bicycle ergometer and the Astrand Ryming test. Maximum oxygen uptake was estimated from the submaximal test and combined with age and sex.

Statistical Analysis

Data from each of the variables of age, race, income, diet, smoking status, alcohol consumption, marital status, menopause, oral contraceptive usage, body composition, and fitness levels were collected for statistical analysis. After collection, the data was uploaded to the mainframe at Oklahoma State University, and analyzed with S.A.S. (see Appendix B). Next, R-square was calculated to determine the amount of variance accounted for. Finally, an analysis of covariance was conducted to control for the possible confounding variables described by the study.

CHAPTER IV

ANALYSIS OF DATA AND DISCUSSION

Analysis Of Variance And Follow-Up

An analysis of variance procedure (ANOVA) was conducted on smoking and body composition data to determine if a significant difference exists between body composition and smoking. The ANOVA yielded an F-value of 2.00 and a P of 0.056. This, revealed a significant difference between body composition and smoking (see Table I).

TABLE I

ANALYSIS OF VARIANCE (SMOKING)

	Sum of Squares	Mean Square	df	F	p
Body Fat	334.0	167.0	2	2.00	0.05

Duncan's Multiple Range test was calculated as a follow-up test for ANOVA to determine if there was a difference between body composition and smoking when

subjects were divided into one of three categories; smokers, non-smokers, and ex-smokers. Cell sizes for smokers, non-smokers, and ex-smokers were 131, 449, and 193, respectively. There was a significant difference between the body composition of ex-smokers and smokers ($p<0.05$). No significant difference in body composition was found between ex-smokers and smokers or non-smokers and current smokers (see Table II).

TABLE II

DUNCAN'S FOLLOW-UP

	n	Mean
Non-smoker	449	30.2853_{a}
Ex-smoker	193	$30.8990_{a,b}$
Smoker	131	28.8565_{b}

Note: Means with the same subscript are not significantly different

Analysis Of Covariance And Follow-Up

The purpose of the analysis of covariance (ANCOVA) was to determine if a difference exists between smoking and body composition after controlling for possible confounding variables. After excluding subjects with incomplete data,

the sample's corrected total was 567 observations. The statistical test indicates a significant difference between smoking and body composition: p-0.0001; F-value 23.24 (see Table III).

TABLE III

ANALYSIS OF COVARIANCE (SMOKING)

	Sum of Squares	Mean Square	df	F	p
Body Fat	13713.2	761.8	18	23.24	0.00001

The procedure controlled for the possible confounding variables of age, ethnicity, physical activity, marital status, menopause, oral contraceptive usage, alcohol intake, and family income. By controlling these variables, researchers accounted for 0.43 (43%) of the total variance in body composition measures. Variables that were significantly related ($p<0.05$) to body composition include alcohol consumption ($p<0.0013$) and physical fitness ($p<0.0001$). Refer to Table IV (next page) for statistics pertaining to each categorical variable.

TABLE IV

STATISTICS FOR INDIVIDUAL VARIABLES

	Mean Root Sq.	df	F	p
Alcohol	221.3	2	6.75	0.0013*
Fitness	12592.7	1	384.10	0.0001*
Oral Contraceptives	12.5	1	0.38	0.5375
Diet	91.1	1	2.78	0.0961
Menopause	17.7	1	0.54	0.4623
Age	21.5	1	0.66	0.4101
Family Income	17.9	3	0.55	0.6490
Race	50.5	5	1.54	0.1759
Marital Status	85.0	1	2.59	0.1080

The ANCOVA follow-up test utilized a general linear model procedure, involving the least squares means. A significant difference between the body composition of non-smokers and current smokers ($p<0.0229$) and ex-smokers and current smokers ($p<0.0201$) was indicated. There was not a significant difference between the body composition of ex-smokers and non-smokers ($p<0.6506$)(refer to Table V).

TABLE V

ADJUSTED LEAST SQUARES MEANS FOR THREE SMOKING GROUPS

	Mean	SD	p
Non-smoker	29.2_a	1.42	0.6507
Ex-smoker	29.7_a	1.45	0.0201
Smoker	27.5_b	1.52	0.0229

Note: Means with same subscripts are not significantly different

Statistics for each variable is further broken down categorically in Table VI.

TABLE VI

VARIABLE ANALYSIS

Variable	n	Mean % Body Fat	SD
Race:			
Black	16	31.5	5.58
White	685	29.9	7.61
American Indian	10	31.4	4.14
Oriental	5	25.4	11.20
Hispanic	60	32.7	7.84
Other	6	31.0	0.21
Family:			
Under $10,000/Year	25	31.3	6.87
$10,000-$20,000/Year	184	30.8	8.10
$20,001-$40,000/Year	310	30.2	7.76
More than $40,000/Year	227	29.3	7.04
Marital Status:			
Single	130	27.9	8.60
Married	502	30.5	7.41
Divorced	117	31.2	7.23
Widowed	15	32.7	7.15
Separated	17	30.2	6.70
Spouse: *			
Yes	502	30.5	7.42
No	279	29.7	8.01
Menopause:			
No	780	30.2	7.64
Yes	13	31.2	6.36
Oral Contraceptive Usage:			
No	752	30.3	7.60
Yes	41	28.6	7.99
Alcohol Intake:			
0 Drink/Day	227	32.0	7.46
0-2 Drinks/Day	454	29.8	7.47
> 2 Drinks/Day	112	28.5	7.92

Note: * by *Spouse* indicates marital status was further grouped into those who are married and those who are single, divorced, widowed, or separated.

Discussion

In accordance with Lissner et al. (1992) and Klesges et al. (1990), this study revealed that smoking is significantly related to body composition. The ANOVA procedure yielded a significant difference between body composition and smoking ($p>0.05$) without controlling for possible confounding variables. After conducting Duncan's Follow-up procedure, results indicated a significant difference between the body composition of smokers and ex-smokers ($p<0.05$). However, the body composition of neither ex-smokers and non-smokers, nor non-smokers and current smokers revealed a significant difference.

At this point the exact mechanism for changes in body composition among smokers, non-smokers, and ex-smokers has not been widely accepted. Therefore, an analysis of covariance was calculated to determine if a significant difference still exists between body composition and smoking after controlling for the variables of age, ethnicity, physical activity, marital status, menopause, oral contraceptive usage, alcohol intake, and family income. This procedure accounted for 43% of the variance. In addition, a significant difference between smoking and body composition was still prevalent after controlling for the confounding variables. Individually, none of the variables were found to be significantly different to body composition, excluding alcohol consumption ($p<0.013$) and

physical fitness ($p<0.0001$), which were significantly different at the 0.05 level.

After performing the ANCOVA, it was deemed necessary to determine if a significant difference exists between body composition and the three levels of smoking status. An adjusted least squares means for the three smoking groups was computed which yielded significant differences between non-smokers and ex-smokers ($p<0.0229$) and ex-smokers and smokers ($p<0.0201$). This differs from the results of the Duncan's Follow-up test which ascertained the significant relationship to be between smokers and ex-smokers only. This revealed that controlling for confounding variables did have an affect on the results.

The results of this study can be both compared and contrasted with previous research. The findings of this study are in agreement with previous research by Klesges et al. (1990) who found, after controlling for dietary intake and physical activity, smokers had a lower estimated body composition than non-smokers. Similarly, Conway and Cronan (1992) determined a small significant association exists between current and ex-smokers, which was also established in this research. However, unlike this study the research by Conway and Cronan (1992) yielded an association between the body composition of smokers and non-smokers. Research by Moffat and Owens (1991) contradicts the findings in this study. They determined no significant relationship existed between the body composition of smokers and non-smokers.

Due to the results of the statistical analysis, it was determined that some component of smoking, such as nicotine's effect on body composition or RHR (Perkins et al., 1989; 1990) may be the mechanisms responsible for the apparent changes in body composition after smoking cessation. After the ANCOVA was performed, only two of the possible confounding variables, alcohol consumption and physical fitness, were related to body composition. This, in addition to controlling 43% of the variance, supports the claim that nicotine is the main factor related to the changes in body composition. If a significant difference was established between non-smokers and ex-smokers, or non-smokers and smokers, then suggesting nicotine as a main determinant in body composition changes would be invalid, since non-smokers have not been exposed to nicotine or its effects.

This research project yielded strong significant differences between body composition and smoking, and between the body composition of non-smokers and ex-smokers after controlling for possible confounding variables. However, certain factors could diminish the strength of these findings. This study did not control for the number of cigarettes smoked per day. Previous research has established the number of cigarettes smoked per day is directly related to weight gain. This, in turn, may have a bearing on our results. In addition, this project did not

take into consideration dietary intake or physical activity, both of which directly affect body composition.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Numerous studies have been conducted comparing the relationship between smoking status and weight gain. However, research on smoking status and body composition are less prevalent. This study is designed to add to this base of knowledge by comparing the body composition of smokers, non-smokers, and ex-smokers.

The sample consisted of 773 adult females employed by a large corporation in the Southwestern United States who participated in a health promotion program. Data was collected through self-reported answers on a Cigna Health Risk Appraisal followed by a laboratory examination. The data obtained for the study was analyzed by the following procedures:

1. Analysis of variance - Determines if a difference exists between body composition and smoking.
2. Duncan's Multiple Range Test - A follow-up test for ANOVA which determines if a significant difference exists among the body composition of smokers, non-smokers, and ex-smokers.

3. Analysis of Covariance - Determines if a significant difference exists between smoking and body composition after controlling for possible covariates.
4. Adjusted Least Squares Means - Follow-up test which determines if, after controlling for possible covariates, a significant difference exists among smokers, non-smokers, and ex-smokers.

Findings

The hypothesis of this study (as stated in null form) is there is no difference among the percentage body fat in smokers, non-smokers, and ex-smokers after controlling for possible confounding variables. After statistically analyzing the data obtained in this study, the following conclusions can be stated:

1. A significant difference was found to exist between the three groups and body composition without controlling for covariates.
2. No significant difference was revealed between the body composition of ex-smokers and non-smokers, or non-smokers and current smokers.
3. A significant difference between the body composition of ex-smokers and the body composition of smokers was indicated.

4. There was a significant difference between the three groups and body composition after controlling for eight possible confounding variables.
5. Of the eight variables controlled, there exists a significant difference between alcohol consumption and body composition, and physical fitness and body composition.
6. After controlling for confounding variables, there exists a significant difference between the body composition of non-smokers and smokers, and ex-smokers and smokers.
7. No significant difference exists between the body composition of ex-smokers and non-smokers after controlling for eight possible confounding variables.

Conclusions

Based on the findings of this study, it can be concluded that even though smokers have a lower percentage body fat than non-smokers, the negative effects of smoking, such as increased risk of heart disease and various cancers, outweigh the decrease in body fat. Since today's society places emphasis on being lean and slender as the ideal, changes in body composition may hinder some individual's ability to quit smoking. Therefore, smoking cessation needs to be directed towards education. By instructing people on

healthy diets and aerobic exercise techniques to help decrease unwanted changes in body composition, participants can learn to control body composition without smoking.

Recommendation

In consideration of the results of this study, the following are suggested areas for further research.

1. Since the results of this study cannot be generalized to other groups, replicating this study using a more diverse population would be advantageous. This (these) study (studies) may include the following areas:
   A. males and females.
   B. individuals residing in other areas around the United States, not just in the Southwestern region.
   C. unemployed as well as employed participants.
2. Studies involving individual genetic predispositions towards obesity.
3. Longitudinal studies investigating long term effects smoking status plays on changes in body composition.
4. Studies to determine what mechanism is most related to changes in body composition.

5. Use the results of this study, namely the affects of smoking on body composition to educate individuals. Present the individuals with information that will aid in smoking cessation, or better yet, prevent people from starting.

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APPENDIXES

APPENDIX A

CIGNA HEALTH RISK APPRAISAL

CIGNA HEALTHPLAN
PERSONAL HEALTH ASSESSMENT

LEARN ABOUT YOUR HEALTH–
DEVELOP A HEALTHY LIFESTYLE

PERSONAL HEALTH ASSESSMENT: COMPLETING THIS QUESTIONNAIRE BENEFITS YOU

What's Involved

The few minutes you take to complete your Personal Health Assessment could be some of the most important minutes in your life.

Although this questionnaire is not a substitute for periodic health examinations by a physician or other health professional, it will help you identify your health risks, realize how serious they might be and what you can do to them.

The Personal Health Assessment consists of this questionnaire and a confidential report that is called your Personal Health Report. In completing this questionnaire, you will be asked to provide information about your past medical history, any problems and/or symptoms you may have and general information about your lifestyle and habits.

Confidentiality

CIGNA Healthplan, Inc., and Medical Datamation, Inc., understand your concern about confidentiality. All of your information will be handled in a strictly confidential manner in accordance with the highest degree of medical ethics.

CIGNA Healthplan: A Future of Growth

CIGNA Healthplan, Inc., a wholly-owned subsidiary of CIGNA Corporation, is already the largest investor-owned provider of prepaid health care in America. We expect the coming years to witness a growth pattern which will bring the benefits of CIGNA Healthplan to an ever-expanding list of locations throughout the United States.

CIGNA Healthplan remains in the forefront, changing the way health care services are delivered and financed — helping to shape a new era in the delivery of quality medical care to people regardless of their economic status.

CIGNA Healthplan promises excellent health care as well as excellent service assured by our National Service Standards and all at an affordable price. Because with the emphasis now on prevention, early detection and outpatient care, the incentives are decidedly in favor of getting people well, keeping them well, and keeping them out of the hospital.

MARKING INSTRUCTIONS

Completing this Health Assessment will take about 30 minutes of your time. You will receive information designed to help you improve your current health status.

DIRECTIONS

- Do not fold, staple, or make stray marks on this form.
- Use a black lead number 2 pencil only.
- Fill in the answer CIRCLES completely. Erase cleanly any answers you wish to change.
- Do not mark with x's or checkmarks.
- Take your time and try to answer each question accurately. You may skip a question if you find it too personal. However, incomplete data will result in a less precise and accurate Health Assessment.

SAMPLE MARKS

RIGHT WRONG

EXAMPLES

TODAY'S DATE 10 15 85
Month Day Year

LAST NAME O'MALLEY
Please Print

HOME ADDRESS 1346 MAPLE AV
House or Box Number, Street

WHEN WERE YOU BORN?

MO.	DAY	YR.
01	24	51

HEIGHT

FEET	INCHES
5	08

1

Fill in the USER Fields at the right only if instructed to do so.

USER ONE USER TWO

138417

2 IDENTIFICATION

We need your name and address in order to return your educational report to you. Demographic data, social security number, age, height, weight, etc. are necessary to accurately develop your Health Assessment report and compare your health status to similar population types.

TODAY'S DATE
1 Month Day Year

LAST NAME
2 Please Print

FIRST NAME
3

MI
4

HOME ADDRESS
5 House or Box Number, Street

CITY
6

STATE
7

ZIP CODE
8

FOREIGN COUNTRY IDENTIFICATION
9 For individuals living outside the United States, enter your country's code.

3 DEMOGRAPHIC DATA

TELEPHONE
1 AREA NUMBER

SOCIAL SECURITY NO.
2

WHEN WERE YOU BORN?
3 MO. DAY YR.

AGE
4 YEARS

HEIGHT
5 FEET INCHES

WEIGHT
6 LBS.

RACE
7
- Black
- White
- American Indian
- Oriental
- Hispanic
- Other

MARITAL STATUS
8
- Single
- Married
- Divorced
- Widowed
- Separated

SEX
9
- Male
- Female

FAMILY INCOME
10
- Under $10,000/year
- $10,000 - $20,000/year
- $20,001 - $40,000/year
- More than $40,000/year

HABITS AND LIFESTYLE

The following section on habits and lifestyle begins with your EATING HABITS. Your particular eating traits as well as those associated with exercise, smoking, alcohol use, trauma exposure, and how you handle stress all bear on your longevity and well-being.

EATING HABITS

	YES	NO	Do you usually or generally-
1	○	○	Eat three meals a day?
2	○	○	Follow a weight reduction diet?
3	○	○	Follow a low cholesterol diet?
4	○	○	Tend to skip breakfast?
5	○	○	Eat snacks between meals or after supper?
6	○	○	Eat fried foods five or more times per week?
7	○	○	Have an intense fear of gaining weight?
8	○	○	Tend to have eating binges followed by self-induced vomiting or use of laxatives?
9	○	○	Follow a strict vegetarian (no milk, meat or eggs) diet?
10	○	○	Follow an ovo-lacto vegetarian (eat eggs, milk) diet?
11	○	○	Tend to eat excessively when exposed to stress?
12	○	○	Eat out five or more times per week?

Mark how often you eat the foods listed. Note that a SERVING is SMALL, about the amount in a frozen packaged meal or inflight meal. If you eat LARGER SERVINGS, COUNT AS TWO or more. There is an overlap in content between the following two sections; we account for this in analyzing your results.

For One Day — Servings Per Day

Type of Food	Don't Eat	Seldom Eat	1	2	3	4	5 or More
13 Fruit or fruit juices	○	○	○	○	○	○	○
14 Potatoes, turnips, carrots, parsnips	○	○	○	○	○	○	○
15 Leafy vegetables (lettuce, cabbage)	○	○	○	○	○	○	○
16 Rice, macaroni, pastas	○	○	○	○	○	○	○
17 Whole grain bread, rolls, cereals	○	○	○	○	○	○	○
18 White bread, rolls, regular cereals	○	○	○	○	○	○	○
19 Pie, cake, doughnuts, sweet rolls	○	○	○	○	○	○	○
20 Meat/meat substitutes (beef, pork, cheese, poultry, fish)	○	○	○	○	○	○	○
21 Legumes, nuts, peanut butter	○	○	○	○	○	○	○
22 Skim milk, 2% milk	○	○	○	○	○	○	○
23 Whole milk	○	○	○	○	○	○	○
24 Butter, margarine (teaspoons)	○	○	○	○	○	○	○
25 Soft drinks (regular, non-diet)	○	○	○	○	○	○	○
26 Caffeinated coffee, tea, cola	○	○	○	○	○	○	○
27 Beer, wine, or mixed drinks	○	○	○	○	○	○	○
28 Salt-shaker use	○	○	○	○	○	○	○
29 Potato chips, corn chips, french fries	○	○	○	○	○	○	○
30 Sugar (teaspoons)	○	○	○	○	○	○	○

For One Week — Servings Per Week

Type of Food	Don't Eat	Seldom Eat	1	2	3	4	5 or More
31 Beef or lamb	○	○	○	○	○	○	○
32 Pork, bacon, sausage	○	○	○	○	○	○	○
33 Hot dogs, lunchmeats, processed meats	○	○	○	○	○	○	○
34 Poultry, fish	○	○	○	○	○	○	○
35 Shrimp, lobster, clams	○	○	○	○	○	○	○
36 Eggs	○	○	○	○	○	○	○
37 Hard cheese, cottage cheese, soft cheese	○	○	○	○	○	○	○
38 Ice cream, milk shakes	○	○	○	○	○	○	○
39 Salad oil, sour cream, mayonnaise	○	○	○	○	○	○	○
40 Candy	○	○	○	○	○	○	○

5 EXERCISE HABITS

Mark the PHYSICAL ACTIVITY LEVEL usually required by your JOB or DAILY ROUTINE (a few occupations are shown as examples).

	LOW			MODERATE			HEAVY		
1	①	②	③	④	⑤	⑥	⑦	⑧	⑨

Office Work — Assembly Line — Lumberjack/Heavy Manual Labor

	YES	NO	Do you-
2	○	○	Know how to monitor your exercise level by taking your pulse?
3	①	②	Get regular vigorous exercise, such as jogging, for at least 20 minutes, 3 times per week?
4	①	②	Get some type of REGULAR EXERCISE?

If "yes" for REGULAR EXERCISE, mark HOW OFTEN AND HOW LONG per session for each type. If "no", go to unit [6].

	Don't Do This	How Often (Times/week) 1	2	3	4	5+	How Long (Minutes/session) 15	30	45	60+
Aerobics	5 ○	○	○	○	○	○	24 ○	○	○	○
Walking slow (20 min/mile)	6 ○	○	○	○	○	○	25 ○	○	○	○
Walking fast (15 min/mile)	7 ○	○	○	○	○	○	26 ○	○	○	○
Jogging (10 min/mile)	8 ○	○	○	○	○	○	27 ○	○	○	○
Running (8 min/mile)	9 ○	○	○	○	○	○	28 ○	○	○	○
Cycling slow (6 mph)	10 ○	○	○	○	○	○	29 ○	○	○	○
Cycling fast (12 mph)	11 ○	○	○	○	○	○	30 ○	○	○	○
Swimming slow (25 yds/min)	12 ○	○	○	○	○	○	31 ○	○	○	○
Swimming fast (50 yds/min)	13 ○	○	○	○	○	○	32 ○	○	○	○
Racquet sports (doubles)	14 ○	○	○	○	○	○	33 ○	○	○	○
Racquet sports (singles)	15 ○	○	○	○	○	○	34 ○	○	○	○
Calisthenics	16 ○	○	○	○	○	○	35 ○	○	○	○
Dancing	17 ○	○	○	○	○	○	36 ○	○	○	○
Basketball, football or similar sport	18 ○	○	○	○	○	○	37 ○	○	○	○
Weight training	19 ○	○	○	○	○	○	38 ○	○	○	○
Golf or bowling	20 ○	○	○	○	○	○	39 ○	○	○	○
Downhill skiing	21 ○	○	○	○	○	○	40 ○	○	○	○
Cross country skiing	22 ○	○	○	○	○	○	41 ○	○	○	○
Rowing	23 ○	○	○	○	○	○	42 ○	○	○	○

6 SMOKING HABITS

Mark items that apply to SMOKING.

1 ○ I do not smoke and never have. If so, go to unit [7].
2 ○ I currently smoke cigarettes.
3 ○ I used to smoke cigarettes, but I stopped.
4 ○ I smoke a pipe/cigar and inhale 5 or more times per day.
5 ○ I would like to quit smoking

If you have EVER SMOKED CIGARETTES, mark daily amount and total number of years you have smoked.

Daily Amount	Number of Years
6 ○ ½ pack/day or less	7 ○ Less than 1 year
○ ½ - 1 pack/day	○ 1 - 5 years
○ 1 - 2 packs/day	○ 6 - 10 years
○ 2 packs or more/day	○ More than 10 years

If you FORMERLY SMOKED CIGARETTES BUT STOPPED, mark number of years since you have stopped.

8 ○ 1 year	○ 5 years
○ 2 years	○ 6 years
○ 3 years	○ 7 years
○ 4 years	○ More than 7 years

7 STRESS AND FEELINGS

Mark any CHANGES you have experienced IN THE PAST YEAR.

1 ○ Spouse died
2 ○ Close family member died
3 ○ Moved to a new town
4 ○ Changed jobs
5 ○ Son or daughter left home
6 ○ You left home
7 ○ Close friend died
8 ○ Got divorced or separated
9 ○ Lost a lot of money
10 ○ Took on a lot of debt
11 ○ Got married
12 ○ Lost job or retired
13 ○ Close relationship ended
14 ○ Developed major health problem
15 ○ I had NONE of the above CHANGES.

Mark the ONGOING SITUATIONS that you often face.

16 ○ Pressure at work, school
17 ○ Medical problems
18 ○ Facing deadlines
19 ○ Financial problems
20 ○ Sexual problems
21 ○ Trouble with family
22 ○ Meeting family demands
23 ○ Emotional problems
24 ○ Marital difficulties
25 ○ Trouble with relationships
26 ○ Trouble with co-workers
27 ○ Time management problem
28 ○ I face NONE of the above SITUATIONS.

Mark the WAYS you usually RESPOND TO STRESS.

29 ○ Get more physical exercise
30 ○ Take a hot bath, shower
31 ○ Escape through reading, hobbies, social activities, music
32 ○ Eat more
33 ○ Drink more alcohol
34 ○ Smoke more
35 ○ Spend quiet time alone, relaxing
36 ○ Ventilate your feelings (let off steam)
37 ○ Talk things over with a relative or friend
38 ○ Use the "relaxation response" or other stress technique
39 ○ Meditate or pray
40 ○ Remain calm outside while getting upset inside
41 ○ Walk away from stressful situations when possible
42 ○ I respond in NONE of the above WAYS.

Mark the TRAITS that usually apply to you.

43 ○ Rapid speech
44 ○ Highly competitive
45 ○ Hard-driving
46 ○ Never late
47 ○ Impatient
48 ○ Rushed
49 ○ Interrupt others
50 ○ I have NONE of the above TRAITS.

Mark HOW OFTEN you have the REACTIONS or TENDENCIES listed.

M = Most of the time S = Some of the time R = Rarely or none of the time

	M	S	R			M	S	R	
51	○	○	○	Cold, sweaty palms	57	○	○	○	Trouble sleeping
52	○	○	○	Tight neck muscles	58	○	○	○	Fast, pounding heart
53	○	○	○	Cry easily	59	○	○	○	Queasy stomach, "butterflies"
54	○	○	○	Grind teeth	60	○	○	○	Clench jaws
55	○	○	○	Hands tremble	61	○	○	○	Unable to relax
56	○	○	○	Hyperventilate	62	○	○	○	Bounce, jerk foot

Mark HOW OFTEN you have the FEELINGS listed.

M = Most of the time S = Some of the time R = Rarely or none of the time

	M	S	R			M	S	R	
63	○	○	○	Sad, depressed	72	○	○	○	Lonely
64	○	○	○	Wish to end it all	73	○	○	○	Still tired after sleep
65	○	○	○	Tense, nervous	74	○	○	○	Worried
66	○	○	○	Unable to cope	75	○	○	○	Optimistic about future
67	○	○	○	Happy	76	○	○	○	Angry
68	○	○	○	Anxious, fearful	77	○	○	○	Inadequate
69	○	○	○	Trapped	78	○	○	○	Insecure
70	○	○	○	Forgetful	79	○	○	○	Irritable, grouchy
71	○	○	○	Confused	80	○	○	○	Unable to concentrate

8 ALCOHOL HABITS

A Mark items that apply to you regarding ALCOHOL USE.

1 ○ I do not drink alcohol and never have.
2 ○ I used to drink alcohol but stopped.
3 ○ I CURRENTLY DRINK ALCOHOL.

B If you CURRENTLY DRINK ALCOHOL, mark details. If not, go to [D]. Mark the NUMBER OF DRINKS you have during a typical drinking OCCASION. (A drink is a bottle of beer, shot of whiskey, glass of wine, or equivalent).

4 ○ 0 - 2 drinks ○ 7 - 10 drinks
○ 3 - 6 drinks ○ More than 10 drinks

C Mark the usual number of DRINKS PER WEEK you currently have. Mark the total NUMBER OF YEARS you've been drinking alcohol.

Drinks per WEEK	Number of YEARS
5 ○ Less than 2 drinks/week	6 ○ Less than 1 year
○ 2 - 10 drinks/week	○ 1 - 5 years
○ 11 - 25 drinks/week	○ 6 - 10 years
○ 26 - 40 drinks/week	○ 11 - 20 years
○ More than 40 drinks/week	○ More than 20 years

D Mark items that apply to you.

I have or have had-

7 ○ A traffic violation related to drinking.
8 ○ A tendency to keep drinking when others stop.
9 ○ Problems with family/friends due to alcohol.
10 ○ Legal or financial problems due to alcohol.
11 ○ Forgotten what happened while drinking.
12 ○ Been told I have a drinking problem.
13 ○ A current desire to talk to someone about my drinking habits.
14 ○ NONE of the above CONDITIONS.

9 DRUGS

YES	NO	Do you or would you-
1 ○	○	Feel like you have a drug problem?
2 ○	○	Like to talk about your drug habits?

10 TRAUMA, ACCIDENT, OTHER HAZARDS

YES	NO	Do you-
1 ○	○	Drive after alcohol/drug use?
2 ○	○	Operate machinery after alcohol/drug use?
3 ○	○	Tend to exceed the speed limit?
4 ○	○	Ride with drivers who have been using alcohol or drugs?
5 ○	○	Know how to swim?
6 ○	⊙	Live in a violent crime area?

Indicate miles traveled yearly in a motor vehicle.

7 ○ 10,000 or less ○ 15,001 - 20,000
○ 10,001 - 15,000 ○ More than 20,000

What percent of the time do you wear a seatbelt?

8 ○ 25% or less ○ 51% - 75%
○ 26% - 50% ○ More than 75%

SELF CARE AND TESTS

The following items ask about your self care practices and about tests you may or may not have had. Early detection of a serious illness allows you to get early treatment and decreases the risk of permanent disability or premature death.

11 SELF CARE

YES	NO	Have you-
1 ○	○	Ever had a chest x-ray?
2 ○	○	Had an abnormal chest x-ray?
3 ○	○	Ever had an EKG (electrocardiogram)?
4 ○	○	Had an abnormal EKG?
5 ○	○	Ever had an exercise EKG?
6 ○	○	Had an abnormal exercise EKG?

YES	NO	Do you-
7 ○	○	Seek advice from a physician if symptoms persist?
8 ○	○	Plan annual rectal exam or test for occult blood (trace blood in the stool) after age 40?

12 MEN (Women, go to Unit [13]).

YES	NO	
9 ○	○	Do you examine your testicles for nodules once a month?

13 WOMEN (Men, go to Unit [14]).

YES	NO	Do you or have you-
10 ○	○	Ever had a PAP test?
11 ○	○	Had a PAP test within past year?
12 ○	○	Had an abnormal PAP test in past?
13 ○	○	Plan annual PAP tests in future?
14 ○	○	Examine your breasts once a month for lumps?
15 ○	○	Have a breast exam by a doctor once yearly?

14 TESTS

If you've ever had these tests done, mark the most recent value. If you do not enter any value in this section, the national norms for your age, sex, and race will be used in your health evaluation.

Blood Pressure		Total	HDL
Systolic	Diastolic	Cholesterol	Cholesterol
1 ○ Never Done	2 ○ Never Done	3 ○ Never Done	4 ○ Never Done
○ 120 or less	○ 80 or less	○ 180 or less	○ 15 or less
○ 121 - 130	○ 81 - 85	○ 181 - 200	○ 16 - 20
○ 131 - 140	○ 86 - 90	○ 201 - 220	○ 21 - 30
○ 141 - 150	○ 91 - 95	○ 221 - 240	○ 31 - 40
○ 151 - 160	○ 96 - 100	○ 241 - 260	○ 41 - 50
○ 161 - 180	○ 101 - 110	○ 261 - 280	○ 51 - 60
○ 181 - 200	○ 111 - 120	○ 281 - 300	○ 61 - 70
○ 201 - 220	○ 121 - 130	○ 301 - 330	○ 71 - 80
○ 221 - 240	○ 131 - 140	○ 331 - 360	○ 81 - 90
○ Over 240	○ Over 140	○ Over 360	○ Over 90
○ Don't Know	○ Don't Know	○ Don't Know	○ Don't Know

PERSONAL HEALTH CONDITIONS

Mark details about any of your past or present health problems that have been diagnosed by a physician or other health professional. Such details are helpful in determining the stage of an illness and how well it is being managed. Many of the things you can do to prevent and detect problems can also aid in controlling diagnosed conditions.

15

YES NO Have you ever had any type of
1 ○ ○ HEART DISEASE or heart problem?

IF "yes" mark type. If "no" go to Unit 16.

2 ○ Angina
3 ○ Cardiac muscle disease
4 ○ Congenital defect
5 ○ Coronary disease
6 ○ Enlarged heart
7 ○ Heart attack
8 ○ Heart failure
9 ○ Rheumatic fever
10 ○ Rhythm problem
11 ○ Valve problem
12 ○ Other

Mark traits that apply.

13 ○ I follow medical advice for heart problem.
14 ○ I have had coronary artery by-pass surgery.
15 ○ I can exercise vigorously without symptoms.

16

YES NO
1 ○ ○ Have you ever had HIGH CHOLESTEROL or blood fats?

If "yes" mark details. If "no", go to Unit 17.

Control level is generally-
2 ○ Poor ○ Fair ○ Good

Highest cholesterol within past year-
3 ○ Under 200 ○ 200-239 ○ 240 or over
○ Not measured ○ Don't know results

Lowest HDL cholesterol within past year-
4 ○ Under 30 ○ 30-50 ○ Over 50
○ Not measured ○ Don't know results

Mark traits that apply.

5 ○ I get my cholesterol checked regularly.
6 ○ I follow medical advice for cholesterol.

17

YES NO
1 ○ ○ Have you ever had HIGH BLOOD PRESSURE?

If "yes" mark details. If "no", go to Unit 18.

Control level is generally-
2 ○ Poor ○ Fair ○ Good

Highest systolic pressure (top no.) within past year-
3 ○ Under 180 ○ 180-220 ○ Over 220
○ Not measured ○ Don't know results

Mark traits that apply.

4 ○ I get pressure checked at least four times a year.
5 ○ I follow medical advice for high blood pressure.

18

YES NO
1 ○ ○ Have you ever had DIABETES (sugar)?

If "yes", mark details. If "no" go to Unit 19.

2 ○ Insulin dependent ○ Non-Insulin dependent

Control level is generally-
3 ○ Poor ○ Fair ○ Good

Highest blood sugar within past year-
4 ○ Under 150 ○ 150-200 ○ Over 200
○ Not measured ○ Don't know

Mark traits that apply.

5 ○ I check my urine or blood sugar at least once a week.
6 ○ I follow medical advice for diabetes.

19

YES NO
1 ○ ○ Have you had any type of CANCER, leukemia, or lymphoma?

If "yes", mark type. If "no" go to Unit 20.

2 ○ Bone
3 ○ Breast
4 ○ Cervix
5 ○ Colon
6 ○ Leukemia
7 ○ Lung
8 ○ Lymphoma
9 ○ Melanoma
10 ○ Ovary
11 ○ Prostate
12 ○ Skin cancer
13 ○ Testicle
14 ○ Urinary bladder
15 ○ Uterus
16 ○ Other
17 ○ I have been free of CANCER for 5 or more years.

20

Mark any of the other ILLNESSES or MEDICAL PROBLEMS listed below that you have ever had.

1 ○ Alcoholism
2 ○ Anemia (sickle cell)
3 ○ Bleeding tract
4 ○ Bronchitis-chronic
5 ○ Cirrhosis-liver
6 ○ Colitis-ulcerative
7 ○ Depression
8 ○ Emphysema
9 ○ Fibrocystic breasts
10 ○ Obesity-more than 20 lbs. overweight
11 ○ Pneumonia
12 ○ Polyps in colon
13 ○ Stroke
14 ○ Suicide attempt
15 ○ I have had NONE of the above PROBLEMS listed.

21 GENERAL HEALTH STATUS

RATE YOUR HEALTH generally	Poor		Fair		Good
1 Physical health	○	○	○	○	○
2 Emotional health	○	○	○	○	○

22

Do you have any PERMANENT MEDICAL DISABILITIES?
1 ⊕ ⊖ If "yes" specify cause. If "no" go to Unit 23.

2 ○ Blindness
3 ○ Cancer
4 ○ Stroke
5 ○ Diabetes
6 ○ Deafness
7 ○ Effects from injury
8 ○ Heart disease
9 ○ High blood pressure
10 ○ Low back problem
11 ○ Lung disease
12 ○ Mental illness
13 ○ Multiple sclerosis
14 ○ Paralysis
15 ○ Cerebral palsy
16 ○ Other causes

23 FAMILY MEDICAL HISTORY (blood relatives)

Your blood relatives include your children, brothers, sisters, parents, and grandparents.

Mark items that apply to your blood relatives.

1 ○ I DO NOT KNOW my family medical history.
2 ○ Mother/sister had breast cancer.
3 ○ Two or more family members (mother, sisters) had breast cancer.
4 ○ Father had a heart attack before age 60.
5 ○ Mother had a heart attack before age 60.
6 ○ Alcoholism
7 ○ Anemia (sickle cell)
8 ○ Bleeding trait
9 ○ Cancer
10 ○ Diabetes (sugar)
11 ○ Heart disease
12 ○ High blood pressure
13 ○ Mental illness
14 ○ Stroke
15 ○ Suicide
16 ○ Tuberculosis
17 ○ Other
18 ○ I have NO FAMILY MEMBERS with the above diseases.

HEALTH CARE SERVICES INFORMATION

This information helps your CIGNA Healthcare center and primary physician learn about your needs for service and information, and understand how to serve you better. All of your health information is confidential to CIGNA. Your individual results will not be accessible to your employer, nor will this information affect your premiums. The sheet included with your questionnaire provides a listing of CIGNA Healthcare centers and primary physicians. Your CIGNA identification card has your membership number and employer group code.

24 H. E. L. P.

Are you completing this questionnaire as part of CIGNA's HEALTH EVALUATION and LIFESTYLE PLANNING Program?

1 ○ Yes
○ No

25 Visits

How many visits do you normally make to a doctor in a one year period of time?

1 ○ 0-1 visits
○ 2-3 visits
○ 4-6 visits
○ 7-10 visits
○ More than 10 visits

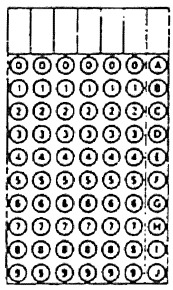
26 Mark areas for which you would like ADDITIONAL INFORMATION if available.

1 ○ Alcohol control
2 ○ Blood pressure management
3 ○ Cardiac rehabilitation program
4 ○ Diabetes management
5 ○ Diet/nutrition
6 ○ Exercise/fitness
7 ○ Breast self examination
8 ○ Smoking cessation
9 ○ Stress management
10 ○ Weight reduction/control

27 MEMBERSHIP NUMBER

Please enter, in the grid below, your CIGNA Healthplan number, if you have one.

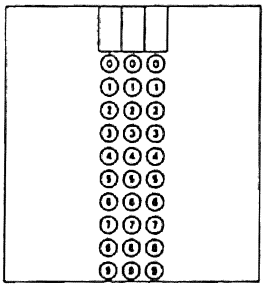
1



28 HEALTH CARE CENTER

Please enter the number for the HEALTH CARE center you wish to use for your medical services.

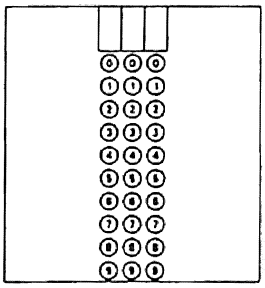
1



29 PRIMARY PHYSICIAN

Please enter the number of your primary physician.

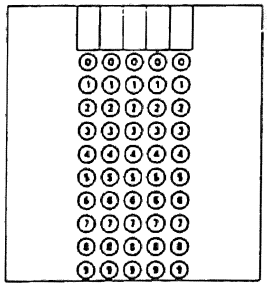
1



30 EMPLOYER GROUP

Please enter your employer group code number.

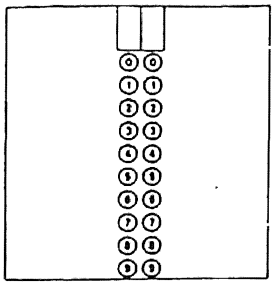
1



31 FOR OFFICE USE ONLY

BODY FAT PERCENT

1



CIGNA Healthplan, Inc., and National Computer Systems, Inc., make no warranty of merchantability or fitness for a particular purpose. In no event will CIGNA Healthplan, Inc., or National Computer Systems, Inc., be liable for any indirect, special or consequential damages arising out of the use of this Health Assessment. In addition, National Computer Systems, Inc., and CIGNA Healthplan, Inc., reserve the right to utilize the information provided by you in a format which does not identify your responses personally for purposes of medical research.

Dear Friend:

We at CIGNA Healthplan recognize our responsibility to provide you and your family with accurate and helpful medical advice. This PERSONAL HEALTH ASSESSMENT is provided to you as part of that commitment.

YOU can make a big difference in the quality of your own health.

A recent study by the Center of Disease Controls shows that among the top ten causes of death in this nation, over 50% of these diseases are caused by lifestyle. Yes you can make a difference! You can and should assume the major role in determining the quality of your personal health. Why not begin today on a program of wellness and health maintenance?

Use the confidential reports and recommendations from this PERSONAL HEALTH ASSESSMENT and you'll have a clear picture of how a healthy lifestyle can help prevent disease and increase your capacity to enjoy life.

At CIGNA Healthplan, we just don't treat illness. We work to keep you healthy. We believe that your personal "healthstyle" is your most important guarantee of lifelong vigor.

We provide you with this PERSONAL HEALTH ASSESSMENT as a tool to assist you in maintaining and improving this precious gift: **your health.**

To your good health,

CIGNA Healthplan, Inc.
a CIGNA company

CIGNA

NCS INFORMATION SERVICES MP12-27564-321

APPENDIX B

STATISTICAL ANALYSIS SYSTEM PROGRAM

```
NOTE: The initialization phase used 0.15 CPU seconds and 2523K.
1              OPTIONS NOCENTER;
2
3              DATA FIT;
4                INFILE FITDAT;
5              INPUT  SSN $CHARS. @11 AGE @15 SEX @17 DIET @21 NOALCO  @24 ALCOAMT
6                @27 RACE @30 NEVSMOK @32 SMOK @34 FORMSMOK @35 FAMHIST
7                @38 NOHIST @40 MENOPAS @42 PILL @44 PREGNANT
8                @46 BODYFAT @51 CHOLTOT @55 HDL @58 CV @61 FAMINC @63 MARSTAT;
9
10             IF SEX=1 THEN DELETE;
11              IF CHOLTOT< 200 THEN CHL=1;
12              IF CHOLTOT GE 200 AND CHOLTOT < 240 THEN CHL=2;
13              IF CHOLTOT GE 240 THEN CHL=3;
14              IF NOALCO=1 OR ALCOAMT = . THEN ALCOHOL = 1;
15              IF ALCOAMT = 1  THEN ALCOHOL=2;
16              IF ALCOAMT GE 2 THEN ALCOHOL=3;
17              IF HDL >1000 THEN HDL = .;
18              IF NEVSMOK=1 THEN SMOKE=1;
19              IF FORMSMOK=1 THEN SMOKE=2;
20              IF SMOK=1 THEN SMOKE=3;
21
22            IF FAMHIST=1 THEN FAM=1;
23            IF FAMHIST= .  THEN FAM=0;
24            IF MENOPAS = 1 THEN MENO=1;
25            IF MENOPAS = . THEN MENO=0;
26            IF PILL=1 THEN PIL=1;
27              IF AGE LE 29 THEN AG =1;
28              IF AGE GT 30 AND AGE LE 39 THEN AG =2;
29              IF AGE GT 40 AND AGE LE 49 THEN AG =3;
```

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2 The SAS System

30              IF AGE GT 50 AND AGE LE 59 THEN AG =4;
31              IF AGE GE 60 THEN AG =5;
32            IF (SEX=2 AND AG =1) AND CV<29 THEN FIT=1;
33            IF (SEX=2 AND AG =1) AND (CV>=29 AND CV<37) THEN FIT=2;
34            IF (SEX=2 AND AG =1) AND  CV>=37             THEN FIT=3;
35            IF (SEX=2 AND AG =2) AND CV<27 THEN FIT=1;
36            IF (SEX=2 AND AG =2) AND (CV>=27 AND CV<36) THEN FIT=2;
37            IF (SEX=2 AND AG =2) AND  CV>=36             THEN FIT=3;
38            IF (SEX=2 AND AG =3) AND CV<25 THEN FIT=1;
39            IF (SEX=2 AND AG =3) AND (CV>=25 AND CV<33) THEN FIT=2;
40            IF (SEX=2 AND AG =3) AND  CV>=33             THEN FIT=3;
41            IF (SEX=2 AND AG =4) AND CV<23 THEN FIT=1;
42            IF (SEX=2 AND AG =4) AND (CV>=23 AND CV<31) THEN FIT=2;
43            IF (SEX=2 AND AG =4) AND  CV>=31             THEN FIT=3;
44            IF (SEX=2 AND AG =5) AND CV<20 THEN FIT=1;
45            IF (SEX=2 AND AG =5) AND (CV>=20 AND CV<30) THEN FIT=2;
46            IF (SEX=2 AND AG =5) AND  CV>=30             THEN FIT=3;
47            IF PILL= . THEN PIL=0;
48              IF AGE LE 35 THEN AGG=1;
49              IF AGE GT 35 AND AGE LE 50 THEN AGG=2;
50              IF AGE GT 50 THEN AGG=3;
51              IF DIET LE 80 THEN FAT = 1;
52              IF DIET GT 80 AND DIET LE 96 THEN FAT = 2;
53              IF DIET GT 98 THEN FAT = 3;
54              IF MARSTAT=1 OR MARSTAT=3 OR MARSTAT=4 OR MARSTAT=5 THEN SPOUSE=0;
55              IF MARSTAT=2 THEN SPOUSE=1;
56             *PROC SORT DATA=FIT;
57            *  BY SSN;
58            * DATA CAL;
59            *   INFILE CALDAT;
60            * INPUT  SSN $CHAR9. ACTCAL 19-22;
61            * PROC SORT DATA=CAL;
62            * BY SSN;
63            *DATA FINAL;
64            * MERGE CAL(IN=INCAL) FIT(IN=INFIT);
65            * BY SSN;
66            * IF INCAL;
67          * DATA TWO;
68          * SET FIT;
69          * PROC GLM;
70          *   CLASS  MENO PIL SMOKE ALCOHOL FAMINC RACE SPOUSE;
71          * MODEL BODYFAT=SMOKE ALCOHOL CV PIL DIET MENO AGE FAMINC RACE SPOUSE;
72          *   LSMEANS SMOKE/STDERR PDIFF;
73          * DATA ANOV;
74          * SET FIT;
75          * PROC ANOVA;
76          *   CLASS  SMOKE;
77          * MODEL BODYFAT=SMOKE;
78          *   MEANS SMOKE/DUNCAN;
79
80           *DATA FOUR;
81           *SET ONE;
82           *PROC GLM;
83           *  CLASS  FAM MENO PIL SMOKE ALCOHOL FAMINC;
84           *MODEL HDL=SMOKE ALCOHOL BODYFAT PIL DIET FAM MENO AGE FAMINC CV;
85           *  LSMEANS SMOKE/STDERR PDIFF;
86
87          *ATA THREE;
```

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3 The SAS System

 88          *SET FINAL;
 89          *PROC GLM;
 90          * CLASS  FIT FAM PIL SMOKE ALCOHOL FAMINC SEX FAT;
 91          * MODEL HDL=FIT SMOKE ALCOHOL BODYFAT PIL DIET AGE FAMINC CV;
 92          *   LSMEANS SMOKE/STDERR PDIFF;
 93
 94          *PROC MEANS;
 95          * BY SMOKE;
 96          * VAR ACTCAL;
 97          *ATA FOUR;
 98          *SET FIT;
 99          *PROC SORT;
100          *BY FAMINC;
101          *PROC MEANS;
102          * BY FAMINC;
103          * VAR BODYFAT;
104          *DATA FIVE;
105          * SET FIT;
106          * PROC SORT;
107          * BY PIL;
108          * PROC MEANS;
109          *  BY PIL;
110           * VAR BODYFAT;
111           *ATA SIX;
112           *SET FIT;
113           *PROC SORT;
114           *BY MENO;
115           *PROC MEANS;
116           * BY MENO;
117           * VAR BODYFAT;
118           *ATA SEVEN;
119           *SET FIT;
120           *PROC SORT;
121           *BY SMOKE;
122           *ROC MEANS;
123           *BY SMOKE;
124           *VAR BODYFAT;
125           *ATA EIGHT;
126           *SET FIT;
127           *PROC SORT;
128           *BY ALCOHOL;
129           *ROC MEANS;
130          * BY ALCOHOL;
131          * VAR BODYFAT;
132          *DATA NINE;
133          * SET FIT;
134          * PROC SORT;
135          * BY RACE;
136          *PROC MEANS;
137          * BY RACE;
138          * VAR BODYFAT;
139          *ATA TEN;
140          *SET FIT;
141          *PROC SORT;
142          *BY SMOKE;
143          *PROC MEANS;
144          * BY SMOKE;
145          * VAR AGE CV DIET;
```

```
4 The SAS System

NOTE: The infile FITDAT is:
      Dsname=U10300A.BERTCHL.DATA,
      Unit=3380,Volume=CSU006,Disp=SHR,Blksize=9040,
      Lrecl=80,Recfm=FB

NOTE: 1097 records were read from the infile FITDAT.
NOTE: The data set WORK.FIT has 805 observations and 32 variables.
NOTE: The DATA statement used 0.53 CPU seconds and 3160K.

146         DATA ELEVEN;
147           SET FIT;

NOTE: The data set WORK.ELEVEN has 805 observations and 32 variables.
NOTE: The DATA statement used 0.04 CPU seconds and 3232K.

148           PROC REG;
149           MODEL BODYFAT=DIET;
150         *DATA TWELVE;
151         * SET FIT;
152         *PROC FREQ;
153         *   TABLES MARSTAT FAMINC RACE ALCOHOL PIL MENO SMOKE;
154         *ATA THIRT;
155         *SET FIT;
156         *PROC SORT;
157         *BY MARSTAT;
158         *PROC MEANS;
159         * BY MARSTAT;
160         * VAR BODYFAT;
161         *ATA FOURT;
162         *SET FIT;
163         *PROC SORT;
164         *BY SPOUSE;
165         *PROC MEANS;
166         * BY SPOUSE;
167         * VAR BODYFAT;
NOTE: 805 observations read.
NOTE: 94 observations have missing values.
NOTE: 711 observations used in computations.
NOTE: The PROCEDURE REG printed page 1.
NOTE: The PROCEDURE REG used 0.07 CPU seconds and 3505K.

NOTE: The SAS session used 0.60 CPU seconds and 3505K.
NOTE: SAS Institute Inc., SAS Campus Drive, Cary, NC USA 27513-2414
```

VITA

Rachel S. White

Candidate for the Degree of

Master of Science

Thesis: COMPARISON OF THE BODY COMPOSITION AMONG SMOKERS, NON-SMOKERS, AND EX-SMOKERS

Major Field: Health, Physical Education, & Leisure

Area of Specialization: Health Promotion

Biographical:

Personal Data: Born in Bartlesville, Oklahoma, July 12, 1969, the daughter of William Kirby and Mary Sue White.

Education: Graduated from Bartlesville High School, Bartlesville, Oklahoma; received a Bachelor of Science degree in Health/Wellness from Oklahoma State University in August 1992. Completed requirements for the degree of Master of Science in Health, Physical Education, and Leisure at Oklahoma State University in December 1993.

Professional Experience: Graduate Assistant, Oklahoma State University Wellness Center, August 1992 to present.