BODY WEIGHT EXTREMES IN ADULT FEMALES: AN ANALYSIS OF RESEARCH PROCEDURES TO STUDY HEALTH RELATED CORRELATES AND PRECURSORS

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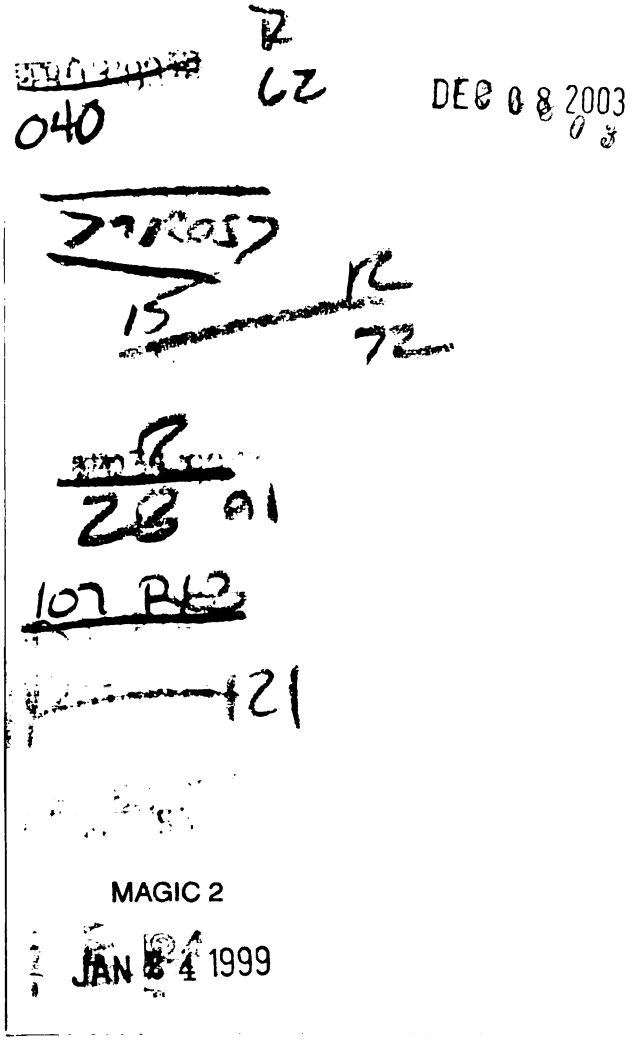

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ABSTRACT

BODY WEIGHT EXTREMES IN ADULT FEMALES:
AN ANALYSIS OF RESEARCH PROCEDURES TO STUDY HEALTH
RELATED CORRELATES AND PRECURSORS

By

Ruth Evelyn Dennis

Important to the understanding and prevention and/or the physical condition of extremes in human body-weight, are the variables precursing and correlating with this condition.

The purpose of this study was to explore and explain alternative models and protocols of research which would provide empirical evidence in resolution of cause/effect questions arising from observed relationships between obesity and chronic disease. Directionally the study points to limitations and potentials of previous studies, demonstrates use of the sample survey, and suggests models of broader potential for continued study of such physiological conditions developing over a period of time.

Traditional studies of bodily weight have been mainly concerned with obesity, implicating the latter as a cause of various chronic diseases. The validity of these findings and conclusions is here challenged for two reasons:

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the unrepresentative nature of the populations considered, and the disregard of the developmental process of extremity in bodily weight. Three research designs are presented as possible means of overcoming these limitations in design and interpretation. As conceptual models, they are adaptations of the traditional modes of research.

I. Sample-Survey of Cross-Sectional Groups

This model was posed as one of the most accurate and immediate means of selecting a population broadly indicative of possible variables. The method is amenable to testing one-point-in-time hypotheses questioning existing relationships between variables.

A demonstration of the use of the sample survey is presented. The research of the design investigated levels of body weight as related to a variety of personal habits, health and chronic disease in adult females. It indicates the advantages of this design over previous designs including wider use of variables applicable to only generalized total population.

II. Longitudinal Study of Communities or Neighborhoods

The protocol of research in this design proposed to identify limited areas of high-risk in body weight extremes and chronic disease by observing frequencies of negative health indicators (e.g. squalor, congestion, crime) and also increases in physical deterioration and social disorganization.

The design further proposed to provide opportunity for

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observation of the development of common precursors and correlate of body weight extremes and chronic disease at the neighborhood level.

III. Longitudinal Study of Individuals

This study similar to those undertaken to investigate chronic disease development was suggested for consideration of the developmental processes of body weight extremes in the individual. It was noted that the advantage of this design is the study of a population before observable manifestation of pathology, host and environmental factors early in life (precursors) then relatable to subsequent development.

The method is notable as the only one that improves the accuracy of cause/effect prognosis over a period of time.

In addition to the observation of precursors and correlates at the neighborhood level, the research protocol here proposes observation of precursors and correlates at the personal level, especially the effects of stress and deprivation on individual health over a period of time. The emphasis then is on measurement of change.

BODY WEIGHT EXTREMES IN ADULT FEMALES: AN ANALYSIS OF RESEARCH PROCEDURES TO STUDY HEALTH RELATED CORRELATES AND PRECURSORS

By

Ruth Evelyn Dennis

A THESIS

Submitted to
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DOCTOR OF PHILOSOPHY

College of Social Science

1973

DEDICATION

This thesis is dedicated to my beloved parents, John and Pennie Gaines, whose continued support of love and understanding has helped to sustain me.

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I am profoundly grateful to many people for their assistance and contributions during the course of this work.

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My greatest thanks goes to my children for their love, patience, and understanding during the years of my doctoral study.

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CHAPTER I

INTRODUCTION

Research in community health aims at systematic ascertainment of the extent and distribution of disease and related problems and investigating the causes of fluctuation in the prevalence of such conditions (Shattuck, 1850) for purposes of prevention and cure. The success of such study is dependent on research design which reflects integration of prior relevant studies with the study-at-hand. By avoiding past problems in design and analysis, a study becomes part of constructive progress in its field and adds to the viable base of future advances. Thus it is the intention of this study of Body-Weight Extremes in Adult Females to emphasize evaluation of past research designs, and to suggest alternative models useful in determining precursors and developmental correlates of body-weight extremes and disease.

Traditionally, studies of body-weight have been concerned mainly with obesity and have been of limited usefulness to subsequent investigation of development and variations in body-weight extremes. Their research-design and data-interpretation indicate a narrowed focus on consequence rather than direction to the broader reaches of etiology. Dealing with special groups and the effects of obesity on chronic disease within these groups, their underlying assumption seems to be

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that some chronic diseases are the result of obesity. The small or non-existent gains resulting from their conclusions suggest that present knowledge of prevention and cure of Body-Weight Extremes is incomplete and perhaps distorted.

This study, geared to etiology and longitudinal perspective, is an exercise designed to reveal the rhythm of reactions such as chronic disease, which although delayed or gradual in emergence, has definite precursors. Conceptually, assuming a chain of events, circumstances and conditions longitudinally operative and within discernible risk fields, four apparent etiological alternatives may be differentiated in terms of body-weight extremes and disease conditions:

Alternative I: Body-weight extremes and disease conditions are both related to similar precursors, but not directly related to each other.

Alternative II: Body-weight extremes and disease conditions related only after coexistence.

AlternativeIII: Body weight extremes, following a set of precursors, become themselves precursors of a new pathogenic condition.

Alternative IV: Conversely, disease conditions following a set of precursors, become precursors of body-weight extremes.

The Problems

The standard bivariate analysis applied to a set of selected individuals can show and has shown statistical relationships between body-weight extremes and disease conditions. However, because of the nature of the method, and because of the restriction of data availability, these

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analyses have not developed evidence answerable to any of the following:

1. Extreme body weight is a precursor of disease condition.

2. Extreme body weight is not a precursor but an element interactive with disease conditions only after both coexist.

3. Both disease and body weight depend upon the same precursors, no interaction occurring between them.

Significance

If Alternative I (A-I) pertains, i.e. both body weight extremes (BWE) and disease conditions are related to similar precursors but not to each other, prevention of both is a function of efforts directed toward precursors. If A-II pertains, i.e. coexistence determines their relationship, as is suggested in the literature, then treatment of either BWE, or disease conditions, or both, may influence the course of one, both, or neither.

If A-III pertains, prevention of BWE would effect prevention of disease conditions; also, successful treatment of BWE would modify the degree of disease conditions.

If A-IV pertains, then attention is demanded by the etiological complex resulting in disease, i.e. the host's resistance to susceptibility, the disease-producing agent, and the nature of the environment in which host and agent are joined, and the cumulative effects of these three elements when the dimension of time is added.

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The literature's suggestion that coexistence of body weight and disease conditions increases the risk of more extreme forms of the disease or weight implies that treatment confined to changing the weight level offers only temporary disease modification, not preventive consideration.

If the literature's assumption is not true, treatment of obesity may enhance a disease condition. For example, a disease developing because of conditions of stress as described by Dodge and Martin (1969) and also causally related to extremes in body weight, may be a further risk by the additional stress of altering the body weight.

Purpose

It is observed that current views of obesity and chronic disease call obesity causative of chronic disease (according to a number of studies, an implied definitive "relationship"). The focus of the methods and the restriction on data availability have characteristically stopped at "showing a relationship" but not indicating the nature of the relationship.

The purpose of this study is to explore and explain alternative modes and protocols of research which would provide empirical evidence of cause/effect relationships arising out of observed relationships between obesity and chronic disease. These models will encourage insights into the developmental processes between chronic diseases (CD) and (BWE), indicating methods of prevention, and also clarifying

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Objectives

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the effectiveness and appropriateness of present approaches to treatment.

Objectives

The objectives are:

1. The review of positive and negative aspects of previous, present and alternative research designs in order to weigh the values of available methods, so that investigations in this area may proceed with full awareness of short-comings and potential in a particular design.

2. The exploration of models of the developmental relationship between BWE, CD and related factors.

3. The development of models to facilitate identification of precursors to BWE and CD.

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CHAPTER II

TRADITIONAL STUDIES OF BODY-WEIGHT

Introduction

Primarily because of the convenient accessibility of data, special-group studies have provided practically all of the information currently available on obesity. Subjects already grouped as hospital patients, insurance-policy holders, etc., are usually found convenient to work with, or their generally available records have provided requisite data. In addition to aiding in the identification of factors associated with obesity and the variability of these factors, such groups offer research a relatively inexpensive maintenance of large populations and expanded dimension.

The Review of the Literature

A review of the literature reveals that a vast majority of past research concerning BWE and its correlates is retrospective but focused on one point in time.

The multiplex of variables already indicated as influential make it possible to classify the literature under three headings: influences pertaining to human health, physical environment and socio-cultural environment.

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Health Influences

Although the influence of body weight on the physical health of an individual or a group of individuals is largely undetermined, it is generally agreed that extremes in body weight - either obesity or underweight - increase the risk of certain types of diseases or undesirable health conditions. This reasoning is based on the higher mortality and morbidity rates among the groups with body weight extremes (Kannel, et al, 1967) (Mark, 1960) (Mayer, 1967).

Much of the data concerning the medical significance of varying body weights has come from insurance studies based on statistics of such companies as the New York Metropolitan Life Insurance Company. Although considered a significant source for approximating the mortality and morbidity risk of body weight extremes (Metropolitan Life Insurance Company, 1960), so select a population is considered by some critics to bias study results.

One such long-term study, the Body Build and Blood Pressure study of the Society of Actuaries (the body weight standards are used in the present study) showed that among five million insured persons, the mortality rate in persons 15 to 69 years of age was one-third greater in those 20 percent or more overweight than in those who weighted less. Overweight women showed a lower mortality rate than overweight men, although mortality in women also increased with weight and age.

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Despite the paucity of data on underweight persons, they seem more vulnerable to death by tuberculosis, acute respiratory disease, and hypertension than do people not in their weight class. (U. S. Public Health Service, 1966).

The literature reveals that clinical observations associating obesity with heart attacks and strokes have been advanced for more than 2,000 years. Wilson and Wilson noted that a number of classical Greek and Roman sources record specific instances of such association as if they were expected, such grouped references were commonplace in early medical literature (Wilson, 1969). The Wilsons further stated that in the 1940's obesity was considered the most common etiologic agent in arteriosclerotic cardiovascular disease and hypertension.

Berylne supports Wilson in the latter contention, and notes that the syndrome of cardio-respiratory failure associated with extreme obesity was first recognized by Kerr and Logan in 1936. He lists obesity, cyanosis, arterial oxygen desaturation and polycythemia as essential features of the cardio-respiratory syndrome (Berylne, 1958).

The Framingham study, conducted in a small American community of 5,127 men and women who had been followed for a period of more than 12 years for signs of intial development of coronary heart disease (CHD), is widely considered to be the most extensive epidemiological study as yet undertaken. In the 12 years, 252 men and 128 women developed CHD.

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There was a marked increase in mortality rates in both men and women more than 20 percent overweight over those of normal weight and a lesser degree of overweight (Kannel, et al, 1967).

Not all researchers agree that obesity is a major etiological factor in heart disease. Hinkle suggests that the high incidence of obesity in coronary heart disease may reflect how the study population is selected. He notes that the use of the interview to conduct an epidemiological study of coronary heart disease is not an efficient way to determine the incidence of the disease, since the examination of those who are detected during surveys is based on electrocardiographic abnormalities. In many cases, the subject had not been aware that these were present, just as a proportion of all myocardial infarctions occurs in people without previous evidence detectable by any means as coronary heart disease. It is actually likely that a central group selected on the basis of an interview will contain many people who have coronary heart disease. Also, persons of higher socio-economic status are more likely to be under medical care and to know if they have a coronary heart condition (Hinkle, 1968).

Wardwell and others analyzed 87 white males who had coronary heart disease, and concluded that "men of middle class protestant background have the highest artios of observed to expected cases of coronary heart disease even when other sociological and selected physiological variables (hypertension, obesity, smoking, and diet) are controlled (Wardwell, 1964).

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Association with Diabetes

The association of diabetes with obesity has been discussed in many studies, there being general agreement that in prolonged obesity a gradual deterioration in carbohydrate tolerance occurs. The results of Ogilvie's study of 11 obese subjects for 18 years showed that all had a diminished carbohydrate tolerance, three of them becoming acutely diabetic (Ogilvie, 1934).

Craddock (1970) distinguishes two types of diabetes:

1. Juvenile diabetes present in children and young adults, is due to a complete lack of insulin.

2. Maturity-onset diabetes present in older adults who are usually obese, and due to a relative lack of insulin or a graduating insensitivity to insulin.

Two other trends of thought on the association of obesity and diabetes are that obesity appears to lead to insulin resistance which, after many years, brings about the diabetic state (Karan, 1965); and, the diabetic tendency manifests itself first as obesity (Medley, 1965).

Arthritis

Leavell and Clark (1953) say of the term:

> Arthritis is applied to the heterogeneous group of conditions which have commonly only the fact that they represent the end products of the actions of various combinations of factors involving agent, host, and environment acting upon the same organ system - the joints of the body.

The term rheumatism is also applied to arthritis, Smillie and Kilbourne dividing the condition into four classes:

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2. Osteoarthritis (hypertrophic)

3. Gout (metabolic arthritic)

4. Infectious (arthritic)

Osteoarthritis, a degenerative disease occurring usually in older persons, is known as a disease of "wear and tear" on the weight-bearing joints. Obesity, with resultant faulty posture, is thought to be an important contributing factor in the disease (Smillie and Kilbourne, 1963) (Radin, 1972).

Hypertension

As in some of the above pathological conditions, the association of body weight to hypertension is still under debate. It has been held that obesity is the most common etiologic agent in hypertension (Wilson, 1960). Hypertension (a sustained increase in blood pressure) and obesity, diabetes and gall bladder diseases, are important coexisting conditions which may have a common denominator in abnormal lipid metabolism, notably cholesterol (Waterman, 1955).

The "Nutritions Review" notes that obesity as a risk factor in coronary arterial disease has generally been relegated to a level of minor importance. The Framingham Study suggests that, apart from associated hypertension or hypercholesteremia, overweight per se has weak, if any, influence on the development of new atherosclerotic manisfestations. They further report that isolated obesity has a significant effect upon the development of atherosclerosis in men, but not in women (Nutrition Reviews, 1967).

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Chaing and Perlman (1971) reviewed the relationship between overweight and hypertension, their study revealing excess weight as substantially contributive to the mortality and morbidity of the hypertensive diseased. Among blacks hypertension is higher than among whites, regardless of socio-economic status. It is not clear whether or not BWE in this group is similarly high, but it is clear that the general confounding of hypertension and obesity with other factors contributes to the present confusion concerning their interrelationship.

Environment

Extreme overweight and its opposite, extreme underweight, are thought to be symptoms of individual human stress. While obesity is attributed to overeating and extreme underweight is attributed to undereating, it is the reasons for both that are of concern to scientists. These reasons are believed to be engendered by the multiple factors of heredity, constitution and environment.

The physical environment, as it relates to body weight, consists of the availability of food, the amount of physical activity, and the amount of stress in the immediate surroundings.

Obesity is commonly thought to be a problem of affluent societies whose intake of sweets (carbohydrates) is high, and whose amount of exercise is generally reduced, while underweight is characteristic of the less-developed areas where seasonal hunger is evident. However, in the United States, obesity is most prevalent among the poor.

It has been observed that extremes in body weight and associated disease disorders have had high positive correlations with stress-producing environments. Dodge and Martin show in their study that while body weight is to a large extent genetically determined, it is more susceptible to environmental influences than are other measurements (Dodge, 1970). This suggests that these external variables are predisposing, precipitating, or causally related to weight extremes. Much of this influence is attributable to the psychological and socio-cultural environment to be discussed later in this paper.

Lack of physical activity has been found to be an important factor in increasing body weight, a particular problem in the United States where there is an increasing use of the automobile and home appliances. Lincoln (1960) found that decreased physical activity was more important to increasing body weight than caloric intake. Using controls, he studied 28 obese girls and 14 obese adolescent boys and discovered that the obese group ate less than the non-obese group. This type of study was repeated in 1961 by Rose, and in 1966 by three separate studies conducted by Heumann, McCarthy, and Maxfield.

Further studies regarding physical activity conclude that:

1. Obese girls were significantly less active than controls (Johnson, et al, 1956).

2. Obese boys were apt to expend less energy than non-obese boys during participation in exercise activities (Stefanik, et al, 1959).

3. Individuals with the highest percentage of body fat spent most of their time in less strenuous activities than those with lower percentages of body fat (Hutson, et al, 1965).

Spatial Aspects of Obesity

The relationship between social class and obesity also suggests a distinct spatial pattern, since lower socio-economic populations form geographic patterns that are identifiable.

The idea that overweight women form a distinct geographic pattern, especially within an urban area, is supported by a study of 1,503 females 18 years and older in Flint, Michigan (Dennis, 1970). Of these women, 1,165 (78 percent)were white, and 338 (22 percent) were non-white. Thirty-six percent of the females were overweight. Fifty-five percent of the black females and 30 percent of the white females were overweight; about 3 percent of black and white females were underweight. The study showed that the higher percentage of overweights (both non-white and white females) were located in virtually the same neighborhood, areas rated low on the socio-economic scale.

Some underweight females were reported in nearly all neighborhoods, but no spatial or socio-economic patterns of distribution emerged. The data for this study were taken from the Michigan Health Survey.

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There appesrs to be little, if any, data on the spatial aspects of body weights within a limited geographical area. However, there exist differences in body build across climatic boundaries, because of physical adaptation to weather and available food (Hunter, 1969).

Socio-Cultural Influences

Social scientists generally agree that the psychological aspect of an individual's inner environment is the sum total of his life experiences and upbringing, while the outer environment is the culture and the society in which he prospers or fails, and that psychological stress results whenever the inner environment is in conflict with the surrounding world in terms of tasks and expectations.

It has been noted by some researchers that obesity is a feature of several psychological disorders. Richardson in 1946 and Mendelson in 1964 note that obese subjects manifested:

1. A high level of anxiety; 'over-compensation' (retreat behind a wall of obesity).
2. A lack of emotional satisfaction ('regression to the infantile state').
3. An increased drive for oral satisfaction; a defense against depression; a true addiction to food; a sexual conflict situation.

Silvertone maintains that if these psychological disturbances were of primary etiological importance in obesity, one would expect obese patients to show much more general psychological disturbance than do non-obese subjects. Moore, et al. investigated the relationship between obesity and mental health in a

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random sample of 1,660 persons selected as representative of 110,000 inhabitants in a residential area of New York City. These residents were subjected to standard psychological interviews.

The relationship of obesity to nine measures of mental health was investigated, holding constant age and socio-economic variables. The obese persons made more pathological responses (or scored lower on mental health measures) than did those of normal weight; and for three of the measures (immaturity, suspiciousness, and rigidity), the results were statistically significant. The author notes that in correlating obesity with a variety of other factors, correlations alone cannot tell us which, if any, of the factors are primary, or indicate whether mental health factors cause obesity or are the results of being obese in a society that devalues obesity (Moore, et al. 1962).

The most outstanding result of Moore's study was the striking relationship between social class and obesity. Obesity was found to be seven times more frequent among women of the lowest socio-economic level than among those of the highest level. Also in keeping with other studies, the prevalence of obesity was found to increase with increasing age.

Socio-Economic Differences

Maddox, et al. (1970) suggested that one of the socio-economic reasons for differences in body weight might be

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differing attitudes toward obesity. In a study of 100 new patients at a public out-patient medical clinic of a medical center, they tested the assumption of overweight as social deviance and disability. The authors note:

> In our society, overweight figures significantly in the perception of others and in the conception of self; there are many indications that overweight is perceived as social deviancy and, partly, in consequence of this imputation, is a social deviancy.

While an overweight person is looked upon as one who lacks self-control and is responsible for his unsightly state (even by physicians and middle class individuals) despite the health implications (Keys, 1955), leanness is associated with longevity, good personal appearance, and self-denial which has historically been suffused with a Protestant ethic emphasizing appropriate rewards, including good health. This attitude toward obesity is not shared by all ethnic groups or subcultures even within our own society. Maddox, et al studies the difference in attitudes of four groups:

1. White males, 60 years of age and over, with at least an eighth grade education, living in a small town or rural area in the west appeared to be most satisfied with or least interested in their weight.

2. White females 40-60 years of age, with a college education, living in cities of a million or over in the east appeared to be most unhappy with their size, wanting to be smaller, even when they were not likely to report much success in reducing.

3. Negro males 20-40 years of age, with college education, living in cities of a million or over in the west were more likely than any other group to want more weight.

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4. Negro females, with at least a high school education or more, living in cities of a million or over in the mid-west appear unconcerned about weight reduction.

With this cross-section of geographic areas and socio-economic levels, their data overwhelmingly supported the essentially negative evaluation of overweight hypothesized to be characteristic of our society. This study supports the findings of Richardson and his associates that the obese child ranked consistently (with few exceptions) the least likable. Also the negative evaluation of obesity that was demonstrated by Maddox, et al. was consistent with the expectations based on impressionistic assessments of cultural values (Maddox, 1970).

The study along with others suggest that women of higher socio-economic status are under greater social pressure to maintain normal weight than others.

In these studies, age, sex and socio-economic status were found to be factors affecting body weight.

In addition to the above factors or interacting with them, is that of individual eating behavior. Studies have shown that the eating behavior of obese persons is distinctly different from that of the non-obese, regardless of socio-economic status.

Bruch did a study that suggested that obese people may not be able to distinguish physiological hunger from such states as fear, anger, and anxiety (H. Bruch, 1961). S. Schochter (1968) showed that unlike normal subjects,

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obese subjects' urge to eat was unrelated to hunger signals. He also showed in another study that external cues for food intake were more important to the obese than to normal subjects. When the effect of taste on eating behavior was examined, it was shown that obese subjects ate more than normal or underweight subjects when the taste was rated fairly good by all groups. (The ratings were terrible, bad, not very good, fairly good, very good, and excellent) Underweight subjects tended to eat more than other subjects when the taste was rated as bad or terrible. They concluded that the external, or non-visceral, taste cue had different effects on the eating behavior of underweight, normal, and obese subjects.

Other studies were made to test the effect of external cues on persons of different body weight. Schochter concluded from these studies that obese people are rather insensitive to food deprivation signals of a physiological nature, but are very sensitive and responsive to visual, taste, or food-related environmental cues.

Since it is unlikely that only persons of lower socio-economic status will have a tendency to respond in an obese or non-obese way to food, and yet high socio-economic females tend to keep their weight lower on the average, these studies support the contention that women of higher socio-economic status are probably more influenced by social pressure to keep their weight near normal than others. Further, as in studies of socio-economic class, there is the question of whether members of higher socio-economic class are in this class

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because they are mentally more capable of upward mobility, or if the majority of the obese drifted or remained in the lower socio-economic class because they were obese and/or mentally incapable of upward mobility (drift theory).

It has been suggested that this contention (drift theory) is not applicable to non-white females, since the access to upward mobility is different for them than it is for white females.

Finally, it is believed by some that the varying body weights in females is a good index for measuring responses to the outer environment (external stimuli),since the latter seem to exhibit a greater sensitivity to change and are more likely to turn to food as a way of coping.

Limitations

The limitations of these classes of studies stem mostly from their resistance to generalization beyond the population being studied. In some cases, the population at risk is not represented, e.g. insurance policy holders may not include a representative proportion of persons from the low socio-economic population where BWE's are found to be more prevalent. The same holds true for weight reducing salons and classes where studies on obesity have been carried out. Hence, the validity of the findings and the conclusions reached are questionable since the population is not representative and major factors relating to the condition may not have been included in the analysis. One such factor is the longitudinally developmental process involved in BWE and its correlates.

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CHAPTER III

THEORY AND HYPOTHESES

Theory

Extremes in body weight among adults have customarily been attributed to faulty metabolism or faulty diet. Of the two, it is noted that metabolic/genetic causes account for a statistically small percentage of extremes, leaving diet and the implied causes of its regulation accountable for most cases. Five conditions predispose faulty dietary patterns:

1. Home environment--culturally influenced habits, individually exercised choices.
2. Economic poverty--cheap starchy foods, ignorance of nutrition.
3. Occupation--housewives, persons working in food industry or service.
4. Emotional factors--eating as compensation for monotony, domestic, or financial, social, business problems, illness.
5. Aging and disease.

When obesity is specifically associated with heart conditions, hypertension, diabetes, arthritis, stroke, kidney malfunction, and when tuberculosis and acute respiratory disease are specifically associated with underweight, the above conditions are agents of increased morbidity and early mortality.

Hypothesis

The testing procedure for Alternative I (A-I) and (A-II) involves a series of hypotheses. These hypotheses follow the

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nested method, each hypothesis being composed of sub-hypotheses which in turn are divided into further sub-hypotheses. Suppose we wish to test (A-I), i.e. that disease conditions and body weight extremes are independent. Let $Hx_i \in$ (A-I) and $Hy_j \in$ (A-II) be a series of hypotheses $\rightarrow Hx_i$ (i = 1,2,3,--k) and Hy_j (j = 1,2,3,--m) are sub-hypotheses of (A-I) and (A-II) respectively (see chart of nested hypotheses). Figure 3.

It is generally agreed that the variations in causes and subsequent manifestations indicate that the three major factors to consider in explaining the development of disease and/or BWE are genetic, traumatic and environmental. The latter two factors are concerned with culture, diet, activity, etc., while the genetic is concerned with metabolic disturbances in the form of inborn errors in metabolism. Mayer noted that a very small percentage of BWE are genetic (Mayer, 1968). Environmental and traumatic conditions seem to account for the majority of the cases. This same line of reasoning is true for most disease conditions. It seems logical to follow the above sequence of hypotheses through a number of sub-hypotheses to discriminate between concurrent development, and causative relationship in either direction for both disease conditions and BWE.

Too, as an alternative to this approach, separate dietary habits from environmental influences in consideration of BWE and disease, is untenable in the light of the volume of evidence supporting general environmental impact (Social, cultural and physical) as a significant factor in the

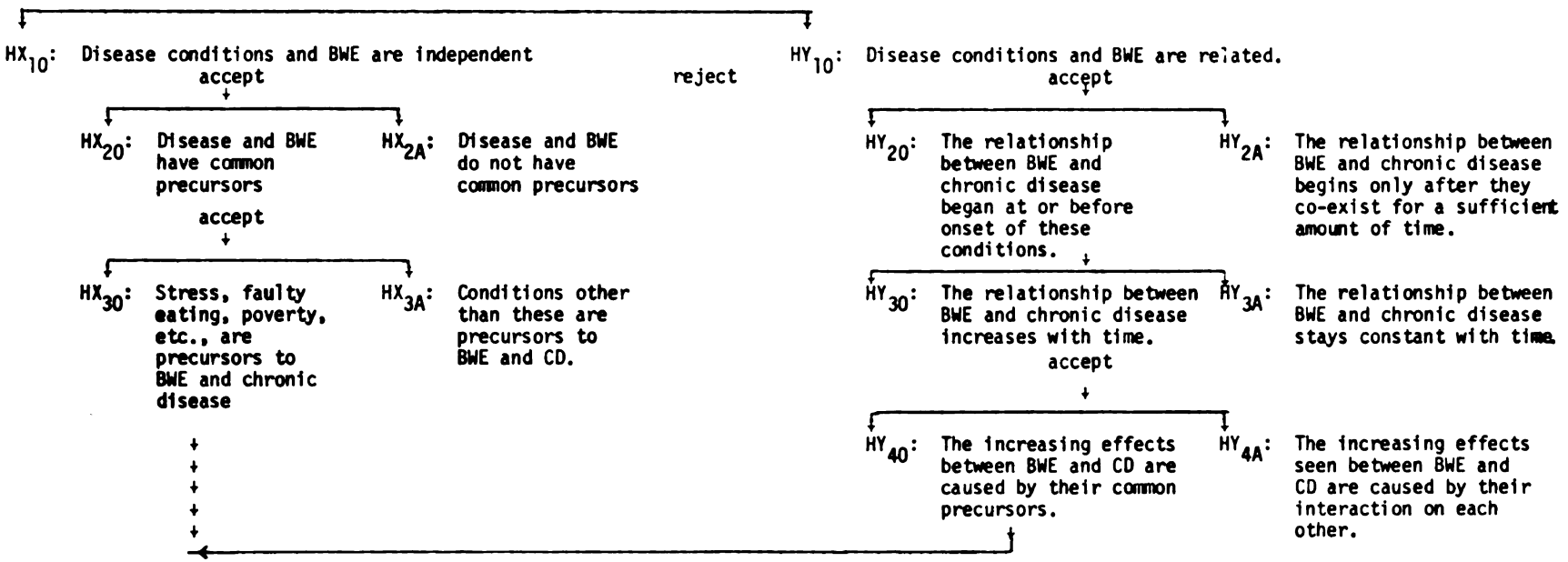

Figure 3.--Nested Hypotheses Leading to the Identification of Common Precursors to BWE and Chronic Disease

development of disease and body weight extremes (Dodge, et al, 1970).

Hypothetical Models

Extremes in body weight are often observed as coincident with particular diseases and poor health, certain environmental, social and personal conditions precipitating such a chain reaction. Or, when BWE antecede disease, they may appear to be cause of disease. Or, they provide occasion for the appearance of disease symptoms and so affect the condition although not necessarily causing it. Finally, BWE may act as a determinant of disease outcome, rather than an initiating force. In the latter case, BWE is precursor of disease.

The hypothetical considerations emerging from longitudinal study of alleged effects of BWE range from demonstrable absence of visible effect to strong positive or negative effect. Figures 1 and 2 show relational analyses implying conceivable statistical results which may be observed between BWE and disease.

Figure 1 may be interpreted as indication of positive accumulative relationship between body weight extremes and unspecified diseases. This hypothetical observation is suggested in the literature; however, the contention that the longer the duration the higher the frequency of disease has been inconclusive.

Figure 2 shows a hypothetical situation of no relationship between BWE and a disease condition. The parallel lines

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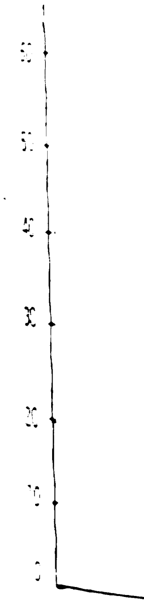
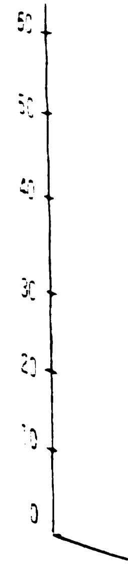




UW = Underweight
NW = Normal weight
OW = Overweight
OB = Obese

FIGURE 1.

HYPOTHETICAL MODELS INDICATING PERCENT OF BODY WEIGHT BY AGE AND WEIGHT LEVEL FOR UNSPECIFIED DISEASES

ACCUMULATIVE PROCESS

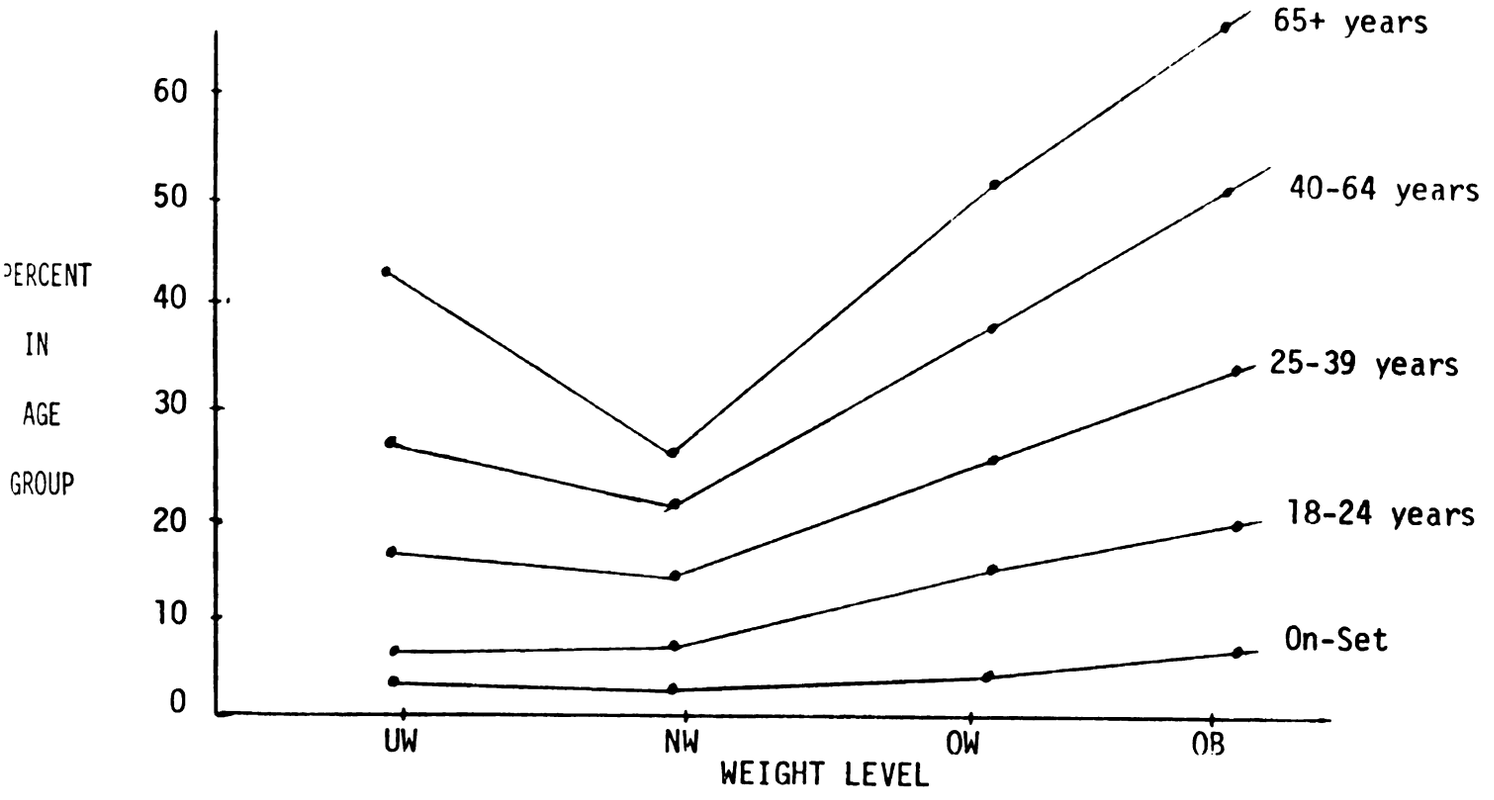
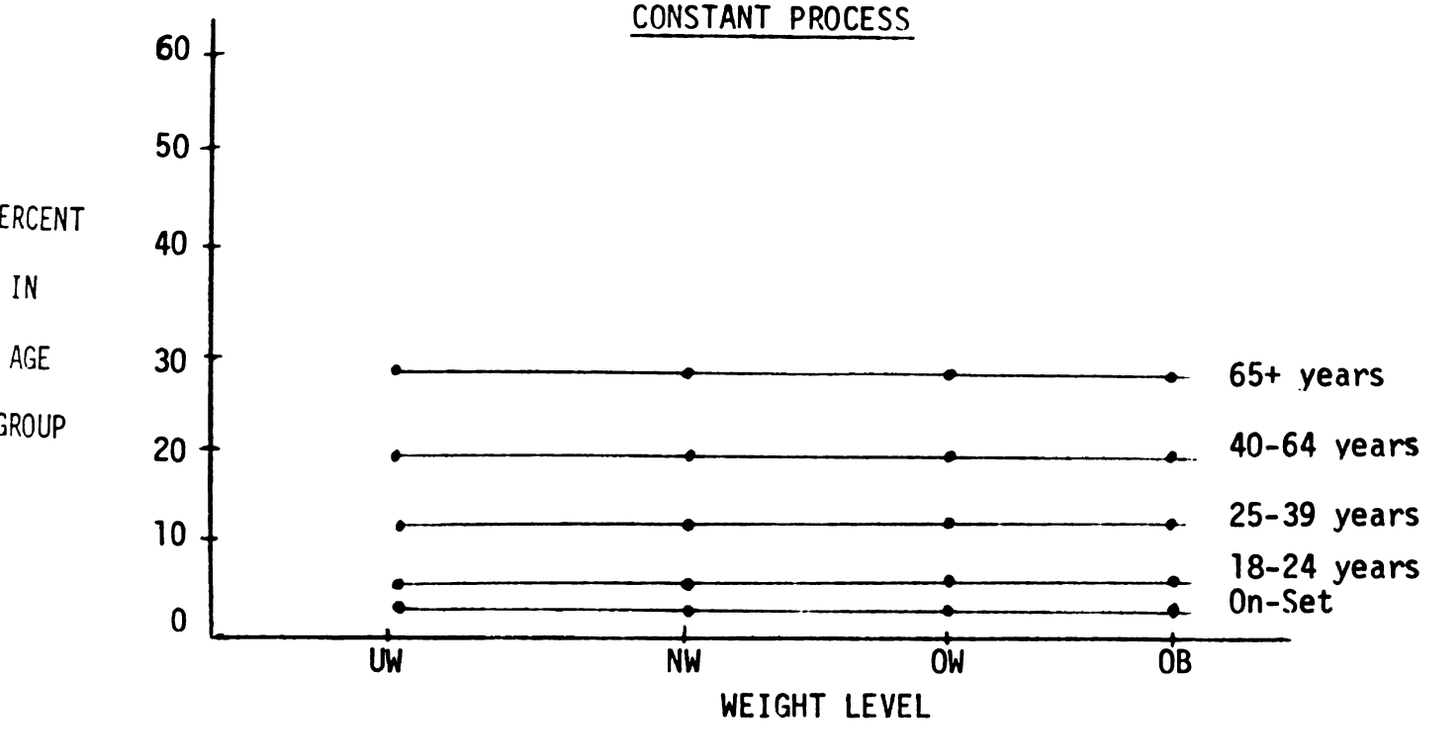


FIGURE 2.

CONSTANT PROCESS



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show that the increase in body weight did not increase the frequency of the disease. The aging process itself may explain the differences observable between age categories.

Variations between patterns observed in Figures 1 and 2 are to be expected. For the purposes of this study, it is logical to assume that patterns such as that observable in Figure 2 indicate little, if any, relationship between BWE and a specified disease. When the patterns observable in Figure 1 emerged, it was interpreted as indication that not only does a positive (or negative) relationship exist, but that other factors (precursors) are interacting with both BWE and disease condition.

Interpretation of Models and Hypotheses

In testing (A-I), when a determination that the frequency of disease in persons of normal weight equals frequency of disease in persons with BWE, during the same time, the conclusion is that body weight and disease are independent. This is both distinct from, and more specific than, inquiry focused on precursors which would be appropriate whether or not (A-I) was accepted or rejected.

(A-II) explores the possibility that the coexistence of BWE and disease increase the risk of (a) greater intensity of the disease, (b) a higher frequency of other disease or negative health conditions, (c) an even higher degree of existing BWE, or (d) a spiral effect between disease and BWE.

Explanation and interpretation of Hy_{10} in traditional

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studies show relationship between body weight and disease without committing themselves to explicit identification of whether one causes the other. The "spiral" contention that they interact and react on each other in a circular cumulative way, reflects Gunnar Myrdal's "principle of circular and cumulative causation," and Ragnar Nurkse's Vicious Circle of Poverty. Winslow points out that poverty and disease form the proverbial circle, that people get sick because they are poor, and poorer because they are sick, and so on. (Winslow, 1951).

A similar principle could be applied to BWE and disease conditions. However, instead of a "circular effect," the interaction between the two or the feedback between them may bring about a "spiral effect," so that a cumulative process takes place, one negative condition becomeing ultimately both cause and effect of the other negative factors. (Spiral is used in the sense that the vertical dimension reflects risk field levels in time.)

In this sense, one negative condition becomes precursor of another, continuing to progressively more extreme forms of itself. Ergo the more an individual's weight tends to deviate from normal, the more likely he is to be ill of specific diseases. The obverse (i.e. the more ill, the more likely deviation from normal weight) pertains for a different set of illnesses for the most part. This spiralling condition will cease if:

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The outside conditions may well be the other precursors common to both disease and BWE, since it might have been these conditions that touched off the process initially. Both BWE and CD are affected by the social, personal and environmental variable of composite entities such as education, employment, marital status, etc., while the environment involves components such as housing conditions, immediate surroundings, nutrition, etc.

Since the feedback may be due to causal interactions between all the variables involved in the developmental process of BWE and chronic disease, it is not reasonable, and it is distracting, to look at just one of these variables in a bivariate analysis. The main scientific task is to obtain meaningful measurements in time and space. One approach is by attempting to identify the causal interrelation of the two as they move under the influences of the pushes and pulls as well as momentum of peculiar internal processes. The scientific ideal is not to split the variables into bivariate analyses, but to measure quantitatively each of the elements for ability to influence each of the others, and to be influenced by changes in the other variables.

The first-order influences (as reflected by risk levels) should be separated from second-order (interactive influences with attendant components (which may be as large or larger

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than the first order in some cases). All of the variables involved in the developmental process between these two factors cannot be quantified for two main reasons: because all of them are not identified, and because those which are identified may be too numerous. However, most of the relationship and cumulative interaction that exists could possibly be accounted for by a limited number of those composite variables. The time element is of paramount importance, since the affects of all variables will spread very differently along the time axis; yet the more that is known of the way the different factors interrelate over time, and of what effects a primary change of each will have on all the other factors, and when, the better the medical community will be able to establish how to maximize therapeutic treatment or prevention.

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CHAPTER IV

AN ECOLOGICAL APPROACH TO STUDY OF BWE

Introduction

The literature indicates that to date studies of body weight extremes disagree on both causes and consequences of the condition. It has been suggested that the methods of study be improved, and that study designs be sophisticated by inclusion of a broader range of variables. The epidemiological methods increasingly employed in investigation of etiological factors in some chronic diseases suggest that a similarly holistic approach to the study of BWE would significantly contribute to its improvement.

As alternatives to traditional study of special groups of selected population, three conceptual models are possible:

1. Sample survey of cross-sectional groups.
2. Longitudinal study of communities or neighborhoods.
3. Longitudinal study of selected individuals.

A summary explanation of these designs and the traditional is shown on the accompanying chart (Figure 4). In the light of current perceptions of feasibility and justification, these designs are sequentially developmental rather than mutually exclusive. Such a concept enhances the possibility of more informed understanding of this particular aspect of human attributes in the realm of social, environmental and medical dynamics.

Figure 4.-- ALTERNATIVE MODELS FOR STUDYING BODY WEIGHT EXTREMES AND DISEASE CONDITIONS

MODELS	HO/HA	METHOD OF APPROACH	POSITIVE ASPECT OF STUDY METHOD	NEGATIVE ASPECT OF STUDY METHOD	FEASIBILITY	JUDGEMENT AS TO OUTCOME
Previous Studies						

Figure 4.-- ALTERNATIVE MODELS FOR STUDYING BODY WEIGHT EXTREMES AND DISEASE CONDITIONS

MODELS	HO/HA	METHOD OF APPROACH	POSITIVE ASPECT OF STUDY METHOD	NEGATIVE ASPECT OF STUDY METHOD	FEASIBILITY	JUDGEMENT AS TO OUTCOME
Previous Studies Selected Population (Special Groups)	Ho: Obesity is independent of morbidity HA: The greater the extent of obesity, the greater the morbidity rate.	Fortituitous groupings, e.g. Life Insurance policy holders, clinic patients. One point in time study.	Easy accessibility of data. Ability to maintain large population at relatively inexpensive cost. Aids in identifying factors associated with BWE and the variability of these factors in sub-groups.	Lacks ability to generalize findings beyond population being studied. Population at risk may be different from population under study. Indeterminate time	Relatively inexpensive due to easy data accessibility.	General conclusion that disease is consequence of obesity untenable Treatment based on conclusions may be ineffective or harmful.
Present Study Sample Survey Multivariate Observation MODEL I	Ho: Body weight extremes (BWE) are independent of morbidity and health habits. HA: Body weight extremes are related to morbidity and health habits.	Random selection of a representative population. Multivariate observations. Crossectional study design.	Results generalized to known population. Simulteneous study of several potential causal factors and their relative strenght possible. Provides comparative information about any group, or area.	The cross-sectional nature of the study design do not allow for the observation processes necessary to adequately identify precursors.	May be more costly in time and money than	Studies the condition in its natural surrounding. Conclusions and resulting treatment should be broader and more effective than the above.
Preposed Study I Community or Neighborhood Studies Multivariate Analyses MODEL II	Premise BWE are geographically distributed such that high frequencies of BWE, disease and social disorganization are located in the same areas. BWE and disease have the same precursors.	Homogeneous grouping of areas based on negative health indicators. Random selection of population within areas at successive points in time. BWE distribution is explained in terms of area characteristics	High risk areas for the emergence of BWE and (CD) chronic disease are identified. Social maladjustment, physical deterioration, and various dieseses and behavioral patterns may be observed with BWE Area precursors noted.	Medical information concerning the individual lacking so that personal precursors may not be identified.	Affected in undetermined ways by death, migration, and withdrawals.	Noting problems at community level may give clues to Precursors. Treatment at the neighborhood level may reach more individuals than by above methods.
Preposed Study II Langitudinal Study Individual Response MODEL III	Premise Individual response to social and physical disorganover time increases his risk for health problems. Factors contributing to risk are precursors to BWE and other health problems.	Stratified random sample and subsequent continued surveillance of indivuals in the sample. Continuance of MODEL I and MODEL II noting high-risk and low-risk areas (BWE/CD/age specific. Multivariate analyses.	Population studied long before clinical manifestation evident. Early factors relating to later development identified. It is possible to include medical, personal, and environmental factors in the study design.	This study design do not yeild results as quickly as MODEL I or MODEL II. Mobility of research staff and population under study as well as refusals affect continuity that is necessary.	Depending upon the duration of study it may be more costly than any of the above. Staffing, cost, and quantity of data have been the discouraging factors of this study design.	Important clues to pathogenesis of BWE and CD should be uncovered. Definite precursors identified. Treatment based on conclusions may be effictive.

The Survey

The development of sampling theory and methods in Model I makes it possible to select population samples meeting specified criteria of precision and requisite representativeness; the individuals under study are in their natural surroundings, and the results applicable to actually existing populations. Furthermore, the model permits inclusion of factors associable with the conditions (in this case BWE) for comparison with norms of similar life-settings, expanding applicability of one defined setting to another, and to any desirable grouping of BWE's to another. (Figure 4B)

Few studies have set out specifically to study body weight and its correlates using the sample survey as is done in Chapter III. Although the Household Survey conducted by the National Center for Health Statistics and the Framingham Massachusetts Study come closest to doing this, both of these studies are mainly concerned with chronic diseases and do not provide community-level ecological components such as the physical and social environment.

Moore, et al. (1962) reviewed the Midtown Manhattan Study which used the probability-sampling procedure to select the population to be studied. Moore calculated the relationship between obesity and mental health, while Swanson, et al. conducted a survey to examine the food intake and body weight of older women. Despite the sampling procedure used to select their population, however, they limited their scope of inquiry by concerning themselves with bivariate analysis.

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It is commonly suspected that multiple factors may be causally related to BWE or that the effect of a single factor may become manifest BWE as well as the diseases with which it have been associated.

Chronic diseases (a BWE sometimes so-called) are inherently characterized by latent periods, viz, the time between initiation of the disease process and clinical recognition. Because there is very little known of the genesis of several of the so-called chronic diseases, their latent period has not been clearly defined. However, evidence in the form of precursors to diseases indicate that the period of latency - the duration of exposure to environmental factors - is a crucial consideration.

Environment plays a permissive role in the development of BWE influencing as it does available food, and it interacts in a variety of ways with constitutional and traumatic factors to permit or modify the development of the condition (Mayer, 1967). Some of the environmental variables of importance include social, familial, and economic factors.

Varying body weights seem to be heterogeneous chronological outcomes of multiple etiologies and consequences. Furthermore, over time, "body weight" may reverse its status in the cause effect field, i.e. it may emerge out of certain risk experiences, or it may in turn become risk determinant bearing on subsequent events or outcomes such as a given disability (e.g. hypertension). The developmental process of disease and BWE is similar to Dodge and Martin's disease continuum in "Theory

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of Social and Stress and Chronic Disease." Mortality at the end of their continuum was due to prolonged exposure to stress.

The many factors that may be responsible for BWE are possibly interactive and generative of second-order risk fields. One possibility, for example, is that factors common to both BWE and diseases may contribute to a risk field for the causation of both.

Hypothesis

This method (the survey) enables the investigator to test the first level of the nested hypothesis (Hy_{10}) shown in Chapter V. The results may be generalized to a known population. A demonstration of the survey approach is shown in Chapter V.

The difficulties and limitations inevitable in cross-sectional studies are obvious when studying any condition that develops over time, and makes alternative approaches essential. The two alternative designs that follow are conceived as methods to solve hypotheses Hy_{20} to Hy_{50} stated above.

A Community-Based Longitudinal Study (Model II)

Neighborhood or community health research offers opportunities to study homogeneous grouping in population with homogeneous health problems. The population is the community which must be individually defined since it may vary within and between studies. Willard (1963) notes that population studies describing the number of people, their characteristics and trends over time, provides essential baseline data for many

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A community-based longitudinal approach to studying BWE is suggested by the observation that seldom, if ever, is a health problem an individual one, distinct from family or other groups and the community. As early as in 1855 Snow's observations on cholera in London and Panum's study of measles in the Faroe Islands are cross-sectional approaches similar to the one proposed here. These and other earlier studies on communities were studies of health, housing, poverty and crime. Instead of selecting a group of cases and suitable controls, a population (geographically defined community) was chosen for study without reference to the presence or absence of disease or of suspected etiological factors in the community.

Two of the most noted longitudinal studies concerning the community are the Framington Study and the Tecumseh Community Health Study which proceed on the basic assumption that a disease develops and becomes manifested in a community within a general ecological setting in which previous disease experiences, environmental exposures, and genetic predispositions all play important roles so that the total community approach has an important potential for the clarification of the interrelationships that may exist between variables (Napier, 1970).

Their original protocol of study was based on the general hypothesis that the age of onset of a chronic disease is a function of:

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1. Constitutional factors (including hereditary factors).
2. Conditional factors (including external environmental factors).
3. The time factors or length of time the conditioning factors act on the constitutionally determined characteristics or interact with them to result in clinical manifestation of the disease (Gordon, 1970).

In applying this Model to BWE, the status of all subjects with respect to relevant variables would be initially determined, and comparisons made between those found to have BWE and those not. The members of the population may be classified according to the presence or absence of the attribute (in this case, BWE); then the incidence of disease in both groups could be ascertained at successive points in time.

Central cities are thought to be natural and productive places for community studies. Robert E. Parks (1952) described the city as a "social laboratory" because it is a world which man created and where he is condemned to live, so that in making the city, man remakes himself.

This design proposes to identify communities or neighborhoods of high risk by frequent common negative health indicators (e.g. squalor, congestion, poor housing, etc.). Some of the spatial distribution of BWE and its relationship to areas was shown in Model I where it was evident that the frequency of the obese females was higher in the areas of environmental deterioration and social disorganization than in other areas.

Most area studies are concerned with factors of the physical or social environment or with factors of a biological or

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A Brief Suggestive Protocol for a Community-Based Longitudinal Study

Four scientific groups may be concerned with community patterns of health and disease, viz:

1. Medical Practitioners--interested directly in the health of their patients, but only indirectly in the health of their communities.
2. Public Officials--e.g. state and local health officers.
3. Social Scientists.
4. Epidemiologists.

The approach to a professional community-based research project will obviously differ according to the background of the investigator, but protocol suggested here reflects at least partially goals of all four groups.

Selecting the Population for Study

In this model, the community is classified according to the presence or absence of selected characteristics, and then ascertainment of the incidence of BWE among both groups at successive points in time. Since longitudinal studies are interested in measuring change, this design suitably measures change in relevant environmental conditions under which the individual has lived during the change period.

Study Objective: Most community-based studies are not designed to test one specific etiologic hypothesis even though many are undertaken with the hope of uncovering new leads to the pathogenesis of a particular disease. A community-based

longitudinal study concerning BWE should have as one of its major study objectives the observation of persons with and without this disorder and factors identifiably leading to its development.

Another study objective being areas of study, areas of high and low incidence of the condition must be included. Selected communities or neighborhoods must be as representative of other communities to which the data will be applied as possible. Their size must be large enough to largely eliminate the "Hawthorne effect"--the effect upon some subjects of the knowledge that they are taking part in an experiment--and small enough for as nearly optimum research as possible (Kessler, 1970). The size of the community chosen is determined mostly by the methodology employed or vice versa.

Method: Since the community or neighborhood and not the individual is the unit of study, it is suggested here that both the prospective and cross-sectional approaches be combined to incorporate randomly selected populations from designated communities with successive surveys. Thus, each survey will yield prevalence-data for a particular point in time, but the comparisons between results for successive points in time will provide longitudinal data (Kessler, 1970).

The effects, if any, of the social and physical environment are usually studied by comparing the incidence of an event either in defined geographical areas or in specified social or other groups where the condition prevailing can be

measured in some quantative form. The community groups must be small enough to be reasonably homogeneous in character, but large enough to provide stable analyses.

The assumption underlying the use of geographical distribution in studying the epidemiology of disease is an old idea, but no data specifically referring this approach to BWE was uncovered in the literature. However, in other chronic diseases, the use of this design has been investigated by Faris and Dunhan (1939), Clausen and Kohn (1954) and others since then. It is commonly believed that this type of study design has its greatest value in suggesting hypotheses of cause and effect which can be put to the test of more detailed inquiries; however in a community-based longitudinal study, more extensive hypotheses concerning community trends are possible.

Generally, then, the protocol for the epidemiological community-based study of BWE is not much different than it would be for many other chronic diseases.

Relevant Variables: BWE is the prime concern of the investigative effort. Variables based on those "showing a relationship" in studies such as identified and verified in Model I may be beginning suspect variables for etiologic hypotheses testing.

The clustering of conditions among the same class of individuals may serve to identify other relevant variables.

This seems especially appropriate in studying the development of BWE where a broader range of factors is more

likely to be involved than in a specific disease. It is also desirable for testing the various levels of hypotheses mentioned earlier, since one of the objectives of the design is to enable the investigator to identify precursors. One way the researcher may accomplish this, as proposed here, would be by testing the various levels of hypotheses (hypotheses Hy_{10} to Hy_{40}) where:

> Hy_{10} attempts to establish the existence of a relationship (e.g. between crime, education, BWE and disease conditions,
>
> Hy_{20} attempts to establish if the relationship began before or after their coexistence or the time origin of onset,
>
> Hy_{30} attempts to establish if the relationship is cumulative, and,
>
> Hy_{40} attempts to establish if the cummulative relationship is due to precursors.

One of the major advantages of this method of study is that high-risk areas are more easily observable and identifiable than are individuals; since the occurrence of an event in an area is more probable, immediate and practical conclusions can be obtained for evaluation, planning and action.

The current thinking is that the underlying reason people eat more than they need to is mostly psychological. In neighborhood studies, the psychological response to conditions in the environment in the form of overeating may be the individual's adaptation to different forms of stress, an attribute that enables him to survive and function under a wide range of conditions. Dubos notes that "man's very adaptability may be his undoing in the long run." He based this statement on what he called "three different aspects of

man's response to the environment:"

1. The effects of environmental factors are most profound and lasting--indeed often irreversible--when they take place early in life, during the developmental periods, prenatal as well as postnatal.
2. Although man is highly adaptable and can, therefore, achieve adjustments to extremely undesirable conditions, such adjustments often have long-range, indirect effects that are deleterious.

3. Because man is shaped by environmental forces, it is desirable that a wide range of experiences be made available to him so as to favor the phenotype expression of various types of genetic potentialities. Diversity is an essential aspect of functionalism (Glass, 1968).

Noting the development of social disorganization or chronic social problems resulting in stress in the form of fear, anxiety, depression or loneliness may give clues to precursors at the community level. Furthermore, since human beings are continuously putting out tentatives in the form of individual and collective reactions to stimuli, habits in the individual and customs in the group may also be factors in BWE and CD. The findings in Chapter V showed that some of the health-related habits of the obese female were different from females in other weight categories.

Illness and BWE can be related to greater variety of demographic characterization and environmental factors by this study method than if the population data must be obtained from census statistics. Treatment may be at the neighborhood level rather than the individual level. A limitation of this design is that emphasis on the area in question prohibits detailed medical information on the individual. Further, migration in and out of the specified area as well as the changing

characteristics of the area complicates interpretation of the results. However, evidence from the sample survey study in Chapter V points out that there are areas where the individual is at a higher risk of BWE and disease than in other areas, and these may be target areas for further study.

Prospective Individual Study

The longitudinal study similar to those undertaken to investigate chronic-disease development is suggested for studying the development of BWE. A longitudinal study is defined as one which is based upon repeated measurements of the same individual over time with the purpose of measuring stability and change.

Most investigators agree that only the longitudinal method can give a true picture of cause and effect relationships over time. In contrast to the community-based prospective study, the individual prospective study is concerned with deviant individuals of one kind or another and the development of the deviancy as well as the outcome of treatment of this condition. Only this method can show the nature of the development and trace problems of change in the individual.

Longitudinal studies are recorded as early as the 18th century concerning the growth of children (Wall, 1970) and more recently numerous such studies have been conducted and catalogued (Bloom, 1964) (Wall, 1970).

Most effective longitudinal studies of individuals are conducted within designated areas based on initially specified hypotheses. Similarly this proposed design would emerge from

the previous ones. The plan of a prospective study is to measure precursors, which requires that the individual be characterized prior to the occurrence of the event.

The consideration of this design has the advantage of studying some individuals in the population long before the manifestation of BWE, so that host and environmental factors found early in life can be related to the development of disease or other negative health conditions found later in life (Dawber, et al. 1963).

These observational procedures for studying chronic diseases are suggestive in developing a protocol for testing Hypotheses Hy_{10} to Hy_{40} for the purpose of identifying common precursors to BWE and CD.

Suggestive Protocol for a Longitudinal Study of BWE

The desirable requirements for a longitudinal prospective study include:

1. An appropriate population-sample of the proper size, which can be kept under surveillance for a long period of time without excessive loss to follow-up.
2. An estimate of the expected incidence of disease-development in the population, the results of the study permitting generalization.
3. Hypotheses to be tested.
4. Planned observations and measurements determining to a large extent hypothesis to be tested.
5. Some ideas of the size of the risk anticipated to be associated with the characteristics under study.
6. An examination procedures capable of detecting the disease in question reliably.
7. A capable staff willing of participating in the study for a long period of time to ensure uniformity (Dawber, et al. 1963).

Selecting the Population for Study

A study protocol for BWE using the longitudinal design has as one of its main problems identifying a population for study that would certainly include varying levels of the major risk factors (e.g. the underlying causes of overeating may be widely variable and subtle). Since in order to identify precursors to BWE, it is required that a person be characterized prior to the occurrence of the disorder, the population under study may include infants. Furthermore, since the disorder may be viewed either as a precursor or a consequence (that is it may be a precursor to specific disease or the disease may be precursor to BWE), it may be necessary to include persons who already manifest BWE in the initial population. The selection of the population may also be influenced by areas identified in Models I and II.

Method: The participants may be selected by a stratified random sample followed by subsequent surveillance of the individuals in the sample. The method of selection is seen as sequential to Models I and II by attaching a cohort analysis to specific individuals in the sample, noting especially two types of areas; (a) high-risk area (BWE/CD/Age Specific), and (b) low-risk area (BWE/CD/Age Specific). Data may be collected longitudinally from interviews, medical examinations, laboratory tests, hospitals, etc.

Hypotheses: Most longitudinal studies are centered around the premise that individual response to social and physical disorganization over a duration of time increases

the risk for health problems. The longer the exposure-time, the greater the risk. A further premise is that factors contributing to these risks are precursors of health problems.

The hypothesis concerning BWE and CD is based upon the assumption that these conditions are multicausal and developmental. Variables to test hypotheses Hy_{20} to Hy_{50} may be identified from the previous models.

The observation of medical, personal and environmental information over time is possible in the design so that possible precursors relating to all these categories may be identified. Furthermore, the task of untangling factors commonly related to chronic disease and BWE in order to observe the individual effects on each may be possible.

Relevant Variables

To identify relevant variables that may be responsible for, or precursory to, the development of BWE, it may be necessary to look beyond the traditional variables (e.g. age, sex, socio-economic status) to the deprivational and stress sources of morbidity, Gladstone suggests in Beyond the Germ Theory where he was concerned with the affects of stress and deprivation on health and disease:

> Life's experience includes a series of hurdles which each individual is required to clear in the race for fulfillment. Each hurdle represents a stress situation--entering school, adolescence, the choice of a vocation, young adulthood, the family, middle life, the empty nest, retirement, the autumnal years, senescence. The progressions from stage to stage are fraught with hazard, and about each of these nodal periods there cluster innumerable wrecks and failures. (Gladstone, 1954).

The pathology of deprivation is defined as diseases due to lack, to inadequacy, or to absence, while the pathology of stress is defined as a response to external variations that are excessive in degree or too sudden in advent.

Seyle notes that the body reacts to stresses and deprivation by what he calls a "general adaptation syndrom", so that the by-product of the adaptations (also noted by Dubos) to stress are the so-called diseases of adaptation.

BWE is thought to be one of the diseases of adaptation (Dodge, 1970) (Mayer Mendleson, 1964) so that stress variables (e.g. unhappy childhood, broken homes, poverty, etc.) should be included in developmental studies concerning this disorder. Further, these variables may be considered in data-analysis and conclusions involving treatment.

Evidence that some form of interaction is underway between BWE and the environment is demonstrated in Table 37 and Figures 23-26. If poverty, deteriorated environments, and social disorganizations are assumed to be stress-producing factors, then areas where the individuals are at high risk to these conditions may be effected in ways of pathological implication.

Finally, it is recognized that biological phenomena are dependent upon some form of genetic direction. Susceptibility to pathological conditions is known to be influenced by the genetic background of the individual. Instances related by Mayer show that the observation that physical traits such as obesity "run in the family" indicate more than environmental

factors. In fact while the studies he noted showed that weight was to a large extent genetically determined, it is more susceptible to environmental influences than other measurements (Mayer, 1968).

There remains some question on if and how genes predisposing subjects to BWE are passed from one generation to succeeding generations. Any longitudinal study of BWE should include the genetic factor, as one of the variables to be considered. For as noted by Mayer, while genes may make one susceptible to BWE, the overeating or undereating and the amount of activity or both leading to a positive or negative energy balance still has to take place prior to the development of the weight extreme. All of the above variables and more are needed for a much more solid basis for preventive treatment. The lack of immediate results and the cost have frequently discouraged researchers from utilizing this design.

CHAPTER V

A DEMONSTRATION OF THE SURVEY APPROACH TO STUDYING BWE

A multiplex of variables acting concurrently, but with varied time responses, appears to be an appropriate approach to the analysis in order to obtain a more complete and meaningful explanation of this phenomenon.

Treatment is severely handicapped by this multiplicity and variability of the etiologic factors and by ignorance regarding factors as yet undiscovered. However, the association of extremes in body weight with various disease-conditions may well be treated more effectively by means other than mere change in body weight.

The objective of actually conducting research on body weight for this study is to ascertain relationships between various variables and body weight for adult females using the sample survey of a specified population to verify alleged relationships and establish the degree (if any) of relationship between previously untested variables.

A further objective is to permit identification of factors affecting both BWE and CD.

Source of Data

The random sample of females on which this study is based will ensure that every female has had an equal chance

to be included in the sample, bias in terms of selection of the population, then is virtually eliminated. The data for preliminary analysis has been taken from the "Michigan Health Survey." The "Michigan Health Survey" is a continuing health-sampling survey developed to secure statistics on the state of health of the population of selected Michigan cities. A detailed description of the survey is described in Appendix C.

All female subjects 18 years of age and over were selected from the sample, ages therefore ranging from 18 to 94 years.

Method

Data collected in the Michigan Health Survey are stored on master tapes. The data for this study were obtained from these tapes using a Fortran program that selected records of females falling within the specified age range. These data were recorded on newly created tape, the tape then sorted into age and weight categories for each city. Finally, contingency tables of age and weight were produced.

Four Michigan cities were selected for the study. They were:

1. Lansing
2. Grand Rapids
3. Muskegon
4. Adrian

The number of adult females falling into the sample from 1970 through 1971 were:

	Total	White	Non-White
Lansing	1,334	1,251	83
Grand Rapids	2,351	2,164	186
Muskegon	1,332	1,256	276
Adrian	398	376	22

The health variables used in this study are as follows:

1. Ill this year
2. Medical examination
3. Overnight hospital admissions
4. High blood pressure (hypertension)
5. Heart trouble
6. Diabetes or high blood
7. Kidney and bladder trouble
8. Emphysema or bronchitis (respiratory difficulty)

The demographic variables are as follows:

Personal

1. Age
2. Sex
3. Race

Social

1. Education
2. Work status
3. Marital status

Habits

1. Prescribed - non-prescribed medicine
2. Cigarettes
3. Vitamins

Body weight is used as the dependent variable and is defined as standard by the Metropolitan Life Insurance "desirable weight" tables. These tables are based on the concept that once growth in height has ceased, there is no biological need to gain weight, and that the best health prognosis (as reflected by mortality and morbidity data) is found in individuals of average or less than average weight. The 1960 Metropolitan Life Insurance Company's desirable weight tables are designed to be applied to individuals aged 25 or over; measurements are with indoor clothing and shoes (based on a ponderal index coefficient - a measure of relative body mass expressed as the ratio of the cubic root of body weight to stature multiplied by 100 - of 3 to 4) (Florey, 1969).

Three frame sizes are used; no indication is given as to how the estimation of the frame sizes was reached. In this study, normal weight is defined as an adult female of weight and height ranging from the lower limits of the small frame to the upper limits of the large frame. (Appendix B). Any adult female falling above or below this range is defined as being either overweight or underweight. It is conceivable that some of the overweight and underweight females fall into the normal range, depending upon their body build. However, those females that are classified in the overweight or underweight category by this definition are more likely to actually belong to the category. It has been generally agreed upon that those persons 30 percent above the desired

or normal weight classification are more likely to be obese. This definition accounts for the two categories of overweight in this study.

Using the above process, body weight has been classified into four categories:

1. Underweight - females falling below the normal weight range.
2. Normal Weight - females within the normal weight range.
3. Overweight - females up to 30% above the normal weight range.
4. Obese - females over 30% above the normal weight range.

For the bivariate analysis, age was classified into four categories based on specific points of change in an adult female's life span:

1. The 18-24 age group includes the major portion of students.
2. The 25-44 age group includes the major proportion of females that are housewives in the child-bearing ages.
3. The 45-64 age group are mostly females whose families have grown up and left home.
4. The 65+ age group are mostly retirees and aged females with an expected higher number of health problems.

All of these categorizations, of course, are compromised with reality; all have essential components of error, and each set includes an unknown contribution to total variance. The only solution to the dilemma is to increase the number of categories toward truly continuous distribution, but the number of observations is limiting at present.

The first level of analysis includes contingency tables of the percent of females in each category of weight and age for various health, demographic, and social variables. These contingency tables were also set up for the selected health-related habits in an effort to determine if the habits of females with BWE differ from normal-weight females. (Appendix A)

Graphs for each table were plotted to give a visual analysis of the relationship. In cases where the relationship was unusually apparent, chi-square tests were made to determine if a significant relationship existed.

Limitations of Design and Interpretation

One of the major limitations of this study is the methodological problems resulting from comparison of measurements of one age group (usually a young age group) with those of another (older) age group. Studies such as these suffer from an indeterminate bias, since the investigator does not know how the aged subject would have performed on the test when young, or what the performance of the young would be when older.

Furthermore, it is impossible to infer the pattern of age-changes in an individual from the average regression of a group. The group average may be the result of an number of different individual patterns of change. Longitudinal studies can eliminate many of the above difficulties.

In the absence of longitudinal data, cross-sectional samples are usually used to estimate age trends.

It may be noted that longitudinal data on a random population would be more desirable than the present data design if a large enough sample could be followed to allow wide variation in incidence rates among subgroups. The present data are adequate in specifying potential variables for subsequent analyses, and for identifying and eliminating problems arising in longitudinal analyses.

The longitudinal method of study is better suited for study of the pathogenesis of a disorder. In the study of BWE and disease disorders, this is especially appropriate since the pre-pathogenesis (period prior to interaction of body weight extremes and disease) stage seems to be crucial. The alternative to the longitudinal study is the construction of a "hypothetical cohort" based on age-statistics for a given instant of time. If we are willing to assume that each age - group in the population is behaving generally in a way typical of the culturally and biologically-prescribed patterns at the particular stage of the life cycle by piecing together the age patterns for the successive age group. It is important to keep in mind that aging is gradual, persistent and variable, as well as asymetric. Chronology, on the other hand, is undirectional, constant in rate, and invariate (within the capacity to measure). The rate of aging not only varies between different individuals, it is also variable in different parts of the same individual; the rate of aging nears zero for extended periods of time.

Further, the changes that occur with age cannot be dated

sharply as beginning at any one point in the life span. Some of the progressively increasing derangements seem to have their onset in fetal life. This may be true to some extent for some small proportions of the obese, who according to recent findings might have some inborn errors making them physically more susceptible to overweight than others. Furthermore, the external environment affects some more than others.

Results

Age-Weight: The sample consisted of 5,615 females. The ages ranged from 18 to 94 years. Three-hundred and four, or 5.4%, of the females were underweight. Three-thousand and seventy-five, or 54.8%, were in the normal weight range. Eleven-hundred and seventy-four, or 20.9%, were classified as overweight. Finally, 1,062, or 18.9%, of the sample were classified as obese (Table 1 in Appendix A). If both overweight and obese females are combined, then 40% of the females were above normal weight.

These data show that weight increases with age, making the most critical period of increased weight between the ages of 40 and 60. Nearly half the females in the sample are "overweight" in this age group.

Most of the underweight females are in the 18-24 age group. (Figure 5)

Race: The sample consisted of 10% non-white females and 90% white females. A greater percent of the non-white females were overweight than their white cohorts. Of the non-white

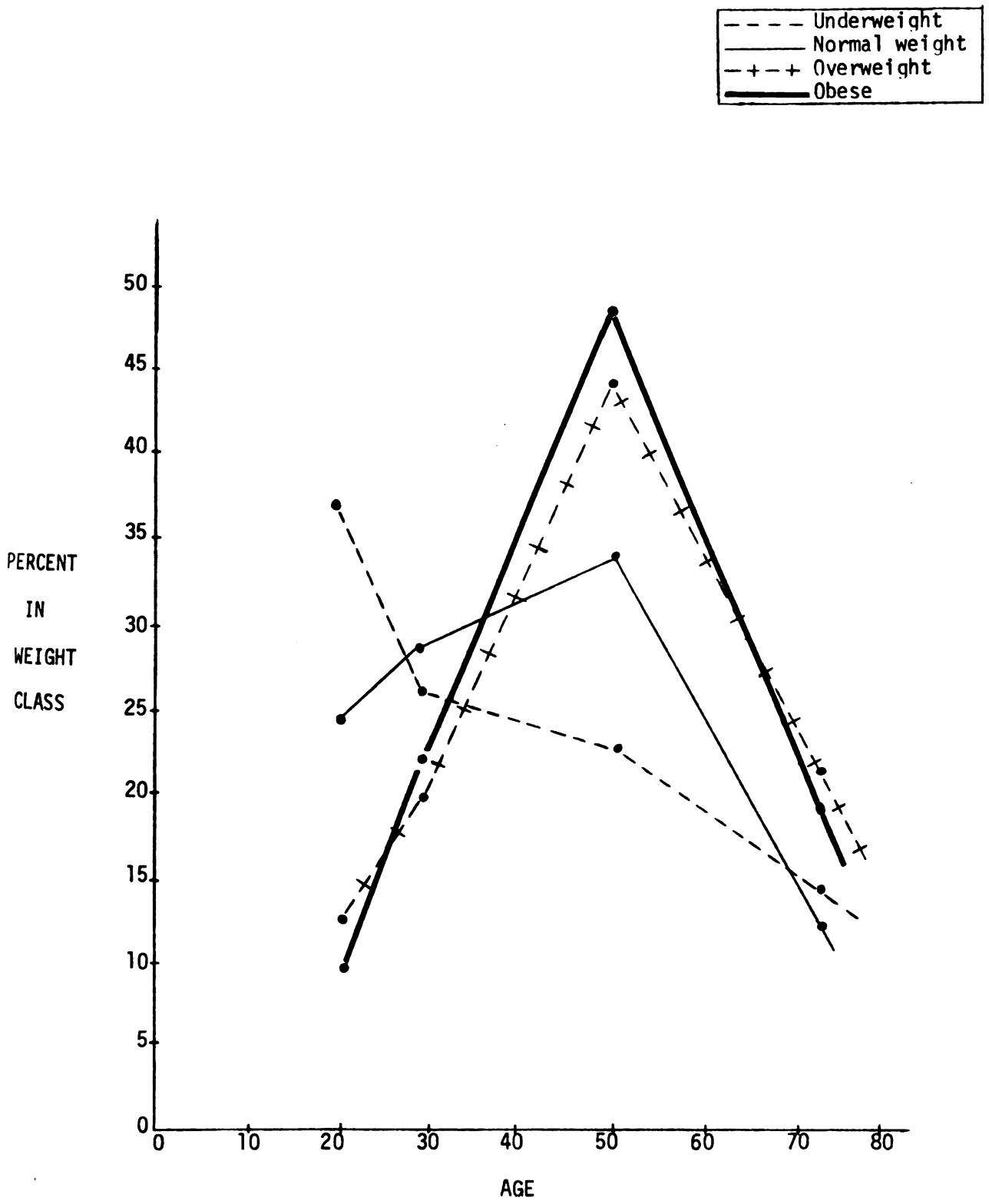


Figure 5. -- Sample Description -- Weight by Age

females, 59.5% were overweight while 37.6 of the white females were overweight. Also, 36.5% of the non-white females who were overweight fell in the obese category compared to 20.1% for the white females.

Marital and Occupational Status: More married women were obese, and a greater number of single women were underweight. Hence, more housewives were obese while the fully employed women were more likely to be of normal weight. Students showed a higher frequency in the underweight category. (Table 4)

Education: The data show that the percent of persons in the 0-7 and 8-12 grades increased continuously from the underweight to the overweight categories. The reverse was true for those with education higher than the 12th grade.

Since education plays an important part in the knowledge of nutrition regardless of income, it will be used in this study as an index of socio-economic status. By separating the subsequent analysis into those in grades 0-12 and 13+, grades will enable this study to control for socio-economic differences in body weight extremes.

Moore, et al. (1962) found that socio-economic status had a definite influence on obesity. They found a marked difference in the prevalence of obesity between the upper and lower-class children, and that these differences were apparent by age six. Obesity was six times more prevalent among women of lower than women of upper socio-economic status.

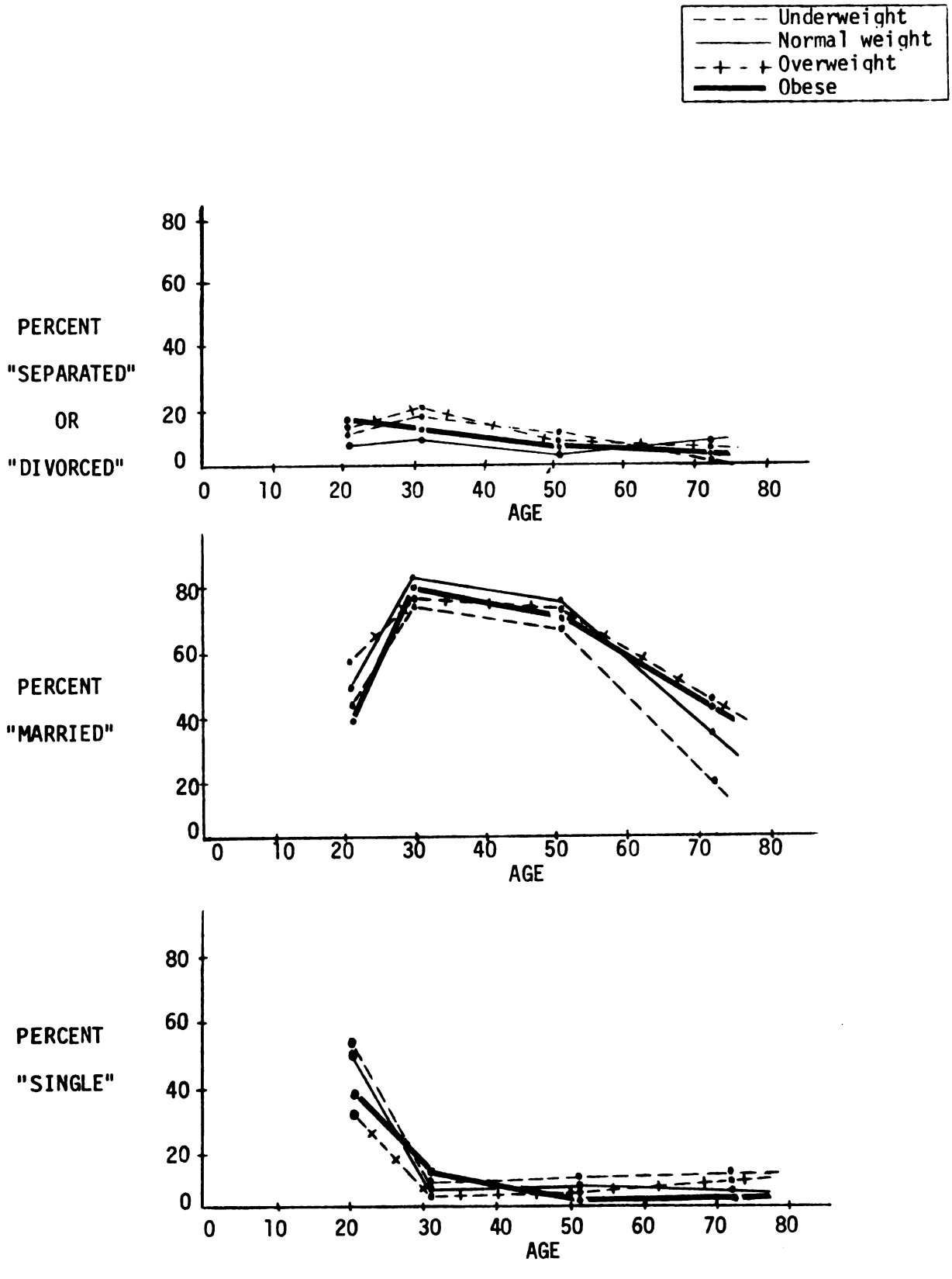


Figure 6. -- Marital Status by Age

Throughout the study, it must also be remembered that the underweight group has the highest percentage of college-educated females. (Figure 7)

Forty-three percent of underweight females reported an education above high school level. This compares with 21% for the normal weight, 19% for overweight, and 12% for obese.

Hypotheses Hy_{10} explores the possibility that there may be a relationship between morbidity and body weight extremes, eg. there may be a greater proportion of females of BWE in the illness category than of normal-weight persons. A chi-square test of proportions was used to determine if the differences in weights within an age group are significant. At ages 18-24, the underweight females showed a considerably smaller proportion of morbidity than the other weight categories, including the normal-weight females. Morbidity decreases or levels off in the next age group, 25-39; thereafter a sharp increase in morbidity begins. (Figure 8)

Illness this Year (1970-1971): The data in this study generally supports the contention of increased morbidity with increasing extremes in body weight.

The underweight persons show more variability in morbidity than other weight classes, a smaller percent of illness at a younger age and a greater percent of illness at an older age than others. (Figure 8) There is a significant difference ($\alpha = .05$) in the proportion of females reporting illness in the underweight category than the normal-weight category at ages 40-64 and 65+.

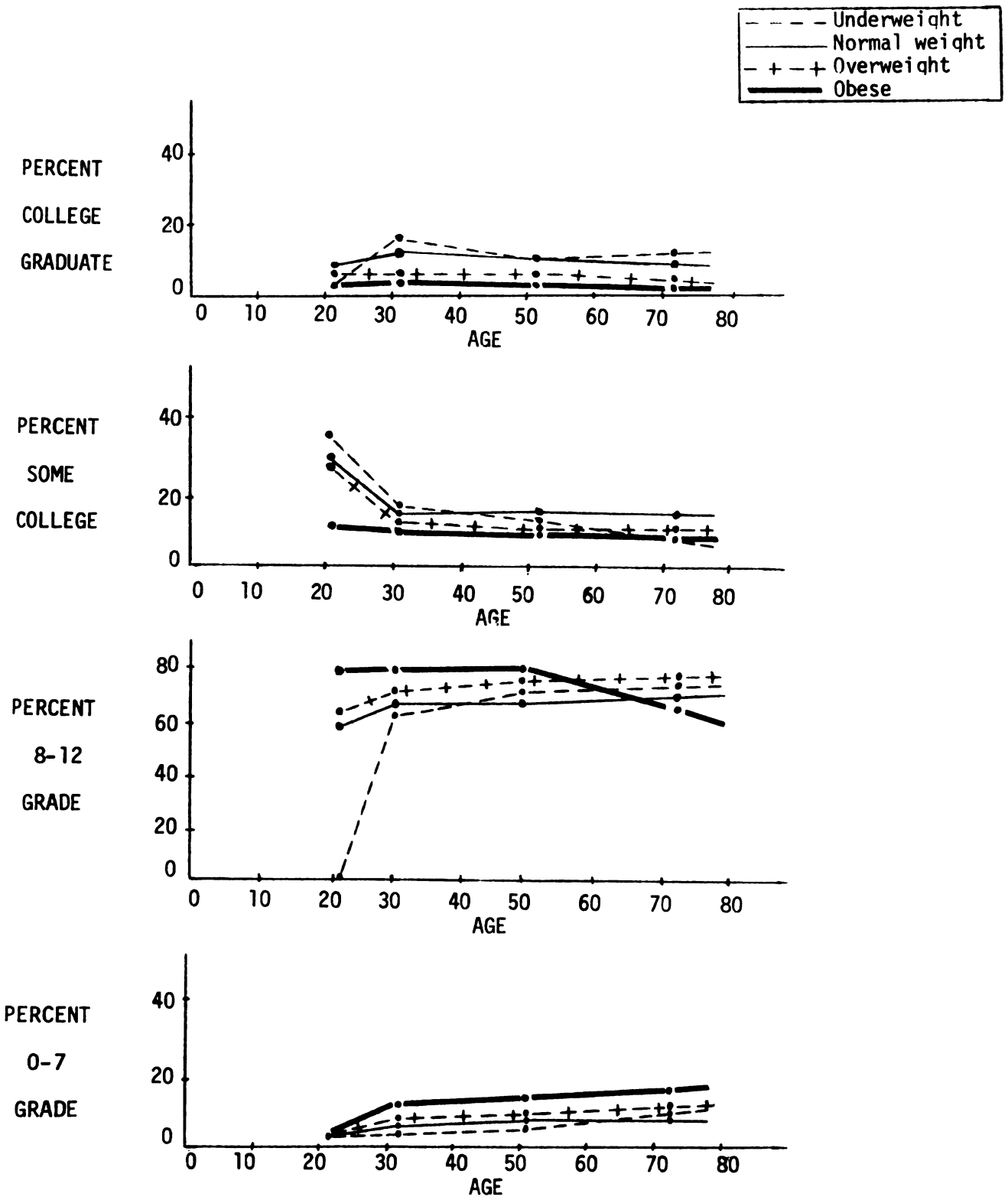


Figure 7. -- Percent of Females by Educational Level
(For Selected Michigan Cities, 1970-71)

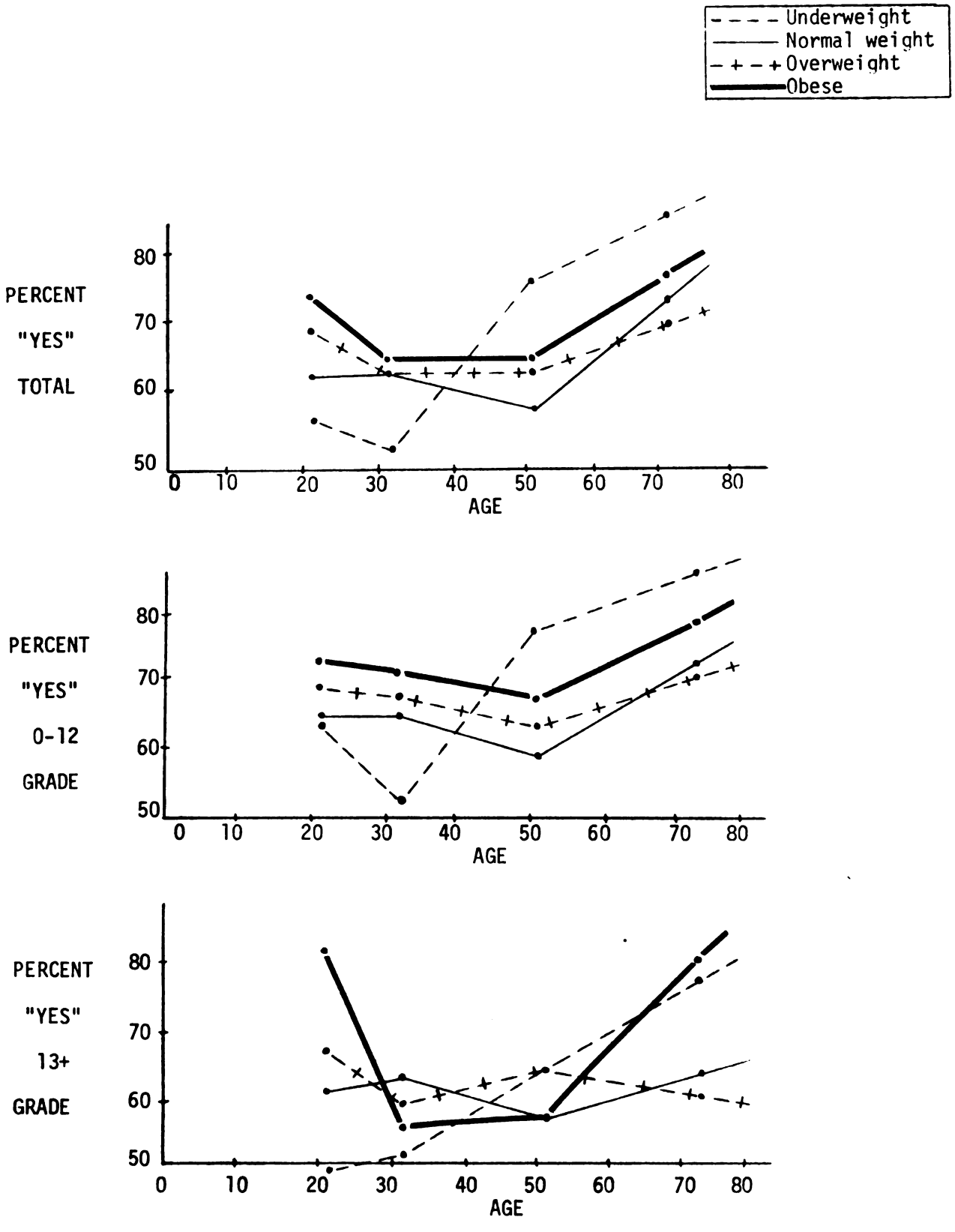


Figure 8. -- Percent of Females Answering "Yes" to Seen By Doctor Because of Illness or Medical Problems (1970-71)

The indication that the percent of illness did not increase continually with age (time) in any of the age classes may be explained in part by the fact that most of the females in the 18-24 year age group are in the peak childbearing stage.

The pattern of morbidity and weight is not as clear for those with education above the 12th grade (women in the upper socio-economic class). Illness in this group seem to be influenced more by age (time). However in the older ages, those with weight extremes (both underweight and obese) reported a greater percent of illness (significant at $\alpha = .05$).

Except for the underweight category, the pattern of weight-extremes follows the hypothetical model in Figure 2 where there is an initial interrelation between general morbidity and weight, but the increase is not cumulative. However, the null hypotheses of no difference between the proportion of persons who are ill with normal weight and obese as well as underweight is rejected at the .05 level of significance for the former and .01 level for the latter. Females responding "yes" to this question may have one or more acute and/or chronic conditions, so the sum total of morbidity is accounted for here.

The first level hypotheses tested here confirm the contention of increased morbidity with increased weight. So the question of whether the weight extremes had a causal relation to morbidity, remains, i.e. whether BWE occurred first and was followed by the illness, or whether the illness was already present in some dominant form, causing obesity or

underweight which manifested itself at a later date.

Hospitalization Overnight: Figure 8 shows that the differences from normal-weight in morbidity for obese and underweight females were significant at older ages and lower socio-economic groups. The examination of the question of hospitalization overnight is an attempt to determine the extent or severity of the illness.

The underweight female showed a higher percentage of overnight hospital stays than any other weight class at all ages except for the 18-24 age group. The overweight group is identical with the normal weight group at all ages except the 18-24 age group (Figure 9).

The underweight females reporting overnight hospital stay were mostly in the lower socio-economic group (0-12 grade).

The pattern for hospital use by weight was not as distinct for the upper socio-economic group as it was the lower socio-economic group.

Hospital stay overnight for young females may have been related to pregnancy, since it seemed to decrease with age until after 50 years of age where it started to level off.

The difference between overweight or obese females' and normal weight females' frequency of hospital use is not significant, while the underweight females show a higher frequency of hospital use than the females in other weight categories. This difference is significant ($\alpha = .05$) only at the older ages and for the lower socio-economic group.

This pattern for the underweight female is similar to

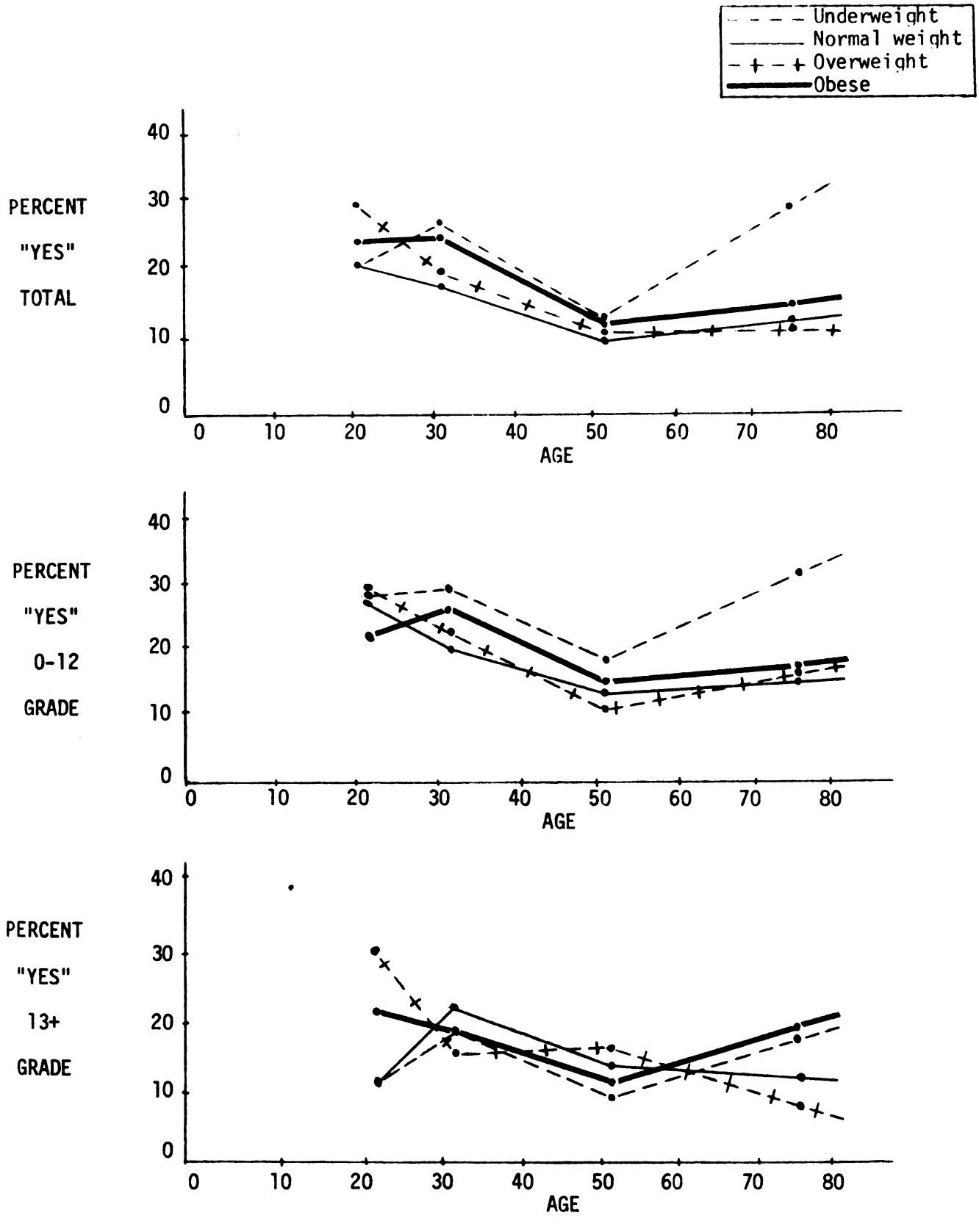


Figure 9. -- Percent of Females Reporting "Yes" to Hospitalization During the Past Year (1972) by Age, Weight and Education

their morbidity pattern. The overweight female seems to fare better than the other weight-extreme categories both on morbidity and hospital use.

Chronic Diseases: Obesity has been associated with four different types of hazards to health:

1. Changes in various normal body functions.
2. Increased risk of developing certain diseases.
3. Detrimental effects of established diseases.
4. Adverse psychological reactions.

In this section of the analysis, the emphasis is on item 2 above, i.e. increased weight increases the risk of developing certain diseases.

The five chronic diseases used to test the contention in item 2 and to verify previous findings are hypertension, heart trouble, kidney or bladder trouble, diabetes and emphysema.

Hypertension: The data were obtained in response to the question, "In the past year, has . . . had trouble with high blood pressure?"

There was a higher percentage of females in the sample reporting hypertension (15.1%) than any of the other chronic diseases presented in this study. About 28% of the obese women reported hypertension compared to about 9% of normal weight women. Approximately half (49.7%) of the obese women 65 and over reported high blood pressure.

Hypertension is positively related to age and weight (Figure 10). The underweight female showed a frequency similar to that of the normal weight female. While the

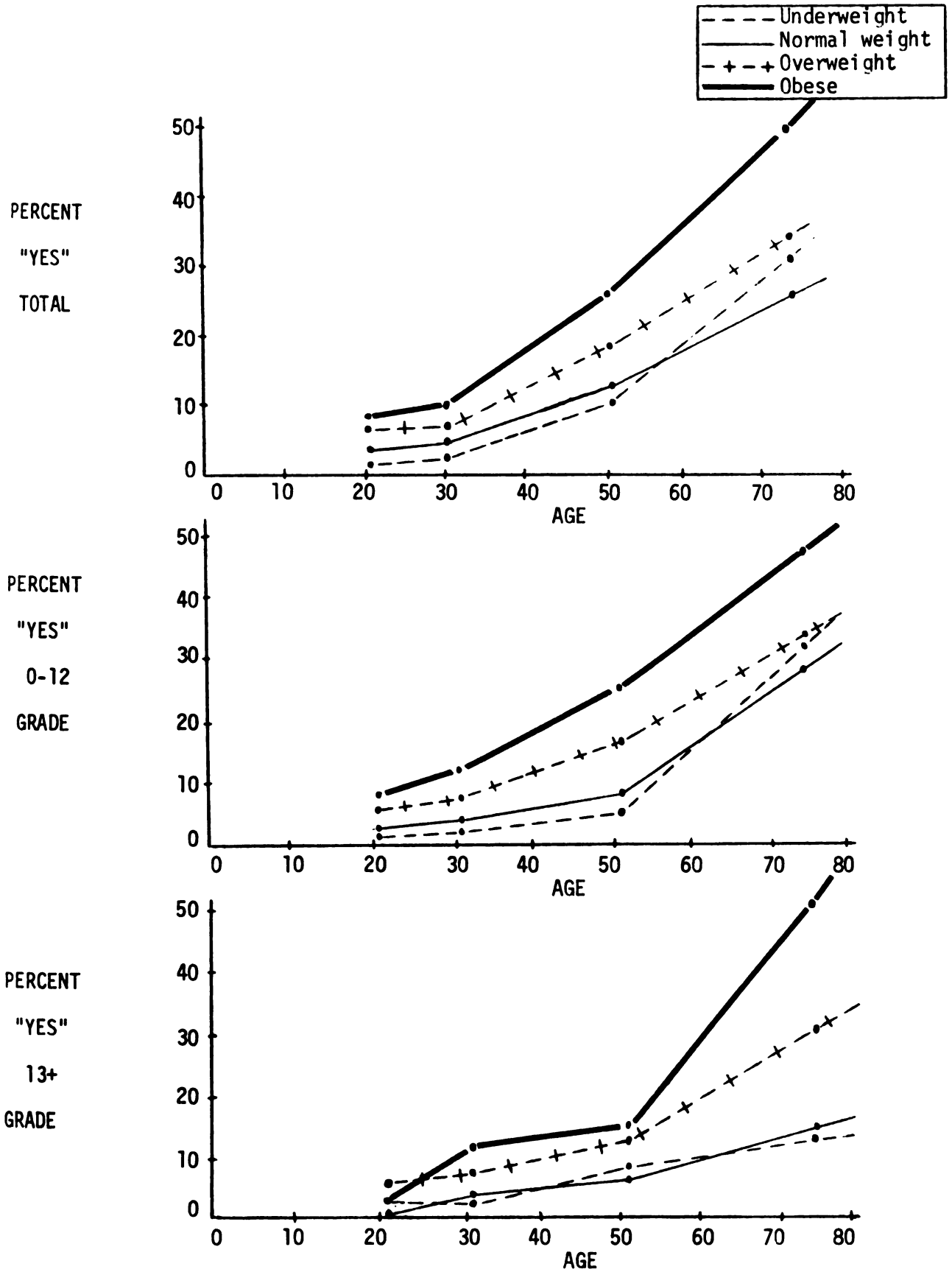


Figure 10. -- Percent of Females Reporting "Yes" to Hypertension During the Past Year (1972) by Weight, Age and Education

overweight females reported a higher frequency of hypertension, this frequency is significant only in higher socio-economic groups at older ages. The difference between the normal weight female and obese female is significant ($\alpha = .05$) after 40 for both low and high socio-economic groups.

The frequency pattern in Figure 10 is similar to the hypothetical model in Figure 1, where it is interpreted as being an increased cumulative process. However, the present data do not show what other variables may be responsible for the development of this cumulative process, or if the disease itself is responsible for developmental obesity.

Emphysema: There was a higher percentage of obese females reporting emphysema for all age groups except the 39-64 age group, where the underweight females show a higher percent (Figure 11). Overweight females reported less emphysema than the other weight groups for all ages except the 24-39 age group. The pattern of reporting emphysema for the underweight females is quite different for the low and high socio-economic groups, i.e. females age 40-64 in the low socio-economic group show a pattern reverse to the same age group of high socio-economic status.

While the low socio-economic obese female reports a consistently higher frequency of emphysema in all age groups, this difference from normal weight is not significant except after age 70--the underweight females in the low socio-economic group in the 40-64 age group showed a significant difference ($\alpha = .05$) from all other categories. This was

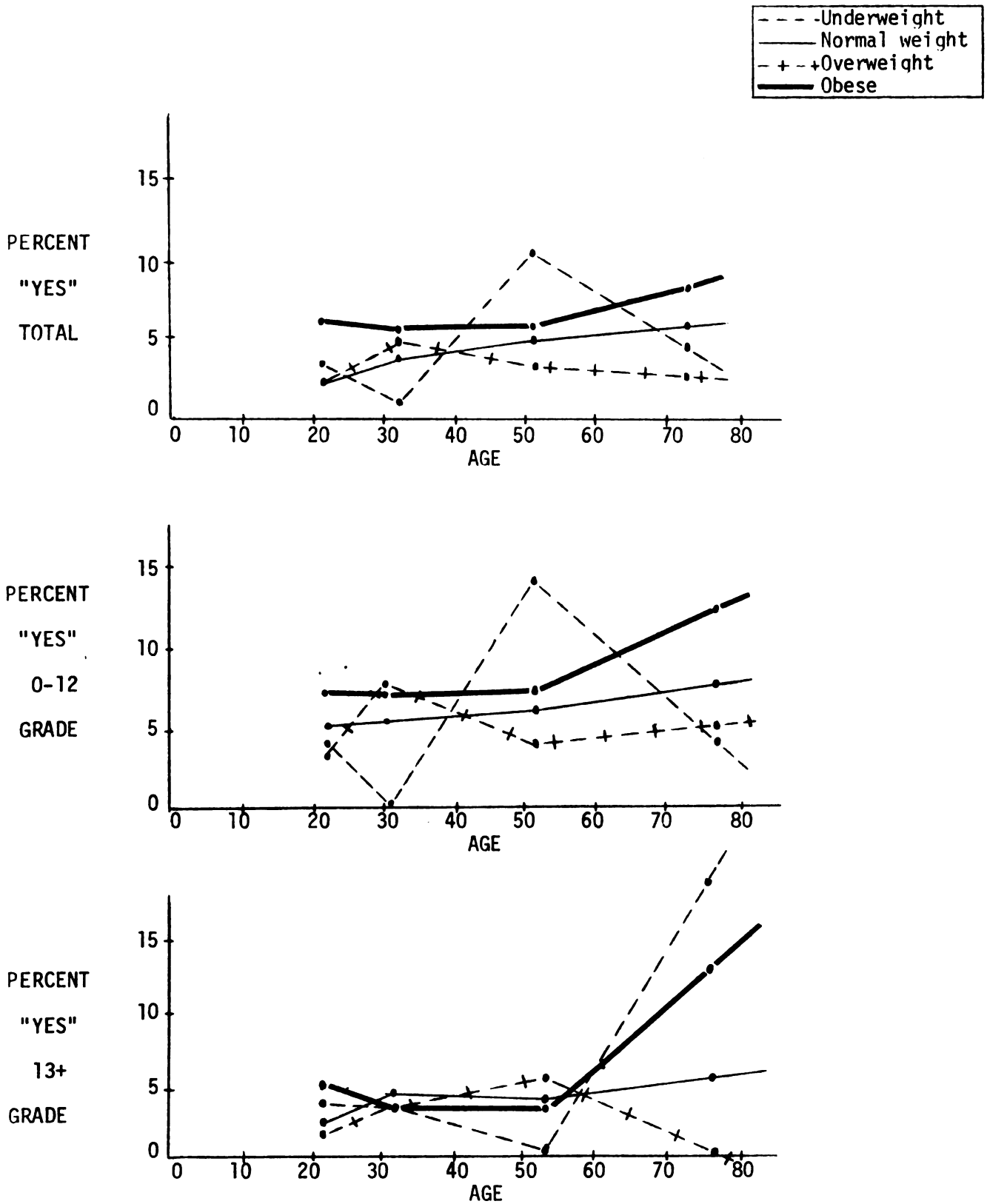


Figure 11. -- Percent of Females Reporting "Yes" to Having Emphysema by Weight, Age and Educational Level

also true for the 65+ age group in the high socio-economic group.

Emphysema did not increase significantly with age except in the high socio-economic group.

About 5% of the females reported having emphysema in the following descending order: obese females reported 6.5%, underweight females reported 4.6%, normal weight females reported 4.4%, and overweight females (showing a consistently lower rate at older ages) reported 3.7%.

Diabetes Mellitus: The association between obesity and diabetes has been well documented (Karon, 1965) (Medley, 1965). However, neither the mechanism for this coexistence nor the role that genetic determinants play is clearly understood. It is thought that obesity increases the risk of diabetes among those with a predisposition for insulin resistance. (Karon, 1965).

Approximately 5% (4.7%) of the females in the sample reported having diabetes. This is the reported rate estimated to be present in the United States population (Craddock, 1970).

Females between the ages 18-24 reported very little diabetes regardless of their weight level (Figure 12). Obese females showed a sharp increase in frequency thereafter. The reported frequency increased with age in all weight categories.

Here again the frequency for the obese did not appear to be cumulative, since the slopes of the lines between weight categories are nearly parallel. Hypotheses Hx_{10} would be

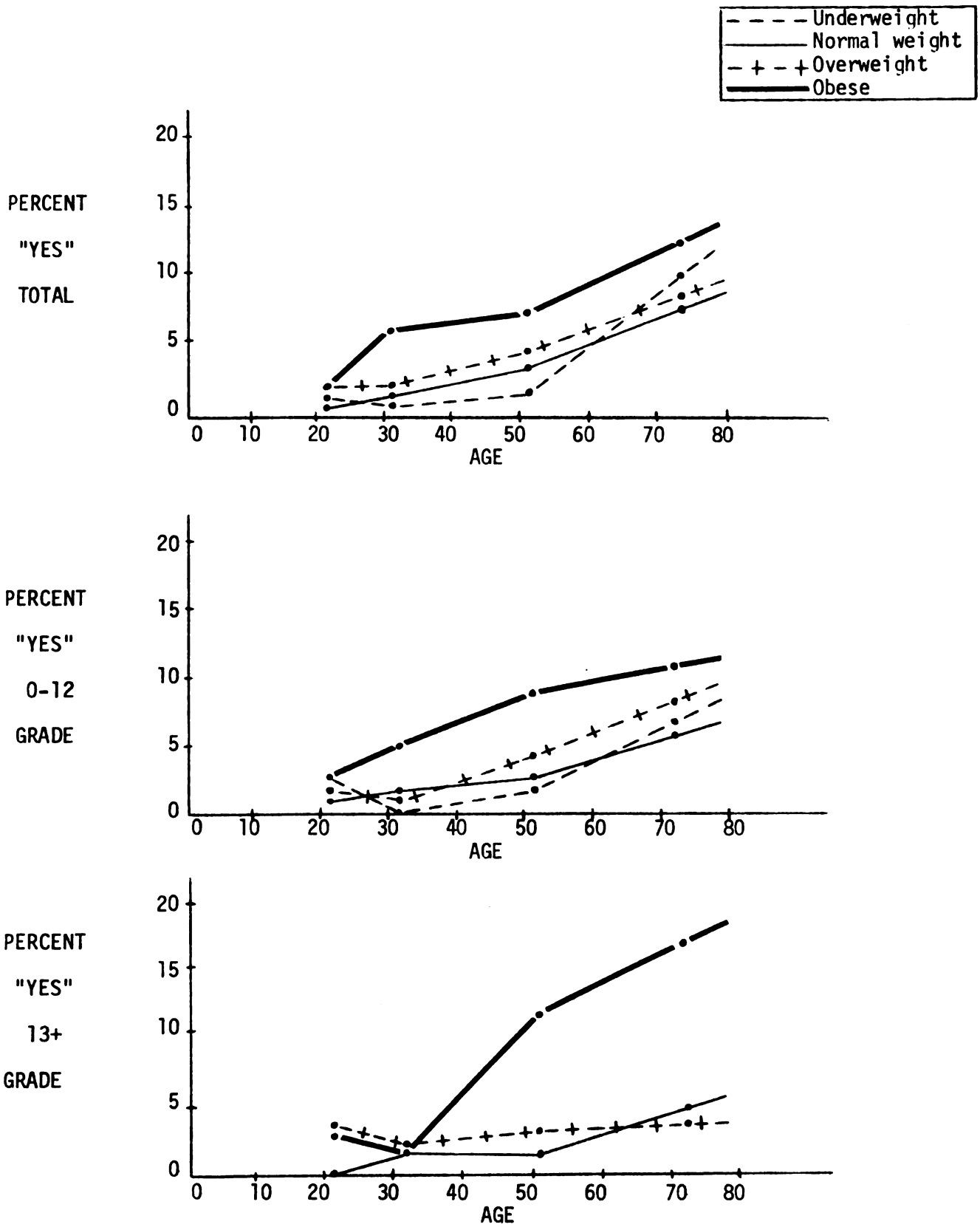


Figure 12. -- Percent of Females Answering "Yes" to Having Diabetes During the Past Year (1972) by Weight, Age and Educational Level

rejected as this data support claims in the literature, i.e. diabetes shows a positive relationship to being obese. The normal weight, overweight and underweight females were effected by this condition in a similar way.

The difference in reported frequency of diabetes between the normal weight female and underweight female, as well as the overweight female, was not significant. However, the difference between the proportion of normal weight reporting diabetes and obese reporting diabetes was significant at the .05 level. Figure 12 also shows that the frequency of diabetes increases with age and weight.

The underweight female dropped out of the reporting entirely for the high socio-economic group while the obese female shows a difference from normal weight females that is even more pronounced than in the low socio-economic group.

Kidney or Bladder Disease: Very little research has been conducted emphasizing kidney disease and weight. However, in the present study, 8.9% of the females reported having kidney or bladder trouble.

This condition did not increase significantly with age except after age 50 when the underweight female in the low socio-economic group took a sharp upward turn that is highly significant ($\alpha = .01$) after age 65. The obese female showed a significant ($\alpha = .05$) difference from the normal weight female in the low socio-economic group (Figure 13).

Heart Disease: Studies relating to heart disease and obesity have been inconclusive as to the impact of these two

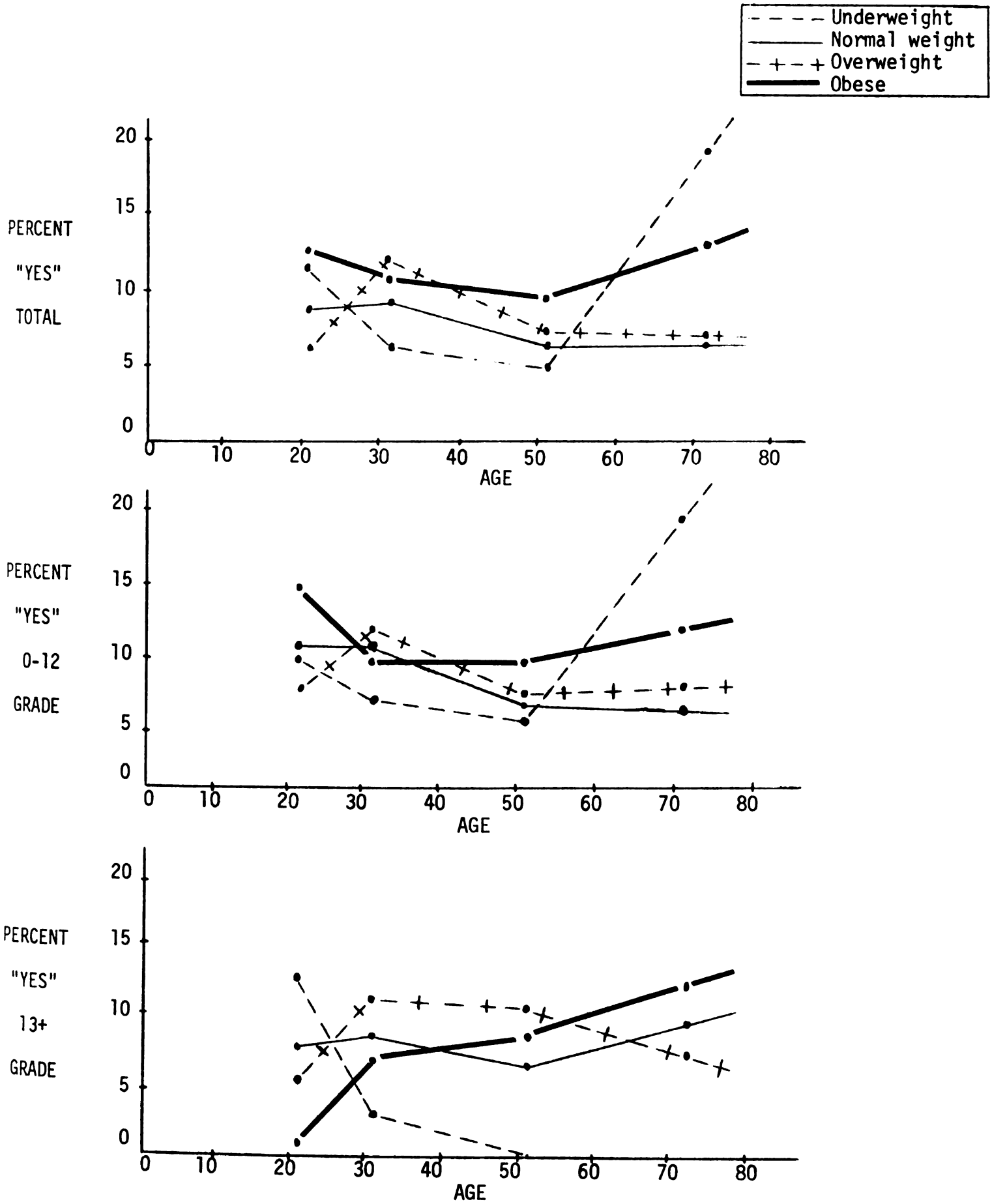


Figure 13. -- Percent of Females Answering "Yes" to Kidney or Bladder Trouble in the Past Year (1972)

conditions on each other. (Kannel, 1967 (Wardwell, 1970) However, it is inferred that extensive obesity puts an unusual workload on the heart, causing acute heart failure.

Two percent of the females reported "having any kind of heart trouble during the past twelve months." Twice as many obese women as normal weight women reported heart trouble. Three times as many obese as normal weight women in the high socio-economic group reported heart trouble.

The contrasting difference shown in Figure 14 is that underweight women in the low socio-economic group reported a higher frequency of heart trouble than any other weight group, while obese females reported a higher frequency (significant at $\alpha = .01$ level for age 65+) in the high socio-economic group. The overweight female again showed a lower frequency than all other weight categories. This was more notable as age increased. Heart trouble was shown to increase with age as well as weight; however, reported differences were slight at younger ages. The increase after age 50 followed the pattern shown in the hypothetical model in Figure 1.

Health-Related Habits: Studies have shown that certain health-related habits are also precursors to specific diseases (Paffenburger, 1969); could this also be true for body weight extremes? Do persons with normal weight have health habits different from others? Could a probe into the health habits of persons with different weights help identify unique problems of persons with body weight extremes so that the solution to these problems would also aid in the prevention

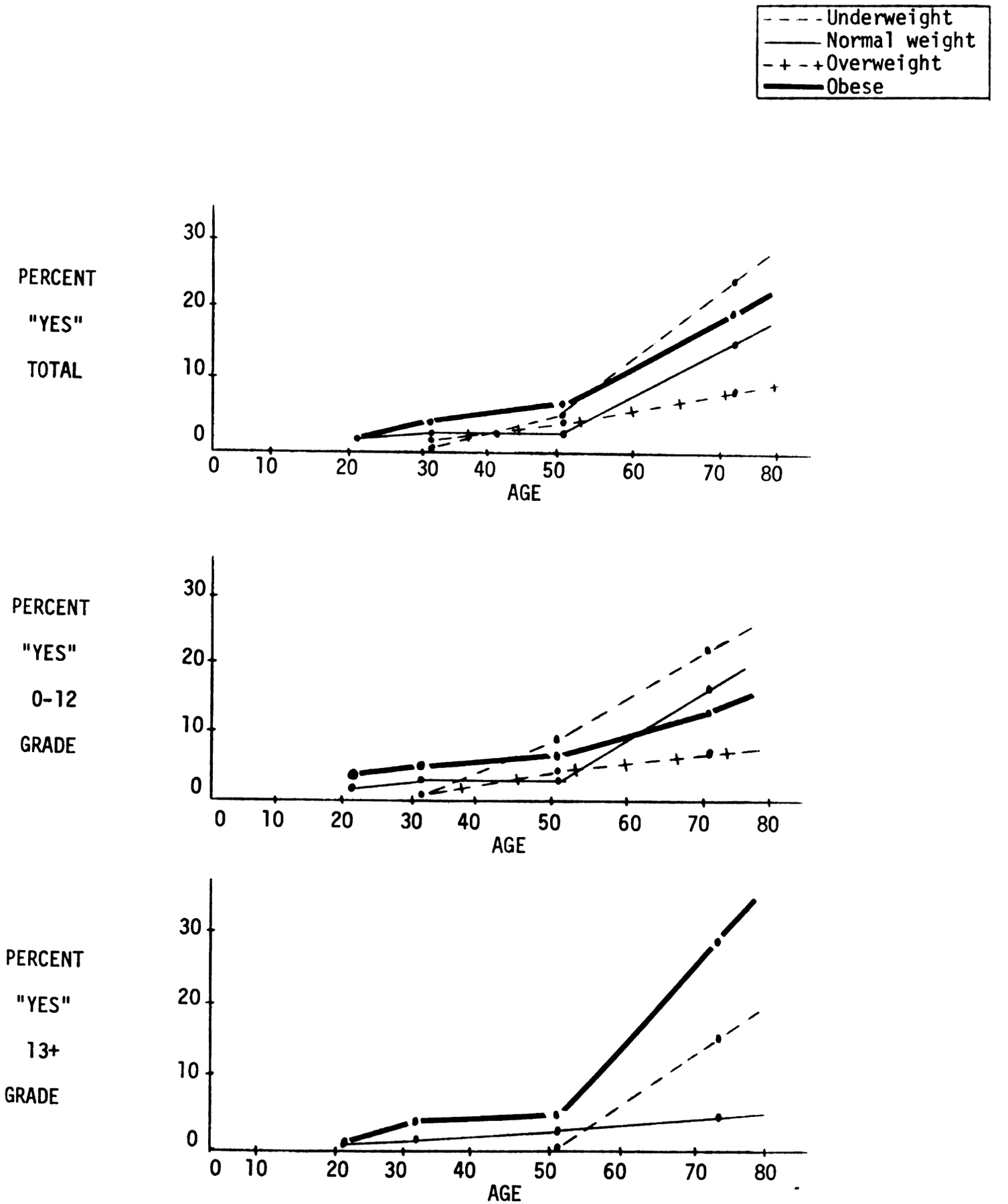


Figure 14. -- Percent of Females Answering "Yes" to Having Trouble With Any Kind of Heart Trouble

of the causes of body weight extremes?

Six health-related habits are used as the respondent answered the question, "Does . . . on most days or every day?"

Cigarette Smoking: About 30% of the females reported habitual smoking. The number of cigarettes smoked per day was not determined. Most of the smoking was reported by the underweight females (40.9%). Two-thirds (66.2%) of the underweight females in the 40-64 age group reported smoking; this compares with 26.0% for the obese females in the same age group. Reported cigarette smoking increased with age for the underweight until 64 years and decreased with age for the overweight females.

There was significant difference ($\alpha = .05$) between the reported smoking habits of the underweight females and their cohorts in all weight categories for females between the ages of 25-64. This difference was even greater for the underweight female in the higher socio-economic group (significant at $\alpha = .05$). (Figure 15)

The influence of smoking on body weight is unclear since the type of female who smokes may not have the initial need for food as others do and vice versa. All age and weight categories showed a decrease in smoking after age 50. This decrease may be due to the non-acceptance of female smokers earlier in this century.

Medical Examination: The reported answer to this question showed that medical examination is influenced more by weight than by illness. The higher percentage of illness

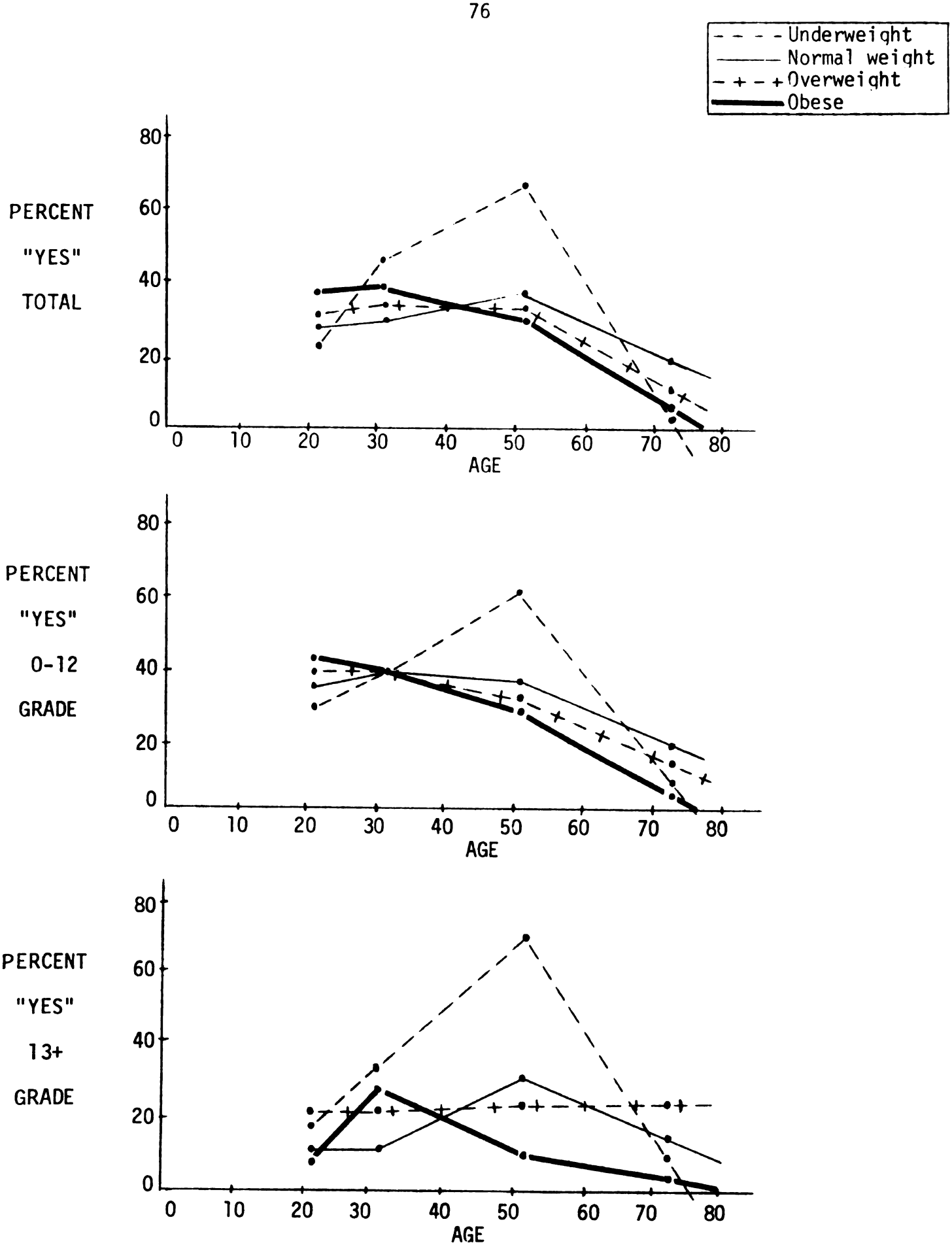


Figure 15. -- Percent of Females Reporting "Yes" to Cigarette Smoking Daily by Age, Weight and Educational Level

in persons with body weight extremes (Figure 16) is contrasted with a lower percent of these persons having medical examinations. This was generally true for both the upper and lower socio-economic groups. (The number of underweight or obese females in the upper socio-economic group reporting no medical examinations for the year was highly significant.) This trend increased with age in reverse of the morbidity trend, i.e. the two groups that reported the highest frequency of illness also reported the lowest frequency of medical examinations.

Vitamins: It is believed by some groups (especially low socio-economic) that vitamins are beneficial, needed only by ill persons, and if taken will help to "put on weight." (Mayer, 1969) This kind of thinking is probably reflected in Figure 17 which shows obese females reporting less vitamin-consumption than the other weight categories in the low socio-economic group. Underweight females, normal weight females and overweight females showed no significant differences in their pattern of vitamin consumption. The taking of vitamins among females in these weight classes increased in frequency with age, whereas the obese female showed an initial decline in frequency with age, followed by a very gradual increase.

Drugs for Medical and Non-Medical Reasons: The obese and overweight female reported taking drugs for medical reasons at a higher frequency than females in other weight categories. The reverse was shown in the use of drugs for non-medical reasons. On the other hand, the younger (age 18-34) under-weight females reported using drugs for non-medical reasons

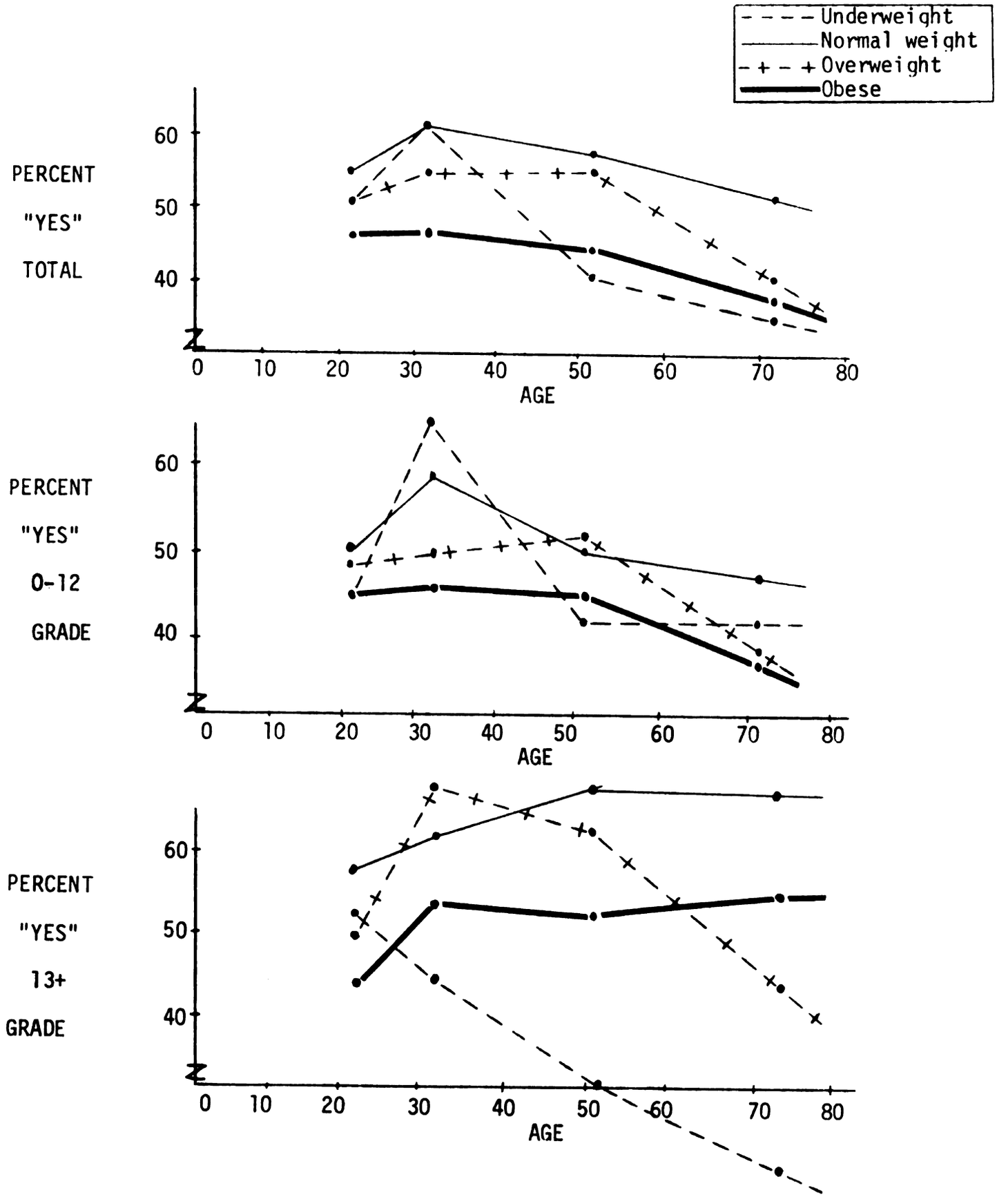


Figure 16. -- Percent of Females Answering "Yes" to Having Had a General Medical or Physical Examination When Not Sick or Pregnant

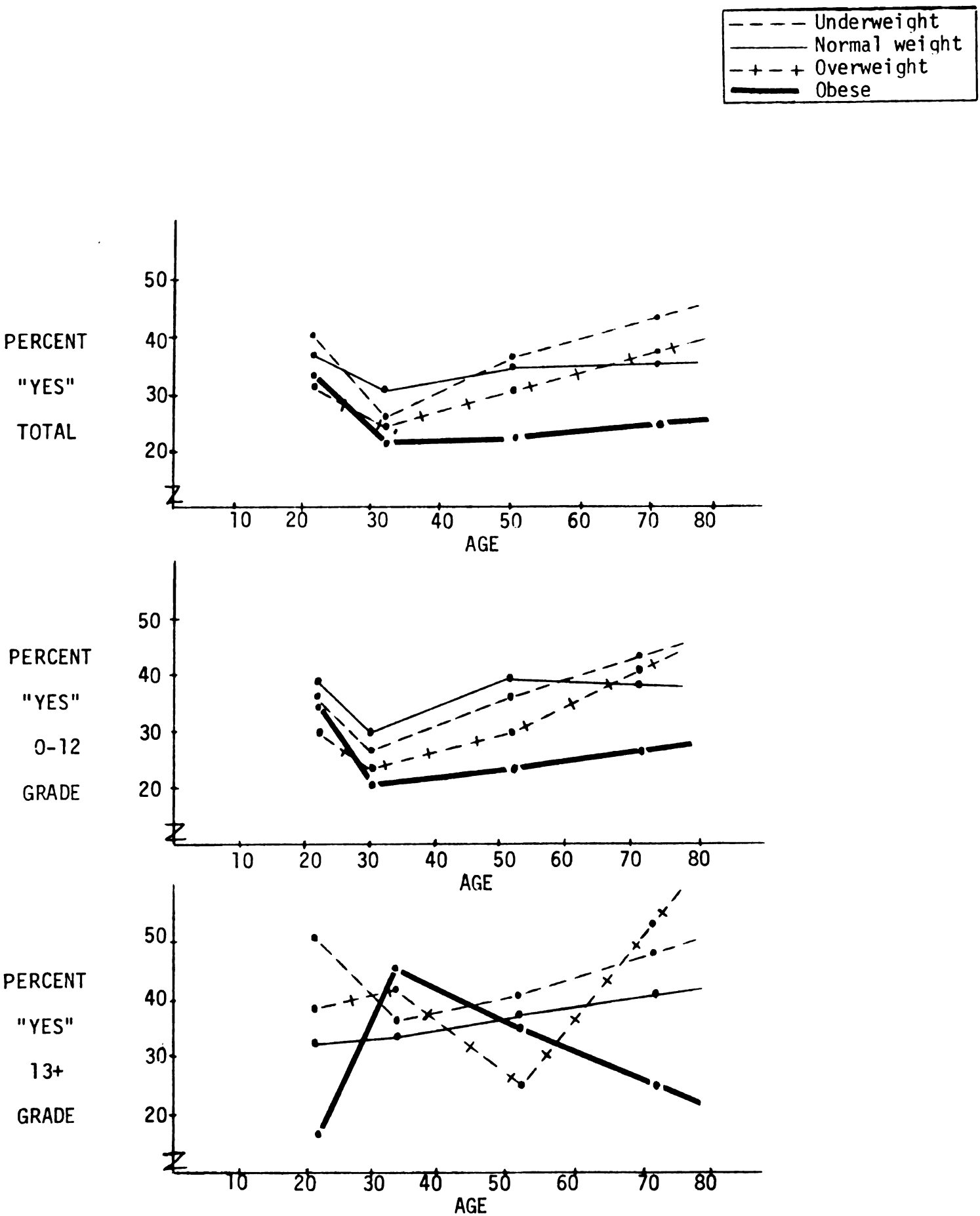


Figure 17. -- Percent of Females Reporting "Yes" to Taking Vitamins Daily

more frequently than did others. The number of females using drugs for non-medical reasons was less than 5%, while more than 40% of all females reported using drugs for medical reasons by the ages of 40-60. (Figure 18)

Geographical Distribution: The evidence resulting from the present study, as well as previous studies (Moore, 1962; Maddox, 1970), shows that there is a notable correlation between obesity, social class and environment. This information suggests a distinct spatial pattern that should follow the distribution of the low socio-economic population.

The City of Grand Rapids, Michigan, was selected for study of the spatial distribution of the different levels of body weight. A total of 2,351 females were in the sample. Eight percent of the population were non-white.

The geographical distribution of the underweight and overweight females was not well defined. Figures 19 and 21 show that females in these two weight classes are distributed throughout the city in a random pattern.

The normal weight and obese females showed definite clustering patterns. The normal weight female tended to cluster on the periphery of the city, while the obese female generally clustered in the center of the city. (Figures 20 and 22)

The high frequency of obese females near the center of the city were in census tracts displaying high percentages of physical deterioration and social disorganization. Examples of physical deterioration for these areas where

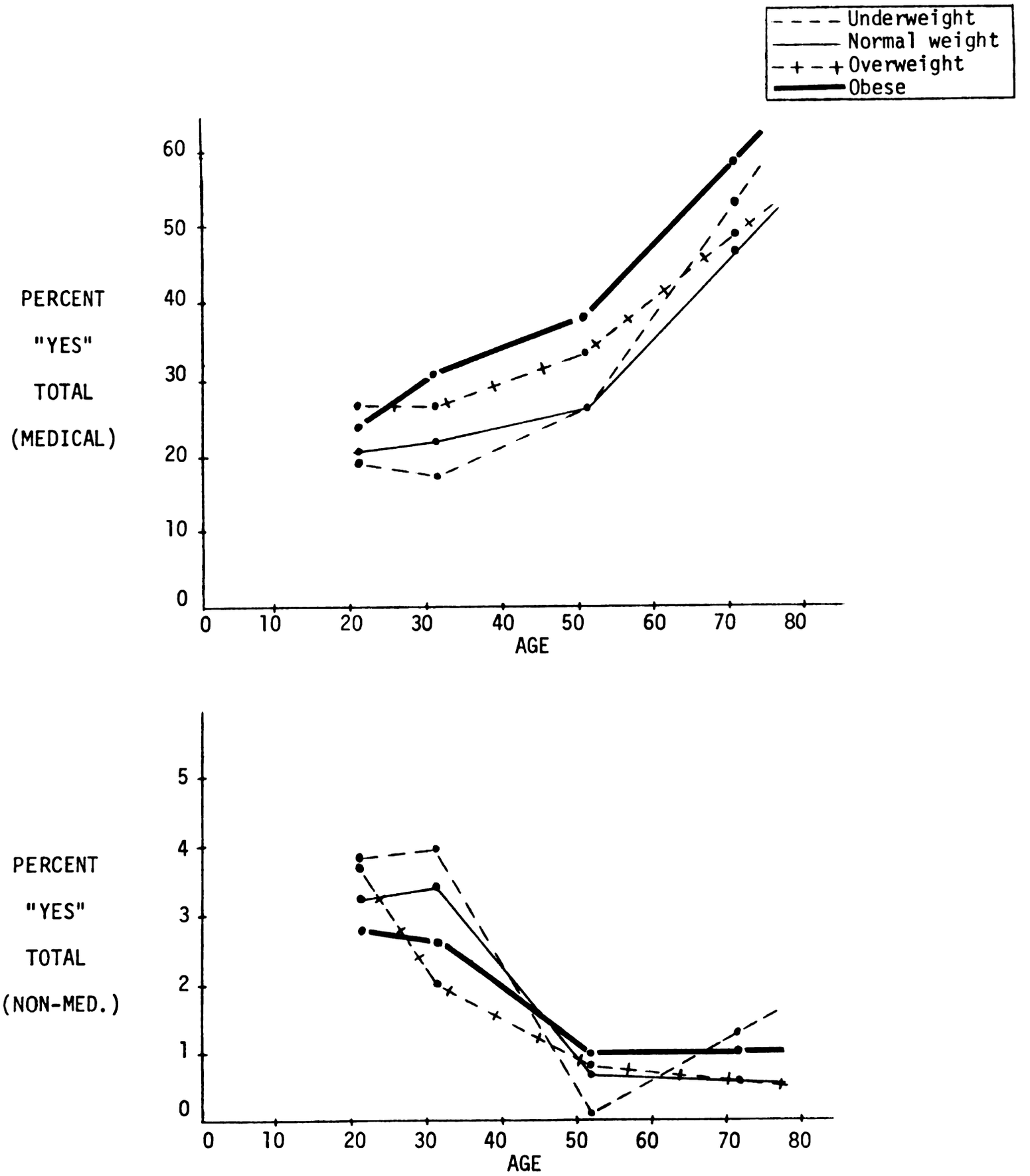
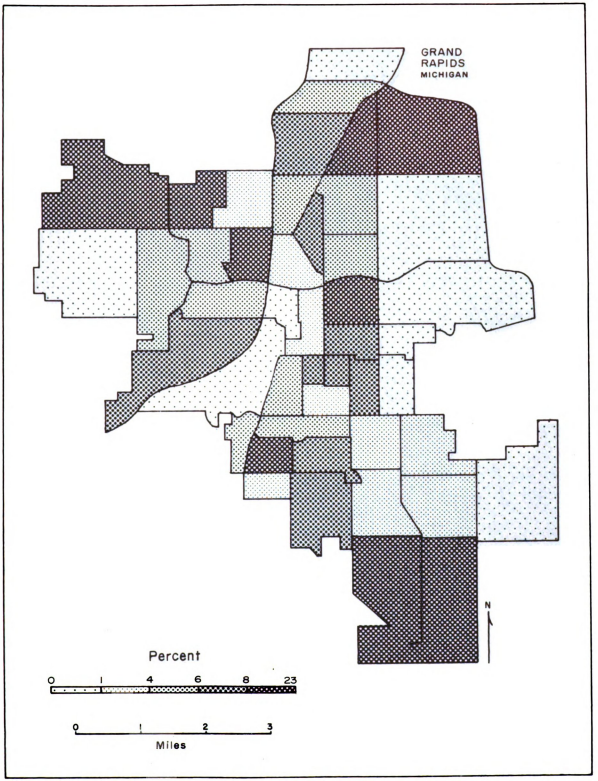
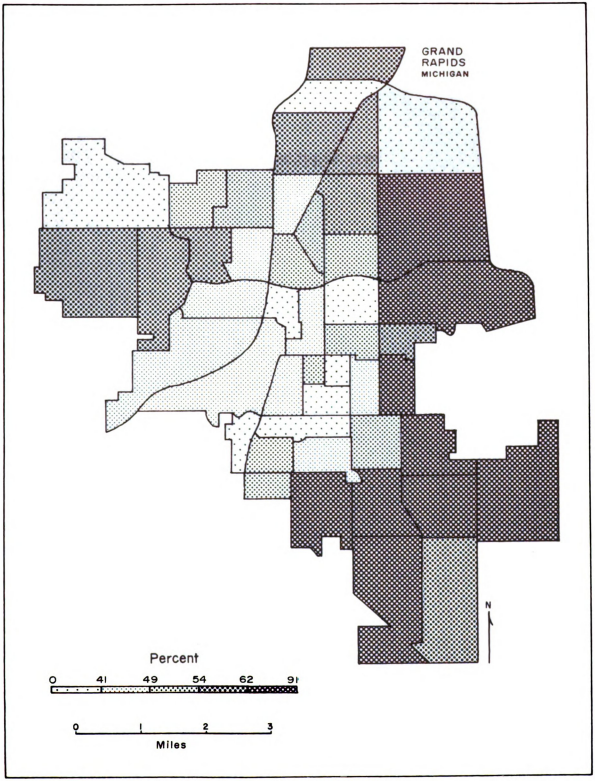


Figure 18. -- Percent of Females Answering "Yes" to Taking Drugs for Medical and Non—Medical Reasons



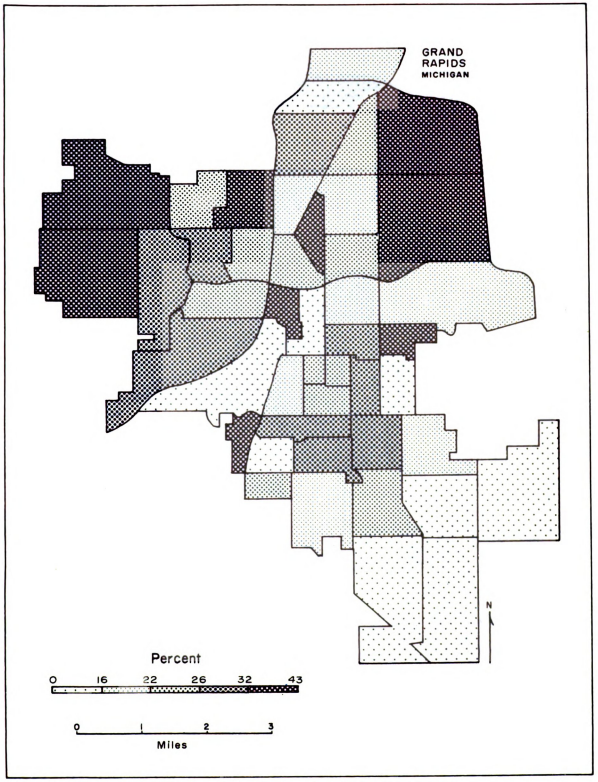
Source: Kent County Health Department 1970-71

Figure 19.--Percent Underweight: Adult Females Grand Rapids, Michigan Census Tracts



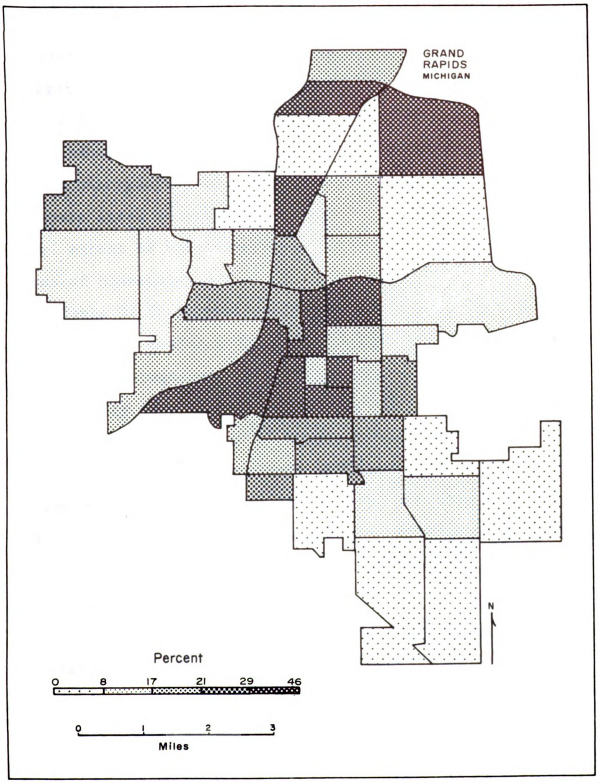
Source: Kent County Health Department 1970-71

Figure 20.--Percent Normal Weight: Adult Females Grand Rapids, Michigan Census Tract



Source: Kent County Health Department 1970-71

Figure 21.--Percent Overweight Adult Females Grand Rapids, Michigan Census Tract



Source: Kent County Health Department 1970-71

Figure 22.--Percent Obese: Adult Females Grand Rapids, Michigan Census Tract

physical deterioration was apparent show (Figure 26) high frequencies of suicide, female family heads, ADC clients, illegitimate births, venereal diseases, etc., reveal that social disorganization is also evidenced in the area. These areas exhibiting high frequencies of physical deterioration and social disorganization are also identified as low socio-economic areas according to generally accepted standards (e.g. extent of home ownership, employment status, female heads of household, etc.).

Table 37 in Appendix A shows a ranking of obese subjects with negative health indicators in the familial, environmental and social categories. The ranks are in a descending order of intensity, e.g. a rank of 1 means the highest indication of severity while a rank of 46 shows the lowest degree of severity, so that Census Tract 26* showing low ranks for all categories of negative health indicators would be considered a high-risk area for negative-health indicators, while Census Tract 40 with high ranks would be considered a low-risk area for negative-health indicators.

A map of each category of characteristics are shown in Figures 23, 24, 25 and 26 demonstrating that high-risk areas shown by the deepest shaded areas, are similar for each figure and for the obesity map (Figure 22).

These are indications of the deeper analysis needed to pursue how these variables interact.

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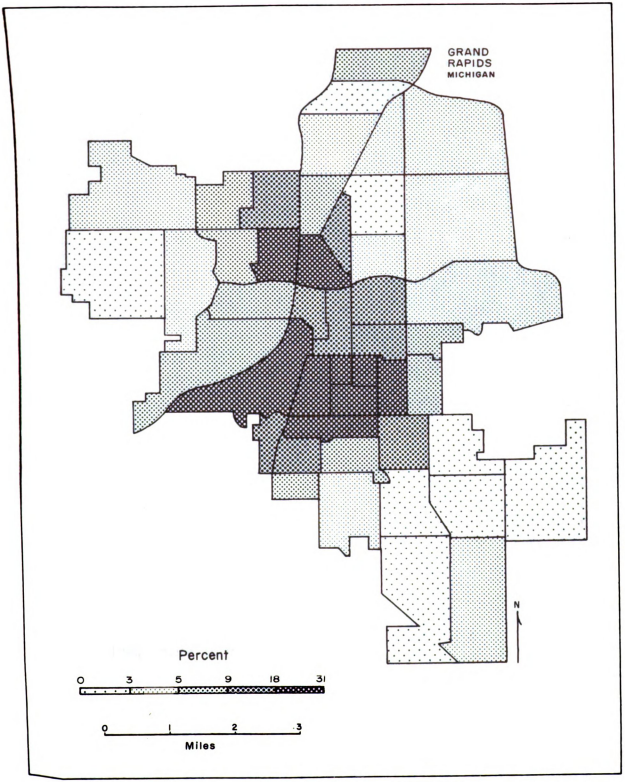
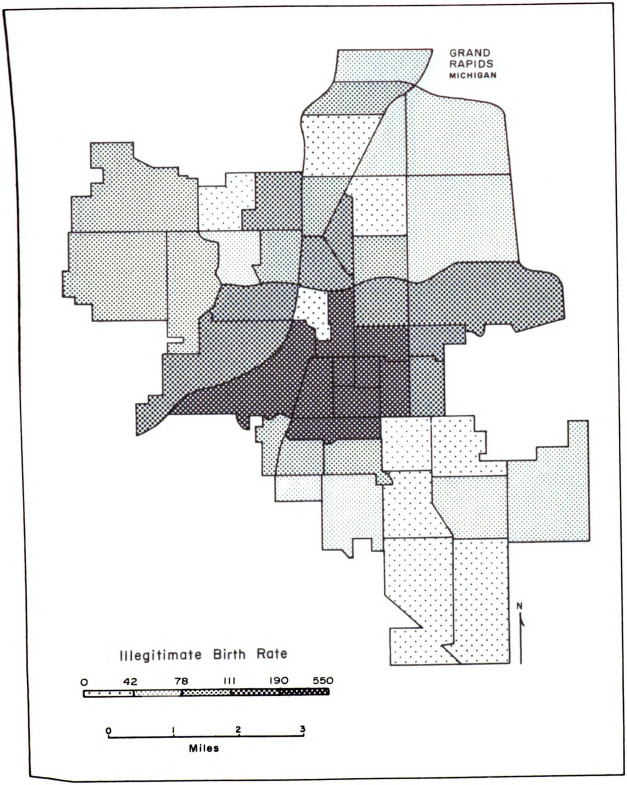
* Census Tract #2 should be ignored because of extremely low population.



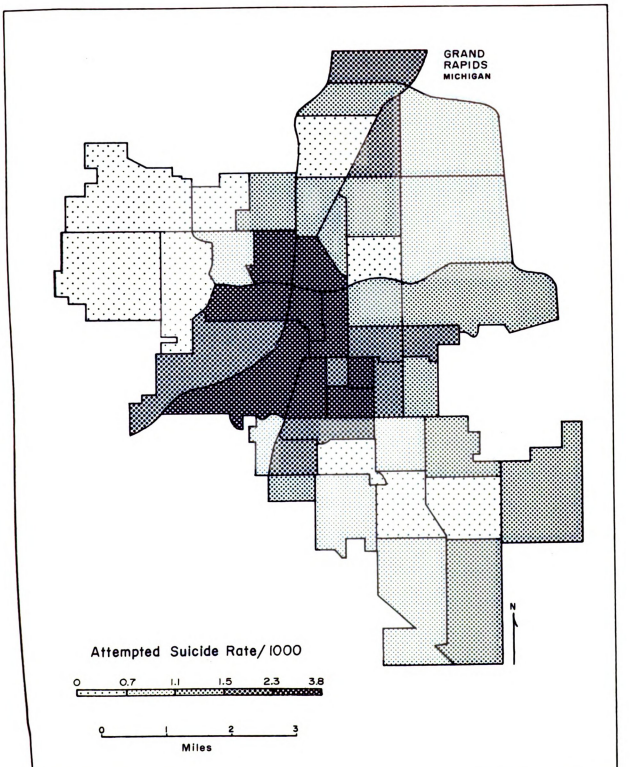
Source : 1970 Federal Census

Figure 23.-- Percent of Families with Income Below Poverty Level
Grand Rapids, Michigan Census Tract



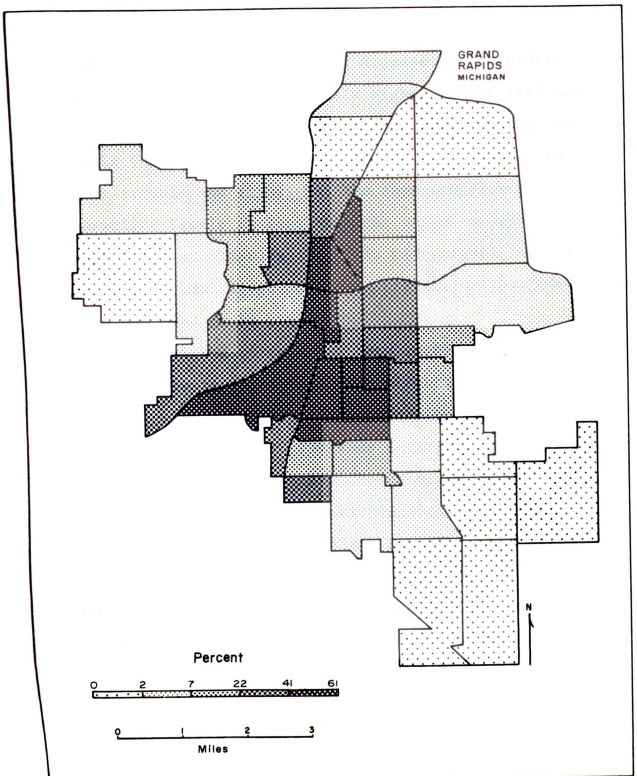
Source: Michigan Department of Public Health, 1972

Figure 24. -- Illegitimate Birth Rate: Grand Rapids, Michigan



Source: 1970 Federal Census

Figure 25 -- Attempted Suicide Rate: Grand Rapids, Michigan



Source: Kent County Health Department 1970-71

Figure 25 -- Percent Deteriorated Structures, Grand Rapids, Michigan

Discussion

One of the most interesting observations in this study is that the reported frequency of disease and morbidity for overweight females (while generally higher than normal weight females) more closely resembled that of the normal weight female than that of the obese female. In some diseases, e.g. heart trouble and emphysema, the reported frequency for the overweight female is less than the normal weight female (especially at older ages). This may suggest that the definition of normal weight may need review, or that the weight range may need to be broader.

The positive correlation between obesity and disease reviewed here is consistent with expectation based on previous research. The frequency of hypertension increased with weight in all age categories. The same pattern except in the younger ages was noted for diabetes. For some of the chronic diseases (e.g. heart trouble and kidney and bladder disease), the effects were more apparent after age 50.

While the frequencies in hypertension and diabetes were fairly constant (as seen in the hypothetical model, Figure 2), they appeared cumulative in heart trouble and kidney diseases (hypothetical model, Figure 1).

For the underweight female the reported frequency of hypertension and diabetes was about the same as for the normal weight females. Generally, all of the chronic diseases in the study showed a frequency higher with weight deviation. This frequency increased as education level decreased and with age.

Even though both extremes in body weight showed "a relationship"to chronic disease that should be of some concern to health professionals, the magnitude of the problem in underweight females is far less than it is for the obese females because the number of underweight females is much smaller.

As previously mentioned, education is a multiplex variable itself, involving numerous sub-variables. As one or more of the sub-variables confounded in the multiplex variable, education seems to be related to the prevention of body weight extremes and chronic diseases; the higher the education level, the lower the frequency of chronic disease in all weight levels. The lower frequency of obesity noted in the higher educated may be due to the commonly held contention that most middle class individuals consider extreme overweight unsightly, immoral, and indicate of gluttony (Keys, 1955; Bruch, 1957). It seems reasonable to conclude, then, that some of the variables confounded in lower education may be precursory to BWE. Some of these variables may be nutrition, education, income, and/or the individual's response to stress.

Both illness and hospital use were higher among those of lower education levels. Illness is shown to be higher at both weight extremes. Overnight hospital use was higher among the underweight, a pattern for the underweight observed for all ages. Poverty and illness perception may be factors that have some bearing on this observation.

The overall pattern of normal weight females receiving medical examinations was reported to be higher than that of females in the other weight classes, for both education levels. The females with higher education reported a higher frequency of medical examination than those in all weight classes with less education.

The geographic clustering of obese females was seen in areas of high negative-health indicators. J. May noted that the geographical pattern of disease is a result of environmental stimuli that provoke adjustment response to populations. The pattern of disease will change as the environmental stimuli and the host's characteristics change over a period of time (May, 1961). The high frequency of obesity in the low socio-economic area may be part of the variables confounded in the multiplex low socio-economic variable. Kruse points out three concepts of the pathogenesis of disease or degenerative conditions that may apply to BWE:

1. Etiological factors include noxious agents, stress, excess, and deprivation;
2. They operate through their presence, excess, defeat, or absence;
3. There is an interrelation between them (Kruse, 1954).

The identification of these stresses and/or agents along with the degree of excess or deprivation may be the identifiable precursors. Economic, social, hygienic conditions, erroneous nutritional habits, and a difficult struggle for existence, especially during the growing years, can reshape the whole individual and his disposition (Gladstone, 1954).

The disadvantage of this design is the same as that of the previous designs as far as the time factor is concerned, because the data are treated as cross-sectional studies and the developmental process between BWE and negative health are not observed. In the present study, as well as others of this type, the time factor is taken into consideration by using analyses where individuals of later ages are compared to those of earlier ages. Also individuals of the same age are compared with each other. The limitations of this design have already been mentioned earlier in this paper.

Epidemiological studies of this nature are based upon the central axiom that disease is not randomly distributed in the human population, but shows aggregation according to time, space and measurable human traits. (Stallones, 1963)

Although this design seldom, if ever, provides positive proof of the "cause" of a disease or condition, it comes close to providing evidence of causal relationships by providing some of the modifications of disease or conditions in populations which produce predicted modifications of disease or conditions in those populations. The hypothesis Hy_{10} tested in this study attempted to show "a relationship" between BWE and specified variables in the population, which only begins the process of showing the cause of a condition.

Summary

This study has investigated the body weight levels of adult females as they relate to a variety of chronic diseases,

health and personal habits. The data showed that about 5% of the females were underweight, 21% were overweight, and 19% were obese.

Education was used as a socio-economic factor or indicator in which 77% of the females had an education up to the 12th grade and 23% had college and above education. This study suggests that educational status has an impact on body weight extremes; the higher the educational status, the less likely is overweight or obesity. Hence, for some conditions, higher education acted as a deterrent to body weight extremes (especially obesity). As a result of this observation, all subsequent charts are presented in three parts: up to high-school education, college and above education, and the total of the two.

Table 1 (Appendix A) shows the distribution of weight by age. The frequency of underweight females decreased continuously with age. The frequency of normal weight females increased slightly until about the age of 50, and then sharply decreased. Overweight and obese females show a similar pattern revealing a low frequency at younger ages, but increasing sharply until age group 40-64. Thereafter, there is a rather sharp decrease in frequency.

The frequency of females in the four different weight categories were observed for those that reported illness and overnight stays in hospitals for illnesses rather than pregnancy. The data supported the contention of increased

morbidity with increasing body weight extremes (both obesity and underweight).

However, the data showed no difference between normal, overweight, and obese females in their reports of overnight hospital stays. The underweight females reported a higher frequency of overnight stays in hospitals. Five chronic diseases were used to measure the relationship between body weight extremes and the chronic disease conditions.

Hypertension showed the greatest positive relationship for obesity. The normal weight female and the underweight female had practically the same frequencies. Diabetes was another chronic disease showing a significant ($\alpha = .05$) relationship for the obese female. Diabetes and hypertension increased with age and weight.

Heart-trouble frequency as reported did not differ significantly between weight classes in the young female. However, after about age 50, the underweight female in the low socio-economic group showed a higher frequency, while in the higher socio-economic group the obese female reported the highest frequency.

The reported frequency of emphysema created a pattern difficult to analyze, e.g. the underweight female in the low socio-economic group shows a higher frequency of emphysema than the other weight classes in the age group between 45-64. Obese females reported a higher frequency of emphysema at all age levels. This frequency is significant for only the high socio-economic group at the older ages.

Kidney or bladder disease for the low socio-economic group showed a similar frequency at ages under 50. Thereafter, both weight extremes showed notable increase significantly different from the normal weight category. The pattern of kidney or bladder disease was not clearly defined for the higher socio-economic group.

Females with extremes in body weight generally showed a difference in the selected health habits reported in this study. Normal weight females reported having more physical examinations than other females. Obese and underweight females in the low socio-economic group reported fewer physical exams.

The pattern of cigarette smoking was about the same for all weight classes except the underweight female. This was especially true in the low socio-economic group. The sharp difference for the underweight female was even more evident at the high socio-economic level.

About 30% of all females reported taking vitamins. The underweight female reported taking the most, while the obese female reported taking the fewest. The frequency of vitamin consumption increased with age in the low socio-economic group; the pattern for the high socio-economic is not as clear.

A definite spatial pattern emerged when respondents were mapped according to residence. This pattern is especially observed in the normal weight and the obese female. The frequency of normal weight females ranges from about 41% in

the central part of the city to 62% on the periphery, while the frequency of obese females ranges from about 8% on the periphery to more than triple (29%) that in the urban center. These types of trends have been noted for chronic diseases; they were noted by Centerline's (1956) studies of hypertension and coronary heart disease mortality in Boston. His data showed that relatively high mortality from these causes tended to occur in highly urbanized areas. He suggested that some of the many possible causes for these trends may be diet, exercise and stress.

The data presented in this section has demonstrated some of the beginnings of variable identification possible in studying the causes and consequences of BWE. The design has used some frequently used variables to verify or refute findings and also some variables that are seldom if ever used to extend our knowledge concerning this disorder.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This set of studies has been concerned with methods of inquiry into two anomolies of human growth and development: body weight extremes and chronic disease. The aim has been to point out limitations and potentials of previous studies, to demonstrate use of the sample survey, and to suggest models potentially broader than the traditional explanations of body weight extremes or any other physical condition of cumulative progress.

A comprehensive review of the literature showed most previous studies of BWE concerned with special groups; while these studies have made some contribution to the observed patterns of correlation between BWE and chronic disease, the contention here is that the interpretations of results based on special groups may be distorted or faulty. This conclusion is based on the observation that present treatment and prevention seem ineffective and may even be harmful.

It was also observed that alleged precursors (e.g. education, age, low income, etc.) and consequences (e.g.

increased morbidity) of BWE seem to be remarkably similar in identity and levels of correlation to those variables which have been shown to be related to certain diseases (e.g. hypertension, diabetes, arthritis, etc.).

The sample survey (Model I) method was used:

1. To demonstrate its use for examining the relationships between BWE, and chronic disease and their correlates.
2. To refute or verify findings of previous studies.
3. To demonstrate the methodology, flexibility, and potential in overcoming some of the limitations of previous studies.
4. To broaden the basis for predicting high-risk groups for BWE.

The data compiled and analyzed using Model I design supported the findings in previous research that selected disease showed a higher percentage at both under - and overweight extremes than at normal weight. The data showed that there was little difference in the frequency of disease levels in persons with normal weight and persons less than 30% overweight, but a significant difference between the frequency of disease in the normal weight, and over 30% of the overweight females.

The major limitation of this design lies in the stochastic nature of the problem. Since the method of research does not allow for the observation of the developmental process of BWE, it limits the interpretation of when and under what circumstances the disorder developed.

These findings are supporting evidence to begin to test further hypotheses that some of the variables specified in Chapter II, and others causing personal anxiety may be precursors to BWE and to chronic disease. However, the one-shot Sample Survey approach is a static study process while BWE, its correlates and precursors are dynamic processes.

The concept of area - or community-study design suggested that there are sufficient homogeneous areas of high - and low-risk occurrence of a condition or disease that by studying the area (or the individual), the findings may expose the importance of environmental variables to BWE and shed more light on previous findings which have led to some of the current methods of prevention and treatment.

The emphasis in the design is on the area or community. It has the advantage of being able to observe the area prior to the occurrence of high incidence of negative health conditions, so that some determination can be made about circumstances under which the disorder (BWE) developed.

The community-based longitudinal approach is concerned with a fixed area that is observed over time. The population as well as the characteristics of the areas are subject to change. This design may be helpful in establishing appropriate variables and statistical approaches leading to the cohort analysis suggested in a longitudinal study for BWE.

The former is designed to observe the area while the latter is designed to follow the cohort.

It is even more efficient to observe the individual over a period of time than to observe the area when a developmental condition is under study. The longitudinal design (Model III) has been used very successfully to study chronic disease as it developed. It has been a consideration in the present study that this method is the most promising for study of BWE, especially since both BWE and chronic disease have been frequently shown to develop under similar conditions.

This method of analysis allows for studying the individual long before clinical manifestation of a disease or condition is evident. When design is used to study chronic disease, it usually uncovers associated factors and identifying precursors. It may provide opportunities for the detection of environmental and personal factors in the development of BWE which may be susceptible to change or removal.

Recommendations

Although it is generally accepted that BWE creates an additional hazard to otherwise healthy people, the variation in the causes and subsequent consequences have been largely undetermined.

The magnitude of this problem seems to demand that more needs to be known about the development of BWE in order to provide adequate solutions to this problem. The material presented here leaves little doubt that BWE is confounded with genetic and environmental factors based on generally

accepted conclusions that hereditary and environmental factors include all conditional factors that determine completely the different characteristics of man and that the dynamic physiologic and phychologic changes taking place from conception to maturity affects the growth and development of the individual. While many studies have been concerned with the growth and development of children, a continued surveillance of the individual into adult life and to senescence would certainly give more insight into the relationship of growth and development of earlier life, to subsequent body weight levels in later life.

If a condition that affects almost half the females in the country is to be understood and controlled, longitudinal studies such as the ones posed in this study should be rigorously undertaken as soon as possible in order that a foundation of fact and theory may be built. This would permit development of guidelines of selective therapy based on a better understanding of the etiological factors of the disorder.

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APPENDIX A

TABLES OF RESPONSES

TABLE 1. -- Description of Sample by Age and Weight

	18-24		25-39		40-64		65+		
	No.	%	No.	%	No.	%	No.	%	TOTAL
Underweight	111	36.5	80	26.3	68	22.4	45	14.8	304
	9.9		5.6		3.1		5.1		5.4
Normal	758	24.7	881	28.7	1053	34.2	383	12.4	3,075
Weight	67.7		61.4		48.4		43.3		54.8
Up to 30%	146	12.4	237	20.2	541	47.1	250	21.3	1,174
Overweight	13.1		16.5		24.8		28.2		20.9
Over 30%	104	9.8	236	22.2	515	48.5	207	19.5	1,062
Overweight	9.3		16.5		23.7		23.4		18.9
GRAND TOTAL	1,119		1,434		2,177		885		5,615
	100.0		100.0		100.0		100.0		100.0

TABLE 2.--Racial Composition of Sample by Age and Weight, Ratio by Race Within Age

		WHITE		NON-WHITE		
	Age	No.	%	No.	%	Total
Underweight	18-24	96	86.5	15	13.5	111
	25-39	74	92.5	6	7.5	80
	40-64	64	94.1	4	5.9	68
	65 +	43	95.6	2	4.4	45
	TOTAL	277	91.1	27	8.9	304
Normal Weight	18-24	687	90.6	71	9.4	758
	25-39	805	91.4	76	8.6	881
	40-64	1,007	95.6	46	4.4	1,053
	65 +	375	97.9	8	2.1	383
	TOTAL	2,874	93.5	201	6.5	3,075
Up to 30% Overweight	18-24	122	83.6	24	16.4	146
	25-39	187	78.9	50	21.1	237
	40-64	492	90.9	49	9.1	541
	65 +	238	95.2	12	4.8	250
	TOTAL	1,039	88.5	135	11.5	1,174
Over 30% Overweight	18-24	85	81.7	19	18.3	146
	25-39	191	80.9	45	19.1	236
	40-64	400	77.7	115	22.3	515
	65 +	186	89.9	21	10.1	207
	TOTAL	862	81.2	200	18.8	1,062
GRAND TOTAL		5,052	90.0	563	10.0	5,615

TABLE 3. -- Marital Status by Age and Weight

	AGE	SINGLE No.	SINGLE %	MARRIED No.	MARRIED %	SEPARATED DIVORCED No.	SEPARATED DIVORCED %	WIDOWED No.	WIDOWED %	TOTAL
Underweight	18-24	57	51.4	45	40.5	9	8.1	-	-	111
	25-39	5	6.3	61	76.3	14	17.5	-	-	80
	40-64	6	8.8	50	73.5	8	11.8	4	5.9	68
	65+	5	11.1	10	22.2	1	2.2	29	64.5	45
	Total	73	24.0	166	54.6	32	10.5	33	10.9	304
Normal Weight	18-24	344	45.4	375	49.5	38	5.0	1	.1	758
	25-39	43	4.9	735	83.4	96	10.9	6	.7	881
	40-64	47	4.5	844	80.1	81	7.7	81	7.7	1,053
	65+	20	5.2	135	35.2	14	3.7	214	55.9	383
	Total	354	14.8	2,089	67.9	229	7.5	302	9.8	3,075
Up to 30% Overweight	18-24	53	36.3	84	57.5	9	6.2	-	-	146
	25-39	10	4.2	191	80.6	33	13.9	3	1.3	237
	40-64	22	4.1	409	75.6	57	10.5	53	9.8	541
	65+	16	6.4	111	44.4	12	4.8	111	44.4	250
	Total	101	8.6	795	67.7	111	9.5	167	14.2	1,174
Over 30% Overweight	18-24	42	40.4	46	44.2	15	14.4	1	1.0	104
	25-39	18	7.6	183	77.5	32	13.6	3	1.3	236
	40-64	16	3.1	390	75.7	52	10.1	57	11.1	515
	65+	4	1.9	90	43.5	7	3.4	106	51.2	207
	Total	80	7.5	709	66.8	106	10.0	167	15.7	1,062
GRAND TOTAL		708	12.6	3,759	67.9	478	8.5	669	11.9	5,615

TABLE 4.--Occupational Status by Age and Weight

TABLE 4.--Occupational Status by Age and Weight

	Age	Working		Housewife		Unemployed		Illness		Retired		Students	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Underweight	18-24	46	41.8	30	27.3	8	7.3	2	1.8	-	-	24	21.8
	25-39	36	45.6	36	45.6	3	3.7	1	1.3	-	-		3.7
	40-64	27	40.3	33	49.3	1	1.5	4	6.0	2	3.0	-	-
	65 +	1	2.2	18	40.0	1	2.2	1	2.2	24	53.3	-	-
Total		110	36.5	117	38.9	13	4.3	8	2.7	26	8.6	27	9.0
Normal	18-24	409	54.0	217	28.6	31	4.1	6	.8	-	-	95	12.5
Weight	25-39	381	43.4	456	51.9	20	2.3	10	1.1	-	-	11	1.3
	40-64	486	46.3	467	44.5	24	2.3	35	3.3	29	2.8	9	.8
	65 +	42	11.0	155	40.5	13	3.4	2	5.2	170	44.4	1	.1
Total		1,318	42.9	1,295	42.2	88	2.9	53	11.7	199	6.5	116	3.8
Up to 30%	18-24	58	39.7	62	42.5	6	4.1	3	2.1	-	-	17	11.6
Overweight	25-39	99	41.8	118	49.8	11	4.5	4	1.7	1	.5	4	1.7
	40-64	251	46.4	233	43.1	18	3.3	18	3.3	18	3.3	3	.6
	65 +	38	15.2	100	40.0	7	2.8	2	.8	102	40.8	1	.4
Total		446	38.0	513	43.7	42	3.6	27	2.2	121	10.4	25	2.4
Over 30%	18-24	34	32.7	44	42.3	17	16.4	2	1.9	-	-	7	6.7
Overweight	25-39	85	36.2	133	56.6	12	5.1	4	1.7	-	-	1	.4
	40-64	211	41.0	243	47.2	19	3.7	21	4.1	19	3.7	2	.3
	65 +	15	7.3	95	45.9	7	3.4	3	1.4	87	42.0	-	-
Total		345	32.5	515	48.6	55	5.2	30	2.8	106	10.0	10	.9
GRAND TOTAL		2,219	39.6	2,440	43.5	198	3.5	118	2.1	452	8.1	178	3.2

TABLE

Under
Norma Weigh
Up to Overw
Over Overw
GRAND

*38 p

TABLE 5.--Educational Status by Age and Weight

		EDUCATIONAL LEVEL								
		0-7 GRADE		8-12 GRADE		SOME COLLEGE		+COLLEGE GRADUATE		TOTAL
Underweight	18-24	-	-	64	57.7	43	38.7	4	3.6	111
	25-39	1	1.3	52	65.8	14	17.7	12	15.2	79
	40-64	2	2.9	53	77.9	7	10.3	6	8.8	68
	65+	5	11.6	32	74.4	3	7.0	3	7.0	43
	Total	8	2.7	163	54.2	105	34.8	25	8.3	301
Normal Weight	18-24	2	.3	454	60.0	247	32.6	54	7.1	757
	25-39	14	1.6	570	68.6	154	15.7	138	14.1	876
	40-64	42	4.0	779	75.1	125	12.0	92	8.9	1,038
	65+	39	10.6	257	69.8	46	12.5	26	7.1	368
	Total	97	3.1	2,060	68.8	572	18.2	310	9.9	3,039
Up to 30% Overweight	18-24	1	.7	92	63.5	44	30.3	8	5.5	145
	25-39	6	2.6	178	75.4	34	14.4	18	7.6	236
	40-64	23	4.3	424	79.4	52	9.7	35	6.6	534
	65+	40	16.5	173	71.2	22	9.1	8	3.2	243
	Total	70	6.0	867	74.9	152	13.2	69	6.0	1,158
Over 30% Overweight	18-24	2	2.0	83	80.6	14	13.6	4	3.8	103
	25-39	14	6.0	190	80.8	19	8.1	12	5.1	235
	40-64	39	7.6	417	80.9	40	7.8	19	3.7	515
	65+	48	24.1	135	67.9	14	7.0	2	1.0	199
	Total	103	9.8	825	78.4	87	8.3	37	3.5	1,052
GRAND TOTAL		278	4.9	3,915	71.1	916	16.2	441	7.8	5,550*

*38 persons with grades unknown

Percentage Distribution of Response to the Question, "In the past year, has --- been seen by a doctor because of illness or any other medical problems?"

TABLE 6.--Females Reporting Seen Doctor Due to Illness

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	63	56.8	47	42.3	1	.9	111
	25-39	42	52.5	38	47.5	-	-	80
	40-64	52	76.5	16	23.5	-	-	68
	65 +	40	88.9	5	11.1	-	-	45
	TOTAL	137	45.0	106	34.9	1	.1	304
Normal Weight	18-24	475	62.7	274	36.1	9	1.2	758
	25-39	566	64.2	311	35.3	4	.5	881
	40-64	618	58.7	429	40.8	6	.5	1,053
	65 +	278	72.6	104	27.2	1	.3	383
	TOTAL	1,937	63.0	1,118	36.4	20	.6	3,075
Up to 30% Overweight	18-24	101	69.2	44	30.1	1	.7	146
	25-39	153	64.6	84	35.4	-	-	237
	40-64	352	65.1	188	34.8	1	.2	541
	65 +	177	70.8	73	29.2	-	-	250
	TOTAL	783	66.7	389	33.1	2	.2	1,174
Over 30% Overweight	18-24	76	73.1	27	26.0	1	1.0	104
	25-39	157	66.5	77	32.6	2	.8	236
	40-64	344	66.8	171	33.2	-	-	515
	65 +	166	80.2	41	19.8	-	-	207
	TOTAL	743	70.0	316	29.8	3	.2	1,062
GRAND TOTAL		3,660	65.2	1,929	34.4	26	.4	5,615

Percentage Distribution of Response to the Question, "In the past year, has --- been seen by a doctor because of illness or any other medical problems?"

TABLE 7.--Females Reporting Seen a Doctor Due to Illness

		0--12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	40	62.5	23	35.9	1	1.6	64
	25-39	28	52.8	25	47.2	-	-	53
	40-64	43	78.2	12	21.8	-	-	55
	65 +	33	89.2	4	10.8	-	-	37
	TOTAL	144	68.9	64	30.6	1	.5	209
Normal Weight	18-24	286	62.7	167	36.6	3	.7	456
	25-39	376	64.4	207	35.4	1	.2	584
	40-64	480	58.5	335	40.9	6	.7	821
	65 +	218	73.6	77	26.0	1	.3	296
	TOTAL	1,360	63.1	786	36.4	11	.5	2,157
Up to 30% Overweight	18-24	64	68.8	29	31.2	-	-	93
	25-39	122	66.3	62	33.7	-	-	184
	40-64	287	64.2	159	35.6	1	.2	447
	65 +	154	72.3	59	27.7	-	-	213
	TOTAL	627	66.9	309	33.0	1	.1	937
Over 30% Overweight	18-24	61	71.8	24	28.2	-	-	85
	25-39	140	68.6	62	30.4	2	1.0	204
	40-64	309	67.8	147	32.2	-	-	456
	65 +	146	79.8	37	20.2	-	-	183
	TOTAL	656	70.7	270	29.1	2	.2	928
GRAND TOTAL		2,787	65.9	1,429	33.8	15	.3	4,231

Percentage Distribution of Response to the Question, "In the past year, has --- been seen by a doctor because of illness or any other medical problems?"

TABLE 8.--Females Reporting Seen a Doctor Due to Illness

13+ GRADE

		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	23	48.9	24	51.1	-	-	47
	25-39	13	50.0	13	50.0	-	-	26
	40-64	9	69.2	4	30.8	-	-	13
	65 +	5	83.3	1	16.7	-	-	6
	TOTAL	50	54.3	42	45.7	-	-	92
Normal Weight	18-24	189	62.8	106	35.2	6	2.0	301
	25-39	188	64.4	101	34.6	3	1.0	292
	40-64	130	59.9	87	40.1	-	-	217
	65 +	50	69.4	22	30.6	-	-	72
	TOTAL	557	63.2	316	35.8	9	1.0	882
Up to 30% Overweight	18-24	36	69.2	15	28.8	1	.7	52
	25-39	31	59.6	21	40.4	-	-	52
	40-64	60	69.0	27	31.0	-	-	87
	65 +	20	66.7	10	33.3	-	-	30
	TOTAL	147	66.5	73	33.0	1	.5	221
Over 30% Overweight	18-24	15	83.3	2	11.1	1	5.6	18
	25-39	17	54.8	14	45.2	-	-	31
	40-64	35	59.3	24	40.7	-	-	59
	65 +	14	87.5	2	12.5	-	-	16
	TOTAL	81	65.3	42	33.9	1	.8	124
GRAND TOTAL		835	63.3	473	35.9	11	.8	1,319

Percentage Distribution of Response to the Question, "In the past 12 months, has --- been a patient in a hospital overnight or longer?"

TABLE 9.--Females Reporting Overnight Hospital Stay

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	25	22.5	86	77.5	-	-	111
	25-39	20	25.0	60	75.0	-	-	80
	40-64	9	13.2	59	86.8	-	-	68
	65 +	14	31.1	31	68.9	-	-	45
	TOTAL	68	22.4	236	77.6	-	-	304
Normal Weight	18-24	173	22.8	583	76.9	2	.3	758
	25-39	175	19.9	705	80.0	1	.1	881
	40-64	122	11.6	930	88.3	1	.1	1,053
	65 +	51	13.3	332	86.7	-	-	383
	TOTAL	521	16.9	2,550	82.9	4	.2	3,075
Up to 30% Overweight	18-24	44	30.1	102	69.9	-	-	146
	25-39	47	19.8	190	80.2	-	-	237
	40-64	63	11.6	478	88.4	-	-	541
	65 +	33	13.2	217	86.8	-	-	250
	TOTAL	187	15.9	987	84.1	-	-	1,174
Over 30% Overweight	18-24	26	25.0	78	75.0	-	-	104
	25-39	57	24.2	179	75.8	-	-	236
	40-64	61	11.8	454	88.2	-	-	515
	65 +	34	16.4	173	83.6	-	-	207
	TOTAL	178	16.8	884	83.2	-	-	1,062
GRAND TOTAL		954	17.0	4,657	82.9	4	.1	5,615

Percentage Distribution of Response to the Question, "In the past 12 months, has --- been a patient in a hospital overnight or longer?"

TABLE 10.--Females Reporting Overnight Hospital Stay

	0--12 GRADE							
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	18	28.1	46	71.9	-	-	64
	25-39	15	28.3	38	71.7	-	-	53
	40-64	8	14.5	47	85.5	-	-	55
	65 +	12	32.4	25	67.6	-	-	37
	TOTAL	53	25.6	156	75.4	-	-	209
Normal Weight	18-24	129	28.3	325	71.3	2	.4	456
	25-39	112	19.2	472	80.8	-	-	584
	40-64	95	11.6	725	88.3	1	.1	821
	65 +	40	13.5	256	86.5	-	-	296
	TOTAL	376	17.4	1,778	81.8	3	.8	2,157
Up to 30% Overweight	18-24	27	29.0	66	71.0	-	-	93
	25-39	39	21.2	145	78.8	-	-	184
	40-64	50	11.2	397	88.8	-	-	447
	65 +	30	14.1	183	85.9	-	-	213
	TOTAL	146	15.6	791	84.4	-	-	937
Over 30% Overweight	18-24	22	25.9	63	74.1	-	-	85
	25-39	51	25.0	153	75.0	-	-	204
	40-64	55	12.1	401	87.9	-	-	456
	65 +	28	15.3	155	84.7	-	-	183
	TOTAL	156	16.8	772	83.2	-	-	928
GRAND TOTAL		731	17.3	3,497	82.7	3	.1	4,231

Percentage Distribution of Response to the Question, "In the past 12 months, has --- been a patient in a hospital overnight or longer?"

TABLE 11.--Females Reporting Overnight Hospital Stay

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	7	14.9	40	85.1	-	-	47
	25-39	5	19.2	21	80.8	-	-	26
	40-64	1	7.7	12	92.3	-	-	13
	65 +	1	16.7	5	83.3	-	-	6
	TOTAL	14	15.2	78	84.8	-	-	92
Normal Weight	18-24	44	14.6	257	85.4	-	-	301
	25-39	62	21.2	229	78.4	1	.4	292
	40-64	24	11.1	193	88.9	-	-	217
	65 +	8	11.1	64	88.9	-	-	72
	TOTAL	138	15.6	743	84.2	1	.2	882
Up to 30% Overweight	18-24	16	30.8	36	69.2	-	-	52
	25-39	8	15.4	44	84.6	-	-	52
	40-64	13	14.9	74	85.1	-	-	87
	65 +	2	6.7	28	93.3	-	-	30
	TOTAL	39	17.6	182	82.4	-	-	221
Over 30% Overweight	18-24	4	22.2	14	77.8	-	-	18
	25-39	6	19.4	25	80.6	-	-	31
	40-64	6	10.2	53	89.8	-	-	59
	65 +	3	18.7	13	81.3	-	-	16
	TOTAL	19	15.3	105	84.7	-	-	124
GRAND TOTAL		210	15.9	1,108	84.0	1	.1	1,319

Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with High Blood Pressure?"

TABLE 12.--Females Reporting Trouble with High Blood Pressure

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	1	0.9	108	97.3	2	1.8	111
	25-39	2	2.5	78	97.5	-	-	80
	40-64	5	7.4	63	92.6	-	-	68
	65 +	14	31.1	31	68.9	-	-	45
	TOTAL	22	7.2	280	92.1	2	.7	304
Normal Weight	18-24	15	2.0	740	97.6	3	.4	758
	25-39	22	2.5	856	97.2	3	.3	881
	40-64	91	8.6	956	90.8	6	.6	1,053
	65 +	114	29.8	265	69.2	4	1.0	383
	TOTAL	242	7.9	2,817	91.6	16	.5	3,075
Up to 30% Overweight	18-24	9	6.2	137	93.8	-	-	146
	25-39	15	6.3	222	93.7	-	-	237
	40-64	95	17.6	445	82.3	1	.2	541
	65 +	88	35.2	158	63.2	4	1.6	250
	TOTAL	207	17.6	962	81.9	5	.5	1,174
Over 30% Overweight	18-24	7	6.7	97	93.3	-	-	104
	25-39	30	12.7	206	87.3	-	-	236
	40-64	144	28.0	367	71.3	4	.8	515
	65 +	100	48.3	106	51.2	1	.5	207
	TOTAL	281	26.5	776	73.1	5	.4	1,062
GRAND TOTAL		752	13.4	4,835	86.1	28	.5	5,615

Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with High Blood Pressure?"

TABLE 13.--Females Reporting Trouble with High Blood Pressure

		0--12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	1	1.6	63	98.4	-	-	64
	25-39	1	1.9	52	98.1	-	-	53
	40-64	4	7.3	51	92.7	-	-	55
	65 +	13	35.1	24	64.9	-	-	37
	TOTAL	19	9.1	190	90.9	-	-	209
Normal Weight	18-24	10	2.2	443	97.1	3	.7	456
	25-39	15	2.6	567	97.1	2	.3	584
	40-64	68	8.3	748	91.1	5	.6	821
	65 +	98	33.1	195	65.9	3	1.0	296
	TOTAL	191	8.8	1,953	90.5	16	.7	2,157
Up to 30% Overweight	18-24	5	5.4	88	94.6	-	-	93
	25-39	11	6.0	173	94.0	-	-	184
	40-64	80	17.9	366	81.9	1	.2	447
	65 +	76	35.7	133	62.4	4	1.9	213
	TOTAL	172	18.4	760	81.1	5	.5	937
Over 30% Overweight	18-24	7	8.2	78	91.8	-	-	85
	25-39	26	12.7	178	87.3	-	-	204
	40-64	134	29.4	318	69.7	4	.9	456
	65 +	91	49.7	91	49.7	1	.5	183
	TOTAL	258	27.8	665	71.7	5	.5	928
GRAND TOTAL		640	15.1	3,568	84.3	23	.5	4,231

Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with High Blood Pressure?"

TABLE 14.--Females Reporting Trouble with High Blood Pressure

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	0	0.0	45	95.7	2	4.3	47
	25-39	1	3.8	25	96.2	-	-	26
	40-64	1	7.7	12	92.3	-	-	13
	65 +	1	16.7	5	83.3	-	-	6
	TOTAL	3	3.3	87	94.5	2	2.2	92
Normal Weight	18-24	5	1.7	296	98.3	-	-	301
	25-39	6	2.1	285	97.6	1	.3	292
	40-64	20	9.2	197	90.8	-	-	217
	65 +	11	15.3	61	84.7	-	-	72
	TOTAL	42	4.8	839	95.1	1	.1	882
Up to 30% Overweight	18-24	3	5.8	49	94.2	-	-	52
	25-39	4	7.7	48	92.3	-	-	52
	40-64	15	17.2	72	82.8	-	-	87
	65 +	10	33.3	20	66.7	-	-	30
	TOTAL	32	14.5	189	85.5	-	-	221
Over 30% Overweight	18-24	0	0.0	18	100.0	-	-	18
	25-39	4	12.9	27	87.1	-	-	31
	40-64	10	16.9	49	83.1	-	-	59
	65 +	8	50.0	8	50.0	-	-	16
	TOTAL	22	17.7	102	82.3	-	-	124
GRAND TOTAL		99	7.5	1,217	92.3	3	.2	1,319

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Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with Emphysema or Bronchitis? (Trouble Breathing)."

TABLE 15.--Females Reporting Trouble with Emphysema

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	4	3.6	105	94.6	2	1.8	111
	25-39	1	1.2	79	98.7	-	-	80
	40-64	7	10.3	61	89.7	-	-	68
	65 +	2	4.4	43	95.6	-	-	45
	TOTAL	14	4.6	288	94.7	2	.7	304
Normal Weight	18-24	24	3.2	733	96.7	1	.1	758
	25-39	36	4.1	843	95.7	2	.2	881
	40-64	52	4.9	998	94.8	3	.3	1,053
	65 +	23	6.0	360	94.0	-	-	383
	TOTAL	135	4.4	2,934	95.4	6	.2	3,075
Up to 30% Overweight	18-24	3	2.1	143	97.9	-	-	146
	25-39	14	5.9	223	94.1	-	-	237
	40-64	20	3.7	521	96.3	-	-	541
	65 +	7	2.8	242	96.8	1	.4	250
	TOTAL	44	3.7	1,129	96.2	1	.1	1,174
Over 30% Overweight	18-24	7	6.7	97	93.3	-	-	104
	25-39	15	6.4	221	93.6	-	-	236
	40-64	29	5.6	485	94.2	1	.2	515
	65 +	18	8.7	189	91.3	-	-	207
	TOTAL	69	6.5	992	93.4	1	.1	1,062
GRAND TOTAL		262	4.7	5,343	95.2	10	.2	5,615

TABLE

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Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with Emphysema or Bronchitis (Trouble Breathing)?"

TABLE 16.--Females Reporting Trouble with Emphysema

		0--12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	2	3.1	62	96.9	-	-	64
	25-39	0	0.0	53	100.0	-	-	53
	40-64	7	12.7	48	87.3	-	-	55
	65 +	1	2.7	36	97.3	-	-	37
	TOTAL	10	4.7	199	95.3	-	-	209
Normal Weight	18-24	18	3.9	437	95.8	1	.3	456
	25-39	23	3.9	560	95.9	1	.2	584
	40-64	41	5.0	777	94.6	3	.4	821
	65 +	17	5.7	279	94.3	-	-	296
	TOTAL	99	4.6	2,053	95.1	5	.3	2,157
Up to 30% Overweight	18-24	2	2.2	91	97.8	-	-	93
	25-39	12	6.5	172	93.5	-	-	184
	40-64	14	3.1	433	96.9	-	-	447
	65 +	7	3.3	206	96.7	-	-	213
	TOTAL	35	3.7	902	96.3	-	-	937
Over 30% Overweight	18-24	6	7.1	79	92.9	-	-	85
	25-39	14	6.9	190	93.1	-	-	204
	40-64	27	5.9	428	93.9	1	.2	456
	65 +	16	8.7	167	91.3	-	-	183
	TOTAL	63	6.8	864	93.1	1	.1	928
GRAND TOTAL		207	4.9	4,018	95.0	6	.1	4,231

Percent Distribution of Response to the Question, "In the past year, has --- had trouble with Emphysema or Bronchitis (Trouble Breathing)?"

TABLE 17.--Females Reporting Trouble with Emphysema

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	2	4.3	43	91.5	2	4.3	47
	25-39	1	3.8	25	96.2	-	-	26
	40-64	0	0.0	13	100.0	-	-	13
	65 +	1	16.7	5	83.3	-	-	6
	TOTAL	4	4.3	86	93.5	2	2.2	92
Normal Weight	18-24	6	2.0	295	98.0	-	-	301
	25-39	13	4.5	278	95.2	1	.3	292
	40-64	8	3.7	209	96.3	-	-	217
	65 +	4	5.6	68	94.4	-	-	72
	TOTAL	31	3.5	850	96.4	1	.1	882
Up to 30% Overweight	18-24	1	1.9	51	98.1	-	-	52
	25-39	2	3.8	50	96.2	-	-	52
	40-64	5	5.7	82	94.3	-	-	87
	65 +	0	0.0	29	96.7	1	3.3	30
	TOTAL	8	3.6	212	95.9	1	.5	221
Over 30% Overweight	18-24	1	5.6	17	94.4	-	-	18
	25-39	1	3.2	30	96.8	-	-	31
	40-64	2	3.4	57	96.6	-	-	59
	65 +	2	12.5	14	87.5	-	-	16
	TOTAL	6	4.8	118	95.2	-	-	124
GRAND TOTAL		49	3.7	1,266	96.0	4	.3	1,319

Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with Diabetes or High Sugar?"

TABLE 18.--Females Reporting Trouble with Diabetes

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	1	.9	108	97.3	2	1.8	111
	25-39	-	-	80	100.0	-	-	80
	40-64	1	1.5	67	98.5	-	-	68
	65 +	5	11.1	39	86.7	1	2.2	45
	TOTAL	7	2.3	294	96.7	3	1.0	304
Normal Weight	18-24	4	.5	753	99.3	1	.1	758
	25-39	10	1.1	870	98.8	1	.1	881
	40-64	33	3.1	1,016	96.5	4	.4	1,053
	65 +	36	9.4	347	90.6	-	-	383
	TOTAL	83	2.7	2,988	97.2	6	.1	3,075
Up to 30% Overweight	18-24	2	1.4	144	98.6	-	-	146
	25-39	2	.8	235	99.2	-	-	237
	40-64	26	4.8	515	95.2	-	-	541
	65 +	25	10.0	225	90.0	-	-	250
	TOTAL	55	4.7	1,119	95.3	-	-	1,174
Over 30% Overweight	18-24	1	1.0	102	98.1	1	1.0	104
	25-39	13	5.5	223	94.5	-	-	236
	40-64	42	8.2	472	91.7	1	.2	515
	65 +	29	14.0	178	86.0	-	-	207
	TOTAL	85	8.0	975	91.8	2	.2	1,062
GRAND TOTAL		230	4.1	5,374	95.7	11	.2	5,615

Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with Diabetes or High Sugar?"

TABLE 19.--Females Reporting Trouble with Diabetes

		0--12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	1	1.6	63	98.4	-	-	64
	25-39	-	-	53	100.0	-	-	53
	40-64	1	1.8	54	98.2	-	-	55
	65 +	4	10.8	32	86.5	1	2.7	37
	TOTAL	6	2.9	202	96.7	1	.4	209
Normal Weight	18-24	3	.7	452	99.1	1	.2	456
	25-39	7	1.2	577	98.8	-	-	584
	40-64	24	2.9	793	96.6	4	.5	821
	65 +	30	10.1	266	89.9	-	-	296
	TOTAL	64	3.0	2,088	96.8	5	.2	2,157
Up to 30% Overweight	18-24	1	1.1	92	98.9	-	-	93
	25-39	1	.5	183	99.5	-	-	184
	40-64	24	5.4	423	94.6	-	-	447
	65 +	24	11.3	189	88.7	-	-	213
	TOTAL	50	5.3	887	94.7	-	-	937
Over 30% Overweight	18-24	1	1.2	83	97.6	1	.2	85
	25-39	11	5.4	193	94.6	-	-	204
	40-64	41	9.0	414	90.8	1	.2	456
	65 +	26	14.2	157	85.8	-	-	183
	TOTAL	79	8.5	847	91.3	2	.2	928
GRAND TOTAL		199	4.7	4,024	95.1	8	.2	4,231

Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with Diabetes or High Sugar?"

TABLE 20.--Females Reporting Trouble with Diabetes

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	-	-	45	95.7	2	4.3	47
	25-39	-	-	26	100.0	-	-	26
	40-64	-	-	13	100.0	-	-	13
	65 +	-	-	6	100.0	-	-	6
	TOTAL	-	-	90	97.8	2	2.2	92
Normal Weight	18-24	1	.3	300	99.7	-	-	301
	25-39	3	1.4	288	98.6	1	.3	292
	40-64	8	3.9	209	96.1	-	-	217
	65 +	4	5.6	68	94.4	-	-	72
	TOTAL	16	1.9	865	98.1	1	.1	882
Up to 30% Overweight	18-24	1	1.9	51	98.1	-	-	52
	25-39	1	1.9	51	98.1	-	-	52
	40-64	2	8.3	85	92.7	-	-	87
	65 +	1	3.3	29	96.7	-	-	30
	TOTAL	4	1.8	217	98.2	-	-	221
Over 30% Overweight	18-24	1	5.6	17	94.4	-	-	18
	25-39	2	6.5	29	93.5	-	-	31
	40-64	2	3.4	57	96.6	-	-	59
	65 +	3	18.7	13	81.3	-	-	16
	TOTAL	5	4.0	119	96.0	-	-	124
GRAND TOTAL		25	3.1	1,291	96.3	3	.7	1,319

Percentage Distribution of Response to the Question, "In the past year, has --- had any Kidney or Bladder Trouble?"

TABLE 21.--Females Reporting Trouble with Kidney or Bladder Disease

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	13	11.6	96	86.5	2	1.8	111
	25-39	6	7.5	74	92.5	-	-	80
	40-64	3	4.4	65	95.6	-	-	68
	65 +	9	20.0	36	80.0	-	-	45
	TOTAL	31	10.2	271	89.1	2	.7	304
Normal Weight	18-24	73	9.6	684	90.2	1	.1	758
	25-39	89	10.1	791	89.8	1	.1	881
	40-64	68	6.5	982	93.3	3	.3	1,053
	65 +	27	7.0	356	93.0	-	-	383
	TOTAL	257	8.4	2,813	91.5	5	.1	3,075
Up to 30% Overweight	18-24	11	7.5	135	92.5	-	-	146
	25-39	27	11.4	210	88.6	-	-	237
	40-64	40	7.4	500	92.4	1	.2	541
	65 +	18	7.2	230	92.0	2	.8	250
	TOTAL	96	8.2	1,075	91.6	3	.2	1,174
Over 30% Overweight	18-24	13	12.5	90	86.5	1	1.0	104
	25-39	24	10.2	212	89.8	-	-	236
	40-64	47	9.1	468	90.9	-	-	515
	65 +	29	14.0	178	86.0	-	-	207
	TOTAL	113	10.6	948	89.3	1	.1	1,062
GRAND TOTAL		497	8.9	5,107	91.0	11	.2	5,615

TABLE

Under
Norma Weigh
Up t Over
Over Over
GRA

Percentage Distribution of Response to the Question, "In the past year, has --- had any Kidney or Bladder Trouble?"

TABLE 22.--Females Reporting Trouble with Kidney or Bladder Disease

		0-12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	7	10.9	57	89.1	-	-	64
	25-39	4	7.5	49	92.5	-	-	53
	40-64	3	5.5	52	94.5	-	-	55
	65+	8	21.6	29	78.4	-	-	37
	TOTAL	22	10.5	187	89.5	-	-	209
Normal Weight	18-24	49	10.7	406	89.0	1	.3	456
	25-39	63	10.8	521	89.2	-	-	584
	40-64	54	6.6	764	93.1	3	.3	821
	65 +	18	6.1	278	93.9	-	-	296
	TOTAL	184	8.5	1,969	91.3	4	.2	2,157
Up to 30% Overweight	18-24	8	8.6	85	91.4	-	-	93
	25-39	21	11.4	163	88.6	-	-	184
	40-64	30	6.7	416	93.1	1	.2	447
	65 +	16	7.5	195	91.5	2	1.0	213
	TOTAL	75	8.0	859	91.7	3	.3	937
Over 30% Overweight	18-24	13	15.3	71	83.5	1	1.2	85
	25-39	22	10.8	182	89.2	-	-	204
	40-64	42	9.2	414	90.8	-	-	456
	65 +	26	14.2	157	85.8	-	-	183
	TOTAL	103	11.1	824	87.9	1	1.0	928
GRAND TOTAL		384	9.1	3,839	90.7	8	.2	4,231

Percentage Distribution of Response to the Question "In the past year, has --- had any Kidney or Bladder Trouble?"

TABLE 23.--Females Reporting Trouble with Kidney or Bladder Disease

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	6	12.8	39	83.0	2	4.2	47
	25-39	1	3.8	25	96.2	-	-	26
	40-64	0	0.0	13	100.0	-	-	13
	65 +	0	0.0	6	100.0	-	--	6
	TOTAL	7	7.6	83	90.2	2	2.2	92
Normal Weight	18-24	24	8.0	288	92.0	-	-	301
	25-39	25	8.6	266	91.1	1	.3	292
	40-64	13	6.0	207	94.0	-	-	217
	65 +	7	9.7	65	90.3	-	-	72
	TOTAL	69	7.8	815	92.4	1	.8	882
Up to 30% Overweight	18-24	3	5.8	49	94.2	-	-	52
	25-39	6	11.5	46	88.5	-	-	52
	40-64	9	10.3	78	89.7	-	-	87
	65 +	2	6.7	28	93.3	-	-	30
	TOTAL	20	9.0	201	91.0	-	-	221
Over 30% Overweight	18-24	0	0.0	18	100.0	-	-	18
	25-39	2	6.5	29	93.5	-	-	31
	40-64	5	8.5	54	91.5	-	-	559
	65 +	2	12.5	14	87.5	-	-	16
	TOTAL	9	7.3	115	92.7	-	-	124
GRAND TOTAL		105	8.0	1,211	91.8	3	.2	1,319

TABLE 24.

Underweigh	
Normal Weight	
Up to 30% Overweigh	
Over 30% Overweigh	
GRAND TOTA	

Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with Heart Disease?"

TABLE 24.--Females Reporting Trouble with Heart Disease

		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	0	0.0	109	98.2	2	1.8	111
	25-39	0	0.0	80	100.0	0	0	80
	40-64	4	5.9	64	94.1	0	0	68
	65 +	11	24.4	32	71.1	2	4.4	45
	TOTAL	15	4.9	285	93.8	4	1.3	304
Normal Weight	18-24	6	.8	750	98.9	2	.3	758
	25-39	9	1.0	870	98.8	2	.2	881
	40-64	36	3.4	1012	96.1	5	.5	1053
	65 +	64	16.7	317	82.8	2	.5	383
	TOTAL	115	3.7	2949	95.9	11	.4	3075
Up to 30% Overweight	18-24	1	.7	145	99.3	0	.0	146
	25-39	2	.8	235	99.2	0.	.0	237
	40-64	31	5.7	506	93.5	4	.7	541
	65 +	29	11.6	217	86.8	4	1.6	250
	TOTAL	63	5.4	1103	94.0	8	.6	1174
Over 30% Overweight	18-24	1	1.0	102	98.1	1	1.0	104
	25-39	7	3.0	228	96.6	1	.4	236
	40-64	35	6.8	476	92.4	4	.8	515
	65 +	43	20.8	161	77.8	3	1.4	207
	TOTAL	86	8.1	967	91.1	9	.8	1062
GRAND TOTAL	TOTAL	279	5.0	5304	94.5	32	.6	5615

Percentage Distribution of Response to the Question "In the past year, has --- had trouble with Heart Disease?"

TABLE 25--Females Reporting Trouble with Heart Disease

		0--12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	-	-	64		-	-	64
	25-39	-	-	53		-	-	53
	40-64	4	7.3	51	98.1	-	-	55
	65 +	9	24.3	26	70.2	2	5.4	37
	TOTAL	13	6.2	194	92.8	2	1.0	209
Normal Weight	18-24	3	.7	451	98.9	2	.4	456
	25-39	7	1.2	576	98.6	1	.2	584
	40-64	33	4.0	783	95.3	5	.6	821
	65 +	56	18.9	238	80.4	2	.7	296
	TOTAL	99	4.6	2,048	93.2	10	.5	2,157
Up to 30% Overweight	18-24	1	.1	92	98.9	-	-	93
	25-39	2	.1	182	98.9	-	-	184
	40-64	26	5.8	417	93.3	4	.9	447
	65 +	28	13.2	181	84.9	4	1.9	213
	TOTAL	57	6.1	872	93.0	8	.9	937
Over 30% Overweight	18-24	1	1.2	83	97.6	1	1.2	85
	25-39	6	2.9	197	96.6	1	.5	204
	40-64	32	7.0	420	92.1	4	.9	456
	65 +	38	20.8	142	77.6	3	1.6	183
	TOTAL	77	8.3	842	90.7	9	1.0	928
GRAND TOTAL		246	5.8	3,956	93.5	29	.7	4,231

Percentage Distribution of Response to the Question, "In the past year, has --- had trouble with Heart Disease?"

TABLE 26.--Females Reporting Trouble with Heart Disease

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	-	-	45	95.7	2	4.3	47
	25-39	-	-	26	100.0	-	-	26
	40-64	-	-	13	100.0	-	-	13
	65 +	1	16.7	5	83.3	-	-	6
	TOTAL	1	1.1	89	96.7	2	2.2	92
Normal Weight	18-24	3	1.0	298	99.0	-	-	301
	25-39	2	.7	289	99.0	1	.3	292
	40-64	1	.5	216	99.5	-	-	217
	65 +	5	6.9	67	93.1	-	-	72
	TOTAL	11	1.3	870	98.6	1	.1	882
Up to 30% Overweight	18-24	-	-	52	100.0	-	-	52
	25-39	-	-	52	100.0	-	-	52
	40-64	4	4.6	83	95.4	-	-	87
	65 +	-	-	30	100.0	-	-	30
	TOTAL	4	1.8	217	98.2	-	-	221
Over 30% Overweight	18-24	-	-	18	100.0	-	-	18
	25-39	1	3.2	30	96.8	-	-	31
	40-64	3	5.1	56	94.9	-	-	59
	65 +	5	31.3	11	68.8	-	-	16
	TOTAL	9	7.3	115	92.7	-	-	124
GRAND TOTAL		25	1.9	1,291	97.9	3	.2	1,319

Percentage Distribution of Response to the Question,
"Does --- on most days or every day smoke cigarettes?"

TABLE 27.--Females Reporting Regular Cigarette Smoking

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	18	29.5	43	70.5	-	-	61
	25-39	38	47.5	42	52.5	-	-	80
	40-64	45	66.2	23	33.8	-	-	68
	65 +	3	6.7	42	93.3	-	-	45
	TOTAL	104	40.9	150	59.1	-	-	254
Normal Weight	18-24	178	32.4	37.1	67.6	-	-	549
	25-39	321	36.4	560	63.6	-	-	881
	40-64	341	32.4	712	67.6	-	-	1,053
	65 +	53	13.8	330	86.2	-	-	383
	TOTAL	893	31.1	1,973	68.9	-	-	2,866
Up to 30% Overweight	18-24	43	36.8	74	63.2	-	-	117
	25-39	92	38.8	145	61.2	-	-	237
	40-64	146	27.0	395	73.0	-	-	541
	65 +	26	10.4	223	89.2	1	.4	250
	TOTAL	307	26.8	837	73.2	1	-	1,145
Over 30% Overweight	18-24	30	38.0	49	62.0	-	-	79
	25-39	99	41.9	137	58.1	-	-	236
	40-64	134	26.0	381	74.0	-	-	515
	65 +	15	7.2	192	92.8	-	-	207
	TOTAL	278	26.8	759	73.2	-	-	1,037
GRAND TOTAL		1,582	29.8	3,719	70.1	1	.1	5,302

Percentage Distribution of Response to the Question, "Does --- on most days or every day smoke cigarettes?"

TABLE 28.--Females Reporting Regular Cigarette Smoking

		0--12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	12	33.3	24	66.7	-	-	36
	25-39	26	49.0	27	51.0	-	-	53
	40-64	35	63.4	20	36.0	-	-	55
	65 +	2	5.4	35	94.6	-	-	37
	TOTAL	75	41.4	106	58.6	-	-	181
Normal Weight	18-24	133	41.5	187	58.5	-	-	320
	25-39	255	43.6	329	56.4	-	-	584
	40-64	268	32.6	553	67.4	-	-	821
	65 +	37	12.5	259	87.5	-	-	296
	TOTAL	693	34.3	1,328	65.7	-	-	2,021
Up to 30% Overweight	18-24	32	43.8	41	56.2	-	-	73
	25-39	78	42.4	106	57.6	-	-	184
	40-64	121	27.1	326	72.9	-	-	447
	65 +	18	8.5	195	91.5	-	-	213
	TOTAL	249	27.2	668	72.8	-	-	917
Over 30% Overweight	18-24	27	42.9	36	57.1	-	-	63
	25-39	87	42.6	117	57.4	-	-	204
	40-64	123	27.0	333	73.0	-	-	456
	65 +	14	7.6	169	92.4	-	-	183
	TOTAL	251	27.7	655	72.3	-	-	906
GRAND TOTAL		1,268	31.5	2,757	68.5	-	-	4,025

TABLE 2

Underwei
Normal Weight
Up to 30 Overweig
Over 30% Overweig
GRAND TO

Percentage Distribution of Response to the Question,
"Does --- on most days or every day smoke cigarettes?"

TABLE 29.--Females Reporting Regular Cigarette Smoking

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	6	24.0	19	76.0	-	-	25
	25-39	11	42.3	15	57.7	-	-	26
	40-64	10	76.9	3	23.1	-	-	13
	65 +	1	16.7	5	83.3	-	-	6
	TOTAL	28	40.0	42	60.0	-	-	70
Normal Weight	18-24	45	19.7	184	80.3	-	-	229
	25-39	64	21.9	228	77.1	-	-	292
	40-64	68	31.3	149	68.7	-	-	217
	65 +	14	19.4	58	80.6	-	-	72
	TOTAL	191	23.6	619	76.4	-	-	810
Up to 30% Overweight	18-24	11	25.6	32	74.4	-	-	43
	25-39	14	26.9	38	73.1	-	-	52
	40-64	23	26.4	64	73.6	-	-	87
	65 +	8	26.7	21	70.0	1	3.3	30
	TOTAL	56	26.4	155	73.1	1	.5	212
Over 30% Overweight	18-24	3	18.7	13	81.3	-	-	16
	25-39	11	35.5	20	64.5	-	-	31
	40-64	11	18.6	48	81.4	-	-	59
	65 +	1	6.3	15	93.8	1	-	16
	TOTAL	26	21.3	96	78.6	1	.1	122
GRAND TOTAL		301	24.8	912	75.1	2	.1	1,214

Percentage Distribution of Response to the Question, "In the past year, has --- had a general medical or physical examination when not sick or pregnant?"

TABLE 30.--Females Reporting General Medical or Physical Exam

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	54	48.6	56	50.5	1	.9	111
	25-39	48	60.0	32	40.0	-	-	80
	40-64	27	39.7	41	60.3	-	-	68
	65 +	16	35.6	29	64.4	-	-	45
	TOTAL	145	47.7	158	52.0	1	.3	304
Normal Weight	18-24	410	54.1	339	44.7	9	1.2	758
	25-39	532	60.4	347	39.4	2	.2	881
	40-64	579	55.0	465	44.1	9	.9	1,053
	65 +	192	50.1	189	49.3	2	.6	383
	TOTAL	1,713	55.2	1,340	43.2	22	.7	3,075
Up to 30% Overweight	18-24	71	48.6	72	493	3	2.1	146
	25-39	130	54.9	106	44.7	1	.4	237
	40-64	298	55.1	242	44.7	1	.2	541
	65 +	92	38.8	158	63.2	-	-	250
	TOTAL	591	50.3	578	49.2	5	.5	1,174
Over 30% Overweight	18-24	48	46.2	54	51.9	2	1.9	104
	25-39	111	47.0	124	52.5	1	.4	236
	40-64	227	44.1	287	55.7	1	.2	515
	65 +	79	38.2	127	61.4	1	.4	207
	TOTAL	465	43.8	592	55.7	5	.5	1,062
GRAND TOTAL		2,914	52.0	2,668	47.2	33	.5	5,615

TABLE 31.--

Underweig	
Normal Weight	
Up to 30 Overweigh	
Over 30 Overweig	
GRAND TO	

Percentage Distribution of Response to the Question, "In the past year, has --- had a general medical or physical examination when not sick or pregnant?"

TABLE 31.--Females Reporting General Medical or Physical Exam

		0--12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	29	45.3	34	53.1	1	1.6	64
	25-39	35	66.0	18	34.0	-	-	53
	40-64	23	41.8	32	58.2	-	-	55
	65 +	15	40.5	22	59.5	-	-	37
	TOTAL	102	48.8	106	50.7	1	.5	209
Normal Weight	18-24	235	51.5	217	47.6	4	.9	456
	25-39	344	58.9	239	409	1	.2	584
	40-64	420	51.2	393	47.9	8	1.0	821
	65 +	136	45.9	158	53.4	2	.7	291
	TOTAL	1,135	52.6	1,007	46.7	15	.7	2,157
Up to 30% Overweight	18-24	45	48.4	47	50.5	1	1.1	93
	25-39	93	50.5	90	48.9	1	.5	184
	40-64	238	53.2	209	46.8	-	-	447
	65 +	76	35.7	137	64.3	-	-	213
	TOTAL	452	48.3	483	51.6	2	.3	937
Over 30% Overweight	18-24	39	45.9	46	54.1	-	-	85
	25-39	94	46.1	109	53.4	1	.5	204
	40-64	196	43.0	259	56.8	1	.2	456
	65 +	67	36.6	115	62.8	1	.5	183
	TOTAL	396	42.7	529	57.0	3	.3	928
GRAND TOTAL		2,085	49.3	2,125	50.2	21	.5	4,231

TABLE 32.

Underwei
Normal Weight
Up to 3 Overwei
Over 30 Overwei
GRAND

Percentage Distribution of Response to the Question "In the past year, has --- had a general medical or physical examination when not sick or pregnant?"

TABLE 32.--Females Reporting General Medical or Physical Exam

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	25	53.2	22	46.8	-	-	47
	25-39	12	46.2	14	53.8	-	-	26
	40-64	4	30.8	9	69.2	-	-	13
	65 +	1	16.7	5	83.3	-	-	6
	TOTAL	42	45.7	50	54.3	-	-	92
Normal Weight	18-24	175	58.1	121	40.2	5	1.7	301
	25-39	186	64.7	105	36.0	1	.3	292
	40-64	151	69.6	66	30.4	-	-	217
	65 +	51	70.8	21	29.2	-	-	72
	TOTAL	563	63.8	313	35.5	6	.6	882
Up to 30% Overweight	18-24	26	50.0	24	46.2	2	3.8	52
	25-39	37	71.2	15	28.8	-	-	52
	40-64	56	64.4	30	34.5	1	1.1	87
	65 +	13	43.3	17	56.7	-	-	30
	TOTAL	132	59.7	86	38.9	3	1.3	221
Over 30% Overweight	18-24	8	44.4	8	44.4	2	11.1	18
	25-39	17	54.8	14	45.2	-	-	31
	40-64	31	52.5	28	47.5	-	-	59
	65 +	9	56.3	7	43.8	-	-	16
	TOTAL	65	52.4	57	46.0	2	1.6	124
GRAND TOTAL		802	60.8	506	38.4	11	.8	1,319

TABLE 33

Underwei	
Normal Weight	
Up to 30 Overweig	
Over 30% Overweig	
GRAND TO	

Percentage Distribution of Response to the Question, "Does --- on most days or every day take vitamins?"

TABLE 33.--Females Reporting Taking Vitamins Regularly

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	46	41.4	65	58.6	-	-	111
	25-39	23	28.7	57	71.2	-	-	80
	40-64	24	35.3	43	63.2	1	1.5	68
	65 +	21	46.7	24	53.3	-	-	45
	TOTAL	114	37.5	189	62.2	1	.3	304
Normal Weight	18-24	258	34.0	497	65.6	3	.4	758
	25-39	277	31.4	603	68.4	1	.1	881
	40-64	374	35.5	674	64.0	5	.5	1,053
	65 +	159	41.5	224	58.5	-	-	383
	TOTAL	1,068	34.7	1,998	65.0	9	.3	3,075
Up to 30% Overweight	18-24	47	32.2	98	67.1	1	.7	146
	25-39	63	26.6	174	73.4	-	-	237
	40-64	167	30.9	374	69.1	-	-	541
	65 +	108	43.2	142	56.8	-	-	250
	TOTAL	385	32.8	788	67.1	1	.1	1,174
Over 30% Overweight	18-24	35	33.7	69	66.3	-	-	104
	25-39	55	23.3	179	75.8	2	.8	236
	40-64	123	23.9	392	76.1	-	-	515
	65 +	56	27.1	150	72.5	1	.5	207
	TOTAL	269	25.3	790	74.4	3	.3	1,062
GRAND TOTAL		1,836	32.7	3,765	67.1	14	.2	5,615

TABLE 3

Underwei	
Normal Weight	
Up to 3 Overweig	
Over 30 Overweig	
GRAND T	

Percentage Distribution of Response to the Question, "Does --- on most days or every day take vitamins?"

TABLE 34.--Females Reporting Taking Vitamins Regularly

		0--12 GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	23	35.9	41	64.1	-	-	64
	25-39	14	26.4	39	73.6	-	-	53
	40-64	19	34.5	35	63.6	1	1.8	55
	65 +	18	48.6	19	51.4	-	-	37
	TOTAL	74	35.4	134	64.1	1	.5	209
Normal Weight	18-24	162	35.5	293	64.3	1	.2	456
	25-39	178	30.5	406	69.5	-	-	584
	40-64	291	35.4	526	64.1	4	.5	821
	65 +	121	40.9	175	59.1	-	-	296
	TOTAL	752	34.9	1,400	64.9	5	.2	2,157
Up to 30% Overweight	18-24	27	29.0	66	71.0	-	-	93
	25-39	40	21.7	144	78.3	-	-	184
	40-64	142	31.8	305	68.2	-	-	447
	65 +	90	42.3	123	57.7	-	-	213
	TOTAL	299	31.9	638	68.1	-	-	937
Over 30% Overweight	18-24	31	36.5	54	63.5	-	-	85
	25-39	41	20.1	161	78.9	2	1.0	204
	40-64	103	22.6	353	77.4	-	-	456
	65 +	51	27.9	131	71.6	1	.5	183
	TOTAL	226	24.4	699	75.3	3	.3	928
GRAND TOTAL		1,351	31.9	2,871	67.9	9	.2	4,231

Percentage Distribution of Response to the Question, "Does --- on most days or every day take vitamins?"

TABLE 35.--Females Reporting Taking Vitamins Regularly

		13+ GRADE						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	23	48.9	24	51.1	-	-	47
	25-39	9	34.6	17	65.4	-	-	26
	40-64	5	38.5	8	61.5	-	-	13
	65 +	3	50.0	3	50.0	-	-	6
	TOTAL	40	43.5	52	56.5	-	-	92
Normal Weight	18-24	96	31.9	203	67.4	2	.7	301
	25-39	97	33.2	194	66.4	1	.4	292
	40-64	76	35.0	140	64.5	1	.5	217
	65 +	31	43.1	41	56.9	-	-	72
	TOTAL	300	34.0	578	65.5	4	.5	882
Up to 30% Overweight	18-24	19	36.5	32	61.5	1	2.0	52
	25-39	22	42.3	30	57.7	-	-	52
	40-64	23	26.4	64	73.6	-	-	87
	65 +	16	53.3	14	46.7	-	-	30
	TOTAL	80	36.2	140	63.3	1	.5	221
Over 30% Overweight	18-24	3	16.7	15	83.3	-	-	18
	25-39	14	45.2	17	54.8	-	-	31
	40-64	20	33.9	39	66.1	-	-	59
	65 +	4	25.0	12	75.0	-	-	16
	TOTAL	41	33.1	83	66.9	-	-	124
GRAND TOTAL		461	35.0	853	64.7	5	.3	1,319

Percentage Distribution of Response to the Question, "Does --- on most days or every day take tranquilizers?"

TABLE 36.--Females Reporting the Regular Use of Tranquilizers

		TOTAL NUMBER						
		YES		NO		DK		
	AGE	No.	%	No.	%	No.	%	TOTAL
Underweight	18-24	2	1.8	109	98.2	-	-	111
	25-39	2	2.5	78	97.5	-	-	80
	40-64	6	8.8	62	91.2	-	-	68
	65 +	4	8.9	41	91.1	-	-	45
	TOTAL	14	4.6	290	95.3	-	-	304
Normal Weight	18-24	12	1.6	745	98.3	1	.3	758
	25-39	45	5.1	834	94.7	2	.2	881
	40-64	67	6.4	983	93.4	3	.2	1,053
	65 +	33	8.6	349	91.1	1	.3	383
	TOTAL	157	5.1	2,911	94.7	7	.2	3,075
Up to 30% Overweight	18-24	4	2.7	141	96.6	1	.7	146
	25-39	6	2.5	231	97.5	-	-	237
	40-64	41	7.6	498	92.1	2	.3	541
	65 +	19	7.6	230	92.0	1	.4	250
	TOTAL	70	6.0	1,100	93.7	4	.3	1,174
Over 30% Overweight	18-24	7	6.7	97	93.3	-	-	104
	25-39	16	6.8	219	92.8	1	.4	236
	40-64	35	6.8	478	92.8	2	.4	515
	65 +	13	6.3	193	93.2	1	.5	207
	TOTAL	71	6.7	987	92.9	4	.4	1,062
GRAND TOTAL		312	5.6	5,288	94.2	15	.2	5,615

Table 37. -- The Ranking of Obese Females with Specified Negative Health Indicators -------- Grand Rapids, Michigan

Census Tract	Obese Rank	Poverty Income	Female Family Head	Det. Dwelling	Abandoned Vehicle	Attempted Suicide	Illegitimate Births
2	1	37	33	30	11	17	20
26	2	5	8	3	2	4	9
31	3	3	4	4	4	4	4
21	4	12	8	12	18	1	7
22	5	18	15	17	15	16	18
28	6	2	3	1	1	7	1
3	7	32	36	37	16	19	32
30	8	8	2	5	11	6	3
9	9	19	19	16	6	15	25
20	10	11	23	7	31	3	45
36	11	4	5	2	3	12	5
19	12	21	12	19	14	5	16
14	13	6	6	9	10	2	10
33	14	25	22	28	23	16	11
40	14	20	16	14	15	15	28
37	15	23	20	22	22	22	26
6	15	31	40	31	16	25	21
35	16	17	27	29	21	21	40
27	17	22	15	13	5	10	12
1	18	28	38	35	15	11	30
39	18	16	18	21	13	9	22
10	19	35	26	25	17	16	43
12	20	33	24	23	20	23	27
32	21	7	9	15	8	12	6
15	22	9	11	11	11	7	19
38	23	16	18	21	13	9	22
29	24	1	1	6	7	14	2
25	25	13	7	10	12	14	8
7	26	27	25	26	19	26	38
16	27	24	17	27	24	20	35
13	28	10	10	8	12	13	13
43	29	40	39	42	30	23	31
18	30	39	42	43	27	26	22
42	31	37	28	32	28	27	42
24	32	26	14	24	25	8	17
17	33	30	30	36	25	24	24
23	34	32	31	30	28	16	14
8	35	15	13	20	9	17	15
45	35	33	41	41	29	17	36
4	36	30	34	38	30	12	34
34	37	37	32	40	30	17	44
5	38	34	35	37	31	27	37
41	39	29	29	34	22	20	29
44	40	38	43	42	26	17	36
46	41	36	37	39	22	18	39
11	42	34	31	33	17	21	33

APPENDIX B

THE METROPOLITAN LIFE INSURANCE COMPANY'S HEIGHT-WEIGHT TABLE

HEIGHT AND WEIGHT TABLES FOR FEMALE ADULTS

Desirable Weights for Persons Age 25 and Over[1]

Weight in Pounds According to Frame (in Indoor Clothing)

Height (with shoes on) 2-inch heels		Women[2]		
Feet	Inches	Small Frame Pounds	Medium Frame Pounds	Large Frame Pounds
4	10	92-98	96-107	104-119
4	11	94-101	98-110	106-122
5	0	96-104	101-113	109-125
5	1	99-107	104-116	112-128
5	2	102-110	107-119	115-131
5	3	105-113	110-122	118-134
5	4	108-116	113-126	121-138
5	5	111-119	116-130	125-142
5	6	114-123	120-135	129-146
5	7	118-127	124-139	133-150
5	8	122-131	128-143	137-154
5	9	126-135	132-147	141-158
5	10	130-140	136-151	143-163
5	11	134-144	140-155	149-168
6	0	138-148	144-159	153-173

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1 Metropolitan Life Insurance Company ------ New York
2 For Girls Between 18 and 25, Subtract 1 Pound For Each Year Under 25.

APPENDIX C

THE MICHIGAN HEALTH SURVEY

MICHIGAN HEALTH SURVEY
(January 1970 - December 1971)

The Michigan Health Survey (MHS), formerly known as Project ECHO (Evidence for Community Health Organization), was started in 1967 as a collaborative effort between the Michigan Department of Public Health and several local health departments throughout the state. Its purpose is to provide current, meaningful information essential for effective planning, management and evaluation of health related services.

During Phase I of the program a count of the number and location of all dwelling units was established for each block in the area under study; environmental information is also collected at this stage on a block by block basis. From the resulting list of dwelling units a simple random sample is drawn every two weeks and interviews are conducted by Community Health Analysts regarding all residents in the selected dwellings; at the same time the blocks in which these dwelling units are located are reappraised. This interviewing and reappraising constitutes Phase II.

The completed questionnaires are edited, keypunched and converted to magnetic tape from which information can be retrieved for tabulation, analysis and dissemination.

NATURE AND RELIABILITY OF THE DATA

Data collected by the MHS has the satisfying statistical characteristics provided by probability sampling and, therefore, invites the application of highly sophisticated statistical techniques, in particular multivariate tabulations and analysis. In this report, however, only elementary descriptive statistical methods have been applied.

In any household survey it is not possible to complete interviews in all selected households. However, every effort should be made to keep the number of "not home" at a minimum, by repeated calls at different times of the day and on different days of the week. Nevertheless, as many as 10% of the selected households can be expected to be inaccessible for interviewing because of "not home".

The body weight data used for this study was based on the estimated height and weight as given by the informant in answer to the questions:

"What is . . . 's height?"

"What is . . . 's weight?"

A majority (70%) of the responses were given by the informant so that self-information on body weight was given most of the time. Furthermore, bivariate distribution of heights and weights in this study compare favorably with those of the National Health Survey where measurements were made by instruments so that the validity of the data is viewed with confidence. The regression line is virtually identical, while the standard error of estimate is slightly larger, as one would expect, due to an additional source of error.