SOCIAL CORRELATES OF WEIGHT IN AN AGING POPULATION

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Evidence is accumulating which shows an association between health problems and overweight.[1] Accordingly, warnings against obesity have become an important part of the physician's practice of preventive medicine. Despite the general acceptance of such cautions, however, the amount of social and epidemiological research concerning weight differences has been limited.[2] The purpose of the present study is to explore certain dimensions of this problem within an urban population that is approaching old age.

The data are drawn from a longitudinal study of a probability sample of 605 white, married couples living in Providence, Rhode Island, on May 1, 1962, in which the husband was 60 to 64 years of age.[3] A goal of this study is the investigation of the important changes in health which occur during the seventh decade of life. The probability of developing a chronic disease, of encountering a disability that requires confinement, or of dying increases throughout this period. As a consequence, the study of the implications of weight differences for health takes on new meaning, since being overweight and the possibility of becoming ill come into closer juxtaposition. Although a weight condition may interfere with good health at any age, it grows in importance as the body ages and becomes increasingly relevant to many of the types of diseases in older age groups.

A necessary prerequisite for the full understanding of such a relationship between health and weight in this, or any other age group is the investigation of the social correlates of weight differences. Such an epidemiological investigation is reported here.[4] This investigation seeks to discover whether obesity and other weight conditions are randomly distributed throughout the study population or whether they are more frequently found in certain groups within that population.

Few other analyses have been undertaken concerning this question. In 1965, findings were published of an investigation of the relationship between obesity and several social factors within the sample population in the Midtown Manhattan Study.[5] The authors could report only one other study which examined weight condition as a social phenomenon rather than as a random and individual occurrence.[6] Therefore, the examination of weight differences should be extended to another study population and the results compared with the findings already reported.

DEVELOPMENT OF THE WEIGHT VARIABLE

A person's weight relative to that of others can be measured in many ways. Perhaps the soundest procedures are clinical in nature. Among these are the estimation of body fat from specific gravity[7] or the measurement of folds of skin and subcutaneous fat.[8] But measures that involve determining the weight of the body in air and under water or applying calipers to various parts of the body —and even the comparatively innocuous procedure of directly weighing and measuring people—are generally inappropriate to household interview studies. Thus, a measure must be developed from the objective information which an individual can provide: his height and weight.[9] Such information was obtained from all but four of the 1,210 respondents (605 couples) in the Providence study population at the time of interview (1962).

Given the need to use self-reported figures, the soundest procedure would be to compare the person's height and weight with the "desirable" height-weight tables developed in medico-actuarial

studies for the various age groups.[10] Unfortunately, such figures take into consideration another factor that is unobtainable in large surveys—body build. An alternative procedure, however, represents a reasonable compromise. In the absence of detailed information on desirable weight by height and age that does not include body build, the general recommendation of physicians and others concerned with this problem is for persons to maintain their weight at the level of ages 20 to 24.[11] Therefore, the present weight condition of the respondents in the Providence survey will be measured relative to the average weights of persons of their height and sex between the ages of 20 and 24.[12] These figures are presented in Table 1 (columns 1 and 3).

This procedure can be challenged by contending that the comparisons between the height-weight figures for the aging population being studied and persons who are 20 to 24 years old at the same time fails to take into account the fact that members of the study population were actually in their twenties four decades ago. This challenge can be answered in several ways. In the first place, comparison of the height-weight tables presently in use with one for

TABLE I. COMPARISON OF "DESIRABLE" WEIGHT USED AS A MEASURE OF WEIGHT CONDITION WITH AVERAGE WEIGHT IN EARLY 1920'S, PERSONS 20–24 YEARS OLD, BY HEIGHT AND SEX

Men			*Women*		
Height (inches)	*"Desirable" Weight*[26]	*Average Weight in 1920's*[27]	*Height (inches)*	*"Desirable" Weight*	*Average Weight in 1920's*[27]
62	128	124	58	102	108
63	132	128	59	105	109
64	136	132	60	108	113
65	139	136	61	112	116
66	142	141	62	115	119
67	145	144	63	118	122
68	149	149	64	121	125
69	153	154	65	125	128
70	157	157	66	129	132
71	161	161	67	132	135
72	166	165	68	136	139
73	170	169	69	140	142
74	174	174	70	144	145
75	178	178	71	149	149
76	181	183	72	154	154

the early 1920's—when members of the study population were themselves 20 years old—shows a remarkable agreement, as seen in Table 1 (columns 2 and 4). Secondly, the respondents' weights at age 20 were also recorded in the 1962 interview and the correlation could be computed between 1. the deviation of the individual's present weight from his desirable weight—the measure of weight condition used in this study—and 2. the actual weight change that he has undergone over the 40-year period. The correlation coefficients were .712 for males and .797 for females, indicating that the statistical measure being employed is a good reflection of actual trends over time. Both sets of comparisons demonstrate that the use of weight at age 20–24 as a standard for desirable weight is a fair measure and appropriate for the purposes of this research.[13]

For the purposes of this analysis, four categories of weight condition are employed: 1. those individuals who were within 15 pounds of their desirable weight (i.e., average weight of 20–24 year olds for their sex and height group) were classified as *normal;*[14] 2. those who were more than 15 pounds below their desirable weight were classified as *thin;* 3. those who were between 16 and 35 pounds over their desirable weight were categorized as *overweight;* and 4, those who were more than 35 pounds in excess of their desirable weight were identified as *obese.*

The use of these four categories distributes the respondents in the manner shown in Table 2, reflecting a high prevalence of obesity and overweight among both males and females. Indeed, 60 per cent of all respondents were above normal weight and more than one of

TABLE 2. WEIGHT CONDITION IN AN AGING POPULATION, BY SEX

	Males		*Females*		*Total*	
	N	%	*N*	%	*N*	%
Thin	30	5.0	6	1.0	36	3.0
Normal	262	43.3	183	30.4	445	36.9
Overweight	200	33.0	197	32.8	397	32.9
Obese	113	18.7	215	35.8	328	27.2
Total	605	100.0	601	100.0	1206	100.0

$x^2 = 61.8$ $p < .05$.

every four could be identified as obese. Because of the extent to which these conditions are found, the discussion which follows will focus upon those individuals who are overweight or obese.[15]

SOCIAL FACTORS ASSOCIATED WITH WEIGHT DIFFERENCES

Sex

The data presented in Table 2 indicate important sex differentials when weight condition is considered in the Providence study population. More than twice as many women as men could be classified as obese while the proportion of each group that was overweight is nearly identical. Furthermore, this four-category presentation conceals the magnitude of the amount of obesity in the study population and the differences between males and females in this regard. Considering, for example, only the 215 women who were categorized as obese, 18, or 8.4 per cent, were 100 pounds or more over their desirable weights and one woman was 164 pounds overweight. In contrast, only three of the 113 obese males or 2.7 per cent were 100 pounds or more in excess of the desirable weight for persons of their height. Conversely, at the lower end of the range in this obese category, 57.5 per cent of the men and only 39.1 per cent of the women were between 36 and 50 pounds over their desirable weight. These figures reinforce the findings concerning the sex differentials in Table 2. Not only is obesity more prevalent among women, but the males so categorized are generally closer to their desirable weight than are their female counterparts.

Table 2 suggests another aspect of the sex differentials in weight condition. Although interpretation must be qualified by the small number of cases,[16] five times as many males as females could be classified as thin—15 or more pounds below desirable weight. Since analyses such as the Framingham Study have shown that weight loss (crudely reflected here as thinness) is closely associated with ill-health,[17] it is revealing to discover that 26 per cent of all males in the Providence study had one or more serious chronic illnesses,[18] as compared with only 17 per cent of the females. This aspect of the weight differences by sex, therefore, may be intertwined with

the greater morbidity among males. The longitudinal design of the larger study of which this analysis is a part will permit elaboration on this point.

Socioeconomic Status

Differentials in weight by sex is emphasized when other social characteristics are examined. Variables which have great meaning for one sex group may not be as important for the other. Analysis of the relationship between socioeconomic status[19] and weight condition is especially illustrative. The data presented in Table 3 show that differences do exist in the frequency of obesity for males by socioeconomic status, with the greatest prevalence of this condition being found among those in the low category. These differences pale into insignificance, however, when compared with the differences for females. Women of high socioeconomic status are infrequently found to be obese (12.2 per cent as compared to 35.8 per cent of all females studied), while those who fall into the low grouping are much more likely to be classified in this manner (45.8 per cent).

TABLE 3. WEIGHT CONDITION IN AN AGING POPULATION, BY SOCIOECONOMIC STATUS

	Socioeconomic Status[28]							
	Low		*Medium*		*High*		*Total*	
Males	*N*	%	*N*	%	*N*	%	*N*	%
Thin	12	5.9	17	6.1	1	0.8	30	5.0
Normal	80	39.6	113	40.5	69	55.7	262	43.3
Overweight	64	31.7	99	35.5	37	29.8	200	33.0
Obese	46	22.8	50	17.9	17	13.7	113	18.7
Total	202	100.0	279	100.0	124	100.0	605	100.0
$x^2 = 15.5$ $p < .05$.								
Females								
Thin	1	0.5	3	1.1	2	1.6	6	1.0
Normal	47	23.4	79	28.5	57	46.4	183	30.4
Overweight	61	30.3	87	31.4	49	39.8	197	32.8
Obese	92	45.8	108	39.0	15	12.2	215	35.8
Total	201	100.0	277	100.0	123	100.0	601	100.0
$x^2 = 42.8$ $p < .05$.								

TABLE 4. WEIGHT CONDITION IN AN AGING POPULATION, BY NATIVITY

	Native-Born, Native Parents		*Native-Born, Foreign Parents*		*Foreign-Born*		*Total*	
Males	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Thin	9	7.8	12	4.9	8	3.3	29	4.8
Normal	55	47.8	100	41.1	106	43.3	261	43.3
Overweight	33	28.7	83	34.2	84	34.3	200	33.2
Obese	18	15.7	48	19.8	47	19.1	113	18.7
Total	115	100.0	243	100.0	245	100.0	603	100.0

$x^2 = 5.8$ not significant.

Females								
Thin	3	2.3	2	0.7	1	0.6	6	1.0
Normal	48	37.2	100	32.6	35	21.2	183	30.4
Overweight	35	27.2	99	32.2	63	38.2	197	32.8
Obese	43	33.3	106	34.5	66	40.0	215	35.8
Total	129	100.0	307	100.0	165	100.0	601	100.0

$x^2 = 13.8$ $p < .05$.

Table 3 shows the merits of identifying an extreme group within those who are above normal weight. Although the terms "overweight" and "obese" are admittedly arbitrary, those respondents who fall into the obese category are a distinctive group. This is demonstrated by the fact that, although women in the higher socioeconomic status are seldom obese, they are frequently found to be overweight. This tendency reflects a general departure from normality in weight that is less pronounced in the case of males and shows that substantial excesses over desirable weight among women are positively associated with socioeconomic status, but that obesity is inversely related.

Nativity

Examination of the relationship between weight condition and nativity produces some additional insights into the problem under study. As Table 4 indicates, prevalence of obesity and overweight appears to be related to generation in the United States. In general, an increasing prevalence of these two weight conditions accompanies decreases in the length of time that respondents and their families have been in this country. Again, differences are found

between males and females in this regard. Not only is the relationship found to be stronger (and statistically significant) for women, but the point at which the differences appear also varies. In the case of the males, the major difference was between the native-born of native parents and the other two groupings, while the difference for females was most noticeable between those who were foreign-born and the two native-born categories.

With socioeconomic status and generation in the United States perhaps being closely related, it is important to determine whether the inverse relationship between obesity and nativity is independent of socioeconomic position. Accordingly, the association between socioeconomic status and weight condition was examined for each of the nativity categories. The results of this analysis are shown in Table 5. In general, differences by nativity disappear when socioeconomic status is held constant. In the case of women in the middle status, for example, 42 per cent of the foreign-born, 36 per cent of the native-born of foreign parents, and 43 per cent of the native-born of native parents can be classified as obese. The percentages for overweight in the same category were 34, 29, and 34 per cent, respectively.

Only in a few instances does a relationship between nativity and weight condition remain in the presence of controls for socioeconomic status, but these are worthy of note. The proportion of women in the upper socioeconomic status who could be identified as obese or overweight drops sharply as length of residence in the United States (as measured by generation) increases. Among the males in the upper category, approximately the same pattern of prevalence of obesity is observed. Although the difference is slight between those who are native-born of foreign parents (16.4 per cent) and those who are foreign-born (15.6 per cent), a sharp drop occurs in the case of those who are native-born of native parents (8.1 per cent). Unlike the women, however, the decline in prevalence of obesity among these males is not paralleled by similar changes in the amount of overweight as the proportion who are classified in this fashion remains generally constant by nativity group.

TABLE 5. WEIGHT CONDITION IN AN AGING POPULATION, BY NATIVITY AND SOCIOECONOMIC STATUS

	Native-Born, Native Parents Socioeconomic Status			*Native-Born, Foreign Parents Socioeconomic Status*			*Foreign-Born Socioeconomic Status*		
Males	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*
Thin	10.7	12.0	0.0	1.8	8.3	0.0	5.9	0.0	3.2
Normal	42.9	42.0	59.5	38.2	36.8	54.5	39.8	44.2	53.1
Overweight	25.0	28.0	32.4	36.4	35.3	29.1	31.4	40.0	28.1
Obese	21.4	18.0	8.1	23.6	19.6	16.4	22.9	15.8	15.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	28	50	37	55	133	55	118	95	32
Females									
Thin	3.5	1.8	2.3	0.0	1.3	0.0	0.0	0.0	5.6
Normal	31.0	21.4	61.4	25.0	33.1	42.6	18.8	23.9	22.2
Overweight	13.8	33.9	27.3	28.3	29.2	45.9	38.7	34.3	50.0
Obese	51.7	42.9	9.0	46.7	36.4	11.5	42.5	41.8	22.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	29	56	44	92	154	61	80	67	18

TABLE 6. WEIGHT CONDITION IN AN AGING POPULATION, BY RELIGION-ETHNICITY

	Italian Catholic		*Irish Catholic*		*Other Catholic*		*Protestant*		*Jewish*		*Total*	
Males	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Thin	3	1.5	7	6.5	12	11.9	6	5.6	2	2.5	30	5.0
Normal	72	35.8	49	45.8	45	44.5	54	50.4	39	48.1	259	43.4
Overweight	78	38.8	35	32.7	29	28.7	31	29.0	25	30.9	198	33.2
Obese	48	23.9	16	15.0	15	14.9	16	15.0	15	18.5	110	18.4
Total	201	100.0	107	100.0	101	100.0	107	100.0	81	100.0	597	100.0

$x^2 = 29.1$ $p < .05$.

Females												
Thin	0	0.0	3	3.3	1	0.8	2	1.8	0	0.0	6	1.0
Normal	32	17.8	31	33.7	44	33.8	44	38.9	32	40.5	183	30.8
Overweight	56	31.1	23	25.0	43	33.1	39	34.5	35	44.3	196	33.0
Obese	92	51.1	35	38.0	42	32.3	28	24.8	12	15.2	209	35.2
Total	180	100.0	92	100.0	130	100.0	113	100.0	79	100.0	594	100.0

$x^2 = 54.4$ $p < .05$.

Religion-ethnicity

Two other social variables, religion and ethnicity, were also considered. Because consideration of religion in many industrial communities lacks meaning without a sensitivity to ethnic factors, and because the number of cases was insufficient to make a detailed analysis of ethnicity, these two variables were combined into a set of five categories: Italian Catholic, Irish Catholic, other Catholic, Protestant and Jewish. Careful reading of the results presented in Table 6, however, can lead to solid inferences about the importance of each of these variables.

The weight condition of the respondents, as reflected in Table 6, shows important differentials by religion and ethnicity for both males and females. Again, the differences are less pronounced in the case of the males than females. The prevalance of obesity is much higher among Italian Catholics, men and women alike, than among any of the other groups. In addition, Catholic women in general are disproportionately represented in the obese category in comparison to Protestant and Jewish women, but no such clear pattern could be found for males. Although the differences were somewhat offset by a higher proportion of their numbers being classified as overweight, the Jewish women were found to be much less frequently obese than women in the other groups.

Because religion-ethnicity and socioeconomic status may be closely related, the combined effects of these factors are assessed in relation to weight condition. This more complex analysis, presented in Table 7, reveals some interesting patterns. In the case of females, the relationship between obesity and religion-ethnicity nearly vanishes among women of low socioeconomic status. The prevalence of obesity in each of the three Catholic groupings in this category is nearly identical and only the Jewish women deviate sharply from that figure. (The number of cases in this last group, however, is very small.) But as above, the low proportion of obesity among the Jewish women is offset by a very high prevalence (71.4 per cent) of overweight. In the middle and high socioeconomic categories, the relationship between religion-ethnicity and

TABLE 7. WEIGHT CONDITION IN AN AGING POPULATION, BY RELIGION-ETHNICITY AND SOCIOECONOMIC STATUS

	Italian Catholic			*Irish Catholic*			*Other Catholic*			*Protestant*			*Jewish*		
Males	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*	*Low*	*Medium*	*High*
Thin	2.8	0.0	0.0	4.3	9.4	0.0	8.5	16.0	0.0	15.4	2.4	2.5	14.3	2.7	0.0
Normal	34.6	33.3	56.3	56.5	40.6	50.0	42.9	41.1	70.0	34.6	48.8	62.5	57.1	45.9	48.6
Overweight	35.5	44.9	31.3	26.1	32.8	40.0	34.3	28.6	10.0	30.8	31.7	25.0	0.0	35.2	32.5
Obese	27.1	21.8	12.4	13.1	17.2	10.0	14.3	14.3	20.0	19.2	17.1	10.0	28.6	16.2	18.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	107	78	16	23	64	20	35	56	10	26	41	40	7	37	37
Females															
Thin	0.0	0.0	0.0	5.9	1.7	5.9	0.0	1.4	0.0	0.0	2.1	2.6	0.0	0.0	0.0
Normal	22.1	6.8	29.4	29.4	31.0	47.1	25.6	37.0	42.9	26.9	27.1	61.5	14.3	45.9	40.0
Overweight	29.8	28.8	47.1	17.6	25.9	29.4	25.6	34.2	50.0	38.5	35.4	30.8	71.4	35.2	48.6
Obese	48.1	64.4	23.5	47.1	41.4	17.6	48.8	27.4	7.1	34.6	35.4	5.1	14.3	18.9	11.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
N	104	59	17	17	58	17	43	73	14	26	48	39	7	37	35

weight returns as Italian women are found to be relatively more obese than women in the other groups, although this pattern was less pronounced in the upper socioeconomic grouping.

Among the males of low socioeconomic status, the greatest prevalence of obesity is found among the Italians and the Jews (although the small number of cases in the latter group makes interpretation difficult). The highest prevalence of obesity among the men in the middle group is also found among the Italians, and, as with the women, the relationship between religion-ethnicity and weight largely disappears among those of high socioeconomic status.

SUMMARY AND INTERPRETATIONS

Two important conclusions can be reached immediately concerning the data which have been presented. First, a very high amount of obesity and overweight was discovered in the aging population under study. Whenever statistics are found which reveal that more than 50 per cent of the men and 60 per cent of the women are above normal weight for their age, they deserve attention. In a study population composed of individuals who are at an age when the possibility of becoming ill is rapidly increasing, the magnitude of these figures cannot be ignored.

Secondly, the data clearly show that differences in weight are not randomly distributed throughout the population. High proportions of obesity, for example, are found to be concentrated in certain segments of that population. This finding agrees with the few other studies that have also examined weight condition as a social phenomenon rather than an individual occurrence. As the Midtown Manhattan Study's authors observed, obesity may always be unhealthy, but it may not always be viewed as abnormal in various population subgroups such as persons of low socioeconomic status or those of Italian backgrounds.[20] With most discussions of the etiology of obesity having focused upon the individual, this conclusion should not be treated lightly.

With respect to more specific findings, the following general

observations can be made. 1. Substantial differences exist in weight condition by sex. Although more males than females could be classified as thin, possibly reflecting differences in health, the most significant departure from normality occurs in the direction of obesity where more than twice as many women as men could be identified in this manner. 2. Important socioeconomic differences in the prevalence of overweight and obesity were also found. Although 54 per cent of the men and 76 per cent of the women in the low-socioeconomic grouping were either overweight or obese, the comparable percentages for men and women of high socioeconomic status were 44 and 53 per cent, respectively. These socioeconomic differences were more marked for females than for males. 3. When socioeconomic status was controlled, relationships between weight condition and a third variable, nativity, generally disappear. Only among those persons of high socioeconomic status did this relationship remain when the controls were applied. Here, the proportion of those individuals who were obese drops with increasing generation in the United States. 4. The same controls for socioeconomic status also produced some very interesting patterns when the relationship between weight and religion-ethnicity was examined. For women, overweight and obesity were highly prevalent in the low socieconomic grouping regardless of religion-ethnicity, but the Italian males in this grouping were much more frequently found to be above normal weight. In the case of both males and females, the highest prevalence of obesity and overweight in the middle grouping is also found among Italians, and the relationship between religion-ethnicity and weight disappears among those of high socioeconomic status.

These results are similar to those presented in the Midtown Manhattan Study despite differences in study population and research design. Weight differentials by socioeconomic status were found in both studies as were such differences by ethnicity, although the Midtown researchers were not able to treat this variable as completely. Both analyses discovered differences in the prevalence of obesity and other weight conditions by sex, but the direction of this relationship differed between the two studies.

In the present analysis the prevalence of obesity among females was much more pronounced than among males, although the opposite pattern was found in the Midtown Manhattan Study. Comparisons are marred by the different methods used to identify weight condition,[21] but part of the variation may be influenced by the age composition of the respective study populations. The Providence Study involved an "aging" group while the respondents in the Midtown Manhattan Study ranged from 20 to 59 years of age. This raises the question as to whether obesity among females is a condition that occurs later in life, at which time it becomes more prevalent among this sex than among males. Additional research is needed to investigate the differences in results obtained in these two studies. The similarity of many of the findings, however, is worthy of careful note.

As an explanation for the weight differences discovered in their study population, the Midtown Manhattan researchers developed a social-psychological interpretation. In a nation where the popular culture emphasizes slimness as a desirable attribute among females, they suggested that this value will influence weight condition in several ways. Pressure to conform to this value will be felt and will increase with proximity to the upper class where the value is most strongly held, and increasing exposure to these values with length of generation in the United States will lead to its adoption.[22] In this fashion, the Midtown researchers were able to explain the patterns they found.

In the present analysis, this "value-orientation" approach requires some modification. The prevalence of obesity among Italian Catholics, even when social class is controlled, suggests that dietary factors are important as well. Studies have shown, for example, that the Italian-American's diet has a high caloric and fat content[23] and that some members of this ethnic group still hold to the belief that obesity provides protection from certain diseases.[24] Apparently, both dietary considerations and orientation to the popular culture's value of "slimness" affect the weight condition of Italians in the study population, although the latter may be sufficient to explain the patterns found for other religious-ethnic

groups. For example, tendencies toward a diet that is inappropriate to maintain normal weight may disappear with improvements in socioeconomic status, thereby explaining why Italian Catholics of high socioeconomic status were not noticeably more obese than other religious-ethnic groups of the same status. On the other hand, the very high prevalence of obesity among all women in the low socioeconomic group may mask any ethnic factor that might be operative.

Additional investigation on these two alternative explanations and extension of the research to other subgroups of the population and additional social variables are needed. The message of the present study centers upon the word "epidemiological" in the announced form of the analysis. McMahon, Pugh and Ipsen make a distinction between descriptive and analytic epidemiology:[25]

> Epidemiology is the study of the distribution and determinants of disease prevalence in man. Two main areas are indicated in the definition. These are the study of the *distribution* of disease (descriptive epidemiology) and the search for the *determinants* of the noted distribution (analytic epidemiology).

This study is an example of the former and has discharged its responsibility by 1. emphasizing the prevalence of obesity in an aging population, 2. noting that weight differences do not occur randomly throughout the population, and 3. pointing to some of the differentials in weight which exist between subgroups of the population. Some interpretation was undertaken and points of comparison and contrast with the Midtown Manhattan Study were noted. With this information, the work of analytic epidemiology should begin by asking persons of different ages about their value orientations concerning weight, making assessments of their diet and analyzing weight changes and the ages at which they occurred. The present study has pointed to the need for such information and with the importance of weight condition for health, these are appropriate questions for further study.

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[9] Such self-reporting imposes certain limitations on the study. But, as the Midtown Manhattan Study authors indicated in their report, the errors of respondents in reporting their weight is in the direction of the mean. Thus, some persons who are either overweight or underweight may be mistakenly included in the "normal" weight grouping, thereby understating relationships that are present. *See* Moore, Stunkard and Srole, *op. cit.,* p. 963.

[10] Society of Actuaries, Build and Blood Pressure Study, Washington, 1959.

[11] Metropolitan Life Insurance Company, *Statistical Bulletin,* 40, 4, November–December, 1959.

[12] Use of the average weights at age 20–24 as a standard presents one problem. A person for whom a desirable weight would be 160 pounds at age 20 might well be obese some 40 years later without gaining a pound, since "maintenance" of constant weight with advancing years obscures the critical change in the muscle-fat ratio relative to the progressive reduction in lean body mass. *See* Pomeranze, Julius, Obesity as a Health Factor in Geriatric Patients, *Geriatrics,* 12, 481, August, 1957. Fortunately, this fact can lead to greater confidence in whatever definite results are obtained since it will cause some of the existing relationship to be hidden or understated.

[13] Although weight at age 20 was available, it could not be used as a substitute for the "desirable weight" standard because ascertaining the persons who were obese at that earlier age was impossible in summary calculations.

[14] The figure of 15 pounds represents an average of ten to 12 per cent gain in weight for this study population between age 20 and the 1962 interview.

[15] This decision must be made to render the discussion as clear as possible. Since very few persons are classified as thin, normality in weight can generally be considered as the reciprocal of overweight and obese.

[16] Because of the small number of cases when spread into an additional variable, analysis of those who are thin is limited to prevent misinterpretation.

[17] Kannel, William B., Director of the Framingham Heart Study, Personal communication.

[18] Serious chronic illnesses are those which are considered life-threatening. These are, as reported in the interview, malignant neoplasms, cerebrovascular accidents, heart disease, vascular disease and cirrhosis of the liver.

[19] The measure used to determine socioeconomic status is an index based upon occupation, education and income as developed and employed by the United States Bureau of the Census. For a full discussion *see Methodology and Sources of Socioeconomic Status,* Working Paper No. 15, Technical Paper Series, United States Bureau of the Census, Washington, 1962. Women are categorized according to the socioeconomic status of their husbands.

[20] Goldblatt, Moore and Stunkard, *op. cit.,* p. 1040.

[21] The height-weight index employed by the Midtown Manhattan Study uses broad categories for both height and weight and is uniformly applied to both males and females, thus creating great differences in the identification of obesity. For example, if the Midtown Manhattan Study's height-weight index had been applied to the Providence Study population, obesity could range from 14 to 30 per cent over desirable weight depending upon an individual's height. Measuring the deviation of an individual's present weight from the "desirable" weight for persons of the same sex and his exact height eliminates that problem in the present analysis.

[22] Goldblatt, Moore and Stunkard, *op. cit.,* pp. 1042–1043.

[23] Joffe, Natalie, Food Habits of Selected Subcultures in the United States, *Bulletin of National Research Council,* 108, 98, October, 1943; and Stout, Clarke, *et al.,* Unusually Low Incidence of Death from Myocardial Infarction: Study of an Italian-American Community in Pennsylvania, *Journal of the American Medical Association,* 188, 848, June 8, 1964.

[24] Joffe, *op. cit.,* pp. 98–99.

[25] McMahon, Brian, Pugh, Thomas F. and Ipsen, Johannes, EPIDEMIOLOGIC METHODS, Boston, Little, Brown and Company, 1960, p. 3.

[26] "Desirable" weight is the average weight of persons 20 to 24 as given in the Society of Actuaries Study; *see* Metropolitan Life Insurance Company, *op. cit.,* p. 2.

[27] The average weights given for the 1920's (when most of the Providence respondents were in their twenties) are from Wood, T. D., PERSONAL HEALTH STANDARD AND SCALE, New York, Columbia University Teacher's College, 1923;

data were published *in* Hathaway, Millicent L. and Foard, Elsie D., HEIGHTS AND WEIGHTS OF ADULTS IN THE UNITED STATES, Home Economics Research Report No. 10, Washington, United States Department of Agriculture, 1960, p. 48. Data presented are for age group 21–22.

[28] Categories of socioeconomic status are based upon the following ranges of socioeconomic-status scores: low, 1–33; medium, 34–66; high, 67–99. Scores developed by the method set forth in *Methodology and Sources of Socioeconomic Status, op. cit.*

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