Three hard-and-fast essentials in the prevention and cure of obesity apply as much to us, as grown men and women, as they do to us as guides of public health behavior. Truly adiposity is not a field safe for shoemaker's children to go barefoot.

Some Basic Considerations of Obesity as a Public Health Problem*

NORMAN JOLLIFFE, M.D., F.A.P.H.A.

Director, Bureau of Nutrition, City Department of Health, and President, National Vitamin Foundation, Inc., New York, N. Y.

THE recognition of obesity as a public health problem has been one of slow development. A decade or two ago hardly any one recognized obesity as anything more than a personal problem, interest in which was motivated by vanity or the dictates of fashion. Outstanding exception to this general rule was a small group of actuarial experts and diabetic specialists who knew that the obese carried very serious health hazards. One may add to this small group many surgeons who often refused to do elective surgery on obese persons because of the technical difficulties and operative risks involved.

There is no need to detail to the readers of this *Journal* how and why the "crude death rate" has declined from 17.2 deaths per 1,000 population in 1900 to 9.7 in 1949; how and why "life expectancy at birth" has increased from 47.3 years in 1900 to 67.6 in 1949, a spectacular increase of 20 years [1]; how and why the proportion of the entire population dying before age 45 has fallen from 38 per cent in 1900 to 10 per cent in 1951.[2] This means that 90 per cent of the present population will live to and beyond age 45. This record of health achievement justifies the characterization of this period as "man's greatest half century." [1]

However, this advance in producing an older population, has of itself created new health problems. Life expectancy at age 40 is less in this country than in 16 other countries. It is the belief of many that the hard core of these newer health problems is the degenerative diseases, chief of which is arteriosclerosis. In this connection mortality figures show that the obese die earlier of the degenerative diseases than do the nonobese. If our present mortality rates continue it has been estimated, for example, that 60 million Americans now living will die of arteriosclerosis.[3] A new plague, although an old disease, has arisen to smite us.[4]

During this same half century obesity has in all probability increased in frequency; how much no one knows for there are no reliable data on the prevalence of obesity in 1900, or thereabouts. That it has increased in prevalence is probable by deduction. For example, the per capita consumption of calories in food has, for practical purposes, remained constant at around 3,100 cal-

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ories a day since 1900.[5] During this period the population at age 45 and over has increased from 17.8 per cent of the whole to 28.4 per cent. This fact alone should have reduced our per capita food consumption, because our need for calories decreases about 7.5 per cent for each 10 years after age 25.[7, 8] Furthermore, there has been a significant decrease in average energy expenditure since 1900 because of easier transportation and labor-saving devices on our farms and in our factories and homes during this period. This latter saving in energy expenditure may be estimated as a minimum of 5 per cent, while the decrease in energy expenditure because of the increasing age of the population would approximate about 2.5 per cent. Thus, if 3,100 calories were the correct energy requirement in 1900, then 230 calories less, or 2,870 calories per capita population, would be a comparable maximum now for an older and less hard-working population. At 3,100 calories we are either now wasting more food than in 1900 or eating more food. It may well be that we are doing both. At any rate it has been estimated that from 25 to 30 per cent of our population is over the desirable weight.[3]

Although the cause of arteriosclerosis is unknown, one fact stands out with clarity; it is that deaths from arteriosclerosis and the degenerative diseases occur earlier in the overweight than in the nonobese population.[3] An excess mortality of 50 per cent for the significantly obese would be a reasonable estimate. It is equally clear at the present time that about the only advice the medical profession can offer with confidence to the public in regard to the prevention of arteriosclerosis and its associated diseases is "never become overweight, and if overweight, reduce and stay reduced." Should the American public do this it would by this means alone increase life expectancy by perhaps one to 4 years.* This compares to about 2 years increase that would result if, beginning today, no one would die of cancer. All of these figures are of course oversimplifications of complicated predictions, but they do point up the comparative magnitude of our newer public health problems.

Our basic information concerning the etiology and treatment of obesity may be briefly summarized as follows:

Obesity is invariably caused by a greater intake of calories in food than expenditure of calories as energy—This fact is important, not only in understanding the cause of obesity, but in its treatment. All too often, as a concession to conservatism we see such statements as "Obesity is nearly always caused by overeating" or in "9 out of 10 subjects obesity is caused by overeating." Such statements give the obese person an excuse for not blaming his obesity upon his own gluttony. They are often, in their own mind at least, the exception to the rule.

The essential component of every reducing regimen is a "calorie deficit" [9]—By metabolic studies the loss of adipose tissue over a period of time, in an obese person maintained on a subcaloric diet, otherwise adequate, has been shown to be directly proportional to the calorie deficit. This loss of adipose tissue can be predicted with remarkable accuracy. These metabolic calculations are based on the fact that one gm. of adipose tissue yields an average of 7.7 calories, one pound of adipose tissue yields 3,500 calories and one kg. yields 7,700 calories. Therefore, a deficit of about

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* Based on an over-all death rate of 9.7 in 1949, the death rates of the nonobese were calculated under the following assumptions: (1) that the obese death rate is 150 per cent of the nonobese, and (2) that the proportion of obese in the total population is 25 per cent, of whom only (a) one-half and (b) one-quarter are sufficiently overweight to influence the death rate. On this basis the nonobese death rates were determined to be, respectively, (a) 9.13 and (b) 9.41 per 1,000.

Increases in life expectancy based on these lower death rates were computed by relating them to the known increase in life expectancy of 1949 over 1900 as a result of the decrease in the death rate from 1900 to 1949.

3,500 calories leads to the metabolism of a pound of adipose tissue, and a deficit of about 7,700 calories leads to the metabolism of one kg. of adipose tissue. This is true whether the calorie deficit is acquired over one day, one week, one month or, for that matter, one year. It is therefore possible, when the calorie deficit is known, to predict with remarkable accuracy the loss of adipose tissue over a period of time.[3]

All methods of freeing the obese from excess fat are effective only in so far as they aid in producing and maintaining a calorie deficit. A calorie deficit can be obtained either by increasing the calorie expenditure or by decreasing the calorie intake, or by both methods. There is an exaggerated idea of the value of exercise in producing a calorie deficit. For the average person a walk of one mile at the rate of 2 miles per hour leads to the expenditure of 100 extra calories. Therefore, to lose 2 pounds of adipose tissue by this type of exercise alone, the average person would have to walk 10 extra miles each day for one week without increasing the food intake. This is difficult because exercise usually increases the appetite. Therefore, a considerable and sustained increase in calorie expenditure by exercise for most obese persons is impractical. On the other hand, to lose 2 pounds of adipose tissue by diet, while maintaining the same calorie expenditure—that is, without additional exercise—the obese person needs to eat daily for one week 1,000 calories less than the calorie expenditure. For most obese persons this is easier than the equivalent amount of exercise and does not require daily 5 extra hours of walking. Therefore, most effective reducing plans are based on the production of a calorie deficit by a reduction of caloric intake below caloric expenditure without as a rule simultaneously increasing the caloric expenditure.

Adjuvants to the low caloric diet, whether medicinal, physical, psychologic, or educational, are valuable only in so far as they increase the caloric expenditure or aid the patient in control of appetite by adherence to the prescribed diet. Those adjuvants that do not aid in one of these ways probably lead to more harm than good.

The reducing diet should form the basis of dietary re-education so that the proper eating habits will continue after the desired loss of weight has been attained—For this reason skipping meals, uncommon or "trick" diets, and high fat diets that do not furnish a sound basis for permanent dietary habits are not recommended. Only under special and unusual circumstances, and then but temporarily, are such expedients used. To re-educate the reducer in proper dietary habits is one of the reasons bread, milk, and a large variety of protein foods, fruit and vegetables should be included in reducing diets. Although no one single food is essential, these foods are all normal ingredients of a well balanced American diet and should form the basis of diets aimed at both weight reduction and dietary re-education.

In this respect I wish to emphasize the education of the patient in elementary dietetics, that is, the importance of calorie counting. A number of people reduce without ever learning food values. This they do by following a rigid menu and never deviating from the prescribed plan. While reducing they are barred from eating many foods which they might eat simply because they know nothing about food values or how to substitute one food for another. They are psychologically barred from eating while away from home because the food served may differ from that prescribed at a particular meal. Still more important is the fact that when the desired amount of weight has been lost, it is promptly regained because the reducer has learned nothing of the energy value of foods.

So to gain freedom from rigid, monotonous menus, in order to reduce and then stay reduced, it is necessary to learn food values in terms of standard portions. With a little practice this can become almost second nature.

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The Journal 25 Years Ago

THINGS THAT WORRY US LESS TODAY

"The Use of Ultra-Violet Light Transmitting Windows" appears in the *Journal* of December, 1928. By Walter H. Eddy, Ph.D., the Laboratory of Physiological Chemistry, Teachers College of Columbia University, it is a detailed discussion of the value of equipping schools with Vita-glass windows in order to provide the youngsters with the sun vitamin, D. The conclusion is apparently "yes" and "no." Says the author, "My own feeling is that schools and office buildings would invest their money more efficiently by equipping solaria, preferably with sky lighting and sex-segregated so that the needy cases could lie exposed for certain periods of the day to the full effect of the sun, with as little clothing as possible."

His final paragraph would appear to indicate that "hucksters" were not unknown even 25 years ago.

"The glasses are important inventions. It seems a pity to detract from their values and discourage their perfecting as aids to health by false claims or misdirected selling campaigns. Their purveyors will therefore do well to stress instructions as to where to install and how to use, rather than quantity sales, at least until the public is educated to their values and limitations."

Anyway, today we do not worry much about getting our vitamins through Vita-glass windows.