Obesity: Real and fancied concerns from the public point of view

M. L. Wahlqvist*

What is obesity?

Most people regard obesity as a disorder of weight in relation to height. This is a convenient way of developing an index of adiposity. The currently most accepted index is the Body Mass Index (BMI) or Quetelet's index(1):

$$BMI = \frac{W\ (kg)}{H\ (m)^2}$$

(healthy range 20–25)

This mathematical approach minimises the effect on the expression of height-related components of body mass such as muscle and bone, and amplifies the non-height related variables such as body fat. It assumes an intermediate level of physical fitness, and relates less well to the very sedentary and the very physically active. It does not take account of those who engage in muscle-building exercises which increase muscularity in a way that relates less well to height; for example, by increases in limb or trunk circumference by muscle. Thus the BMI can be misleading in respect of adiposity, but once a figure of 30 is exceeded there is a high level of confidence that there is excess adiposity in relation to BMI as a predictor of health outcomes(1). The current definition of obesity therefore is a BMI greater than 30, and of overweight, greater than 25. In the overweight range 26–30 there are many who are not too fat, but who through physical training and fitness have increased muscle bulk not related to height. This is one source of public misconception about obesity. The corollary is that there are people of low physical fitness with BMIs less than 25, who have reduced muscle mass and increased body fat, relative to their fitter peers(2). The great importance of considering physical activity when assessing BMI must be stressed.

The above definition of obesity now appears to require recognition of the distribution of body fat, since abdominal fatness, in both men and women, carries a greater health risk than does that at the hips(3,4). Thus, for people with a BMI greater than 25, it may be at least as important for them to monitor their abdominal circumference, as their weight (see below).

Public perceptions of self

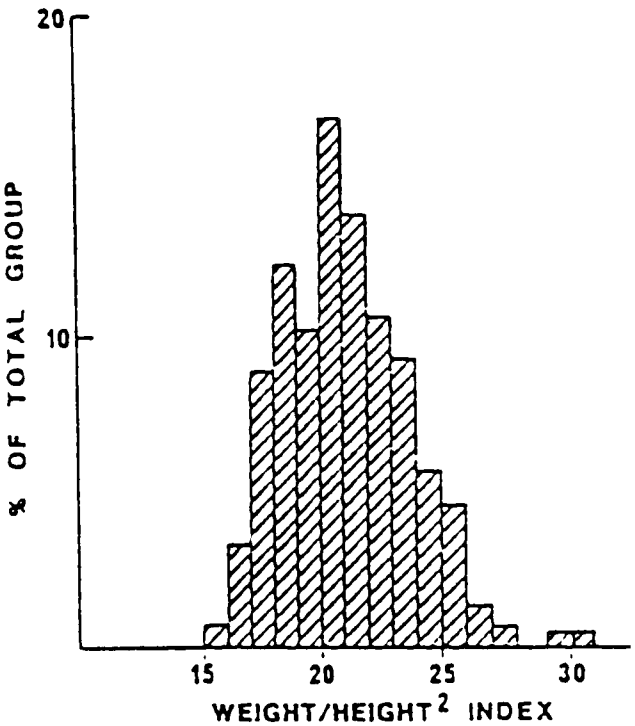
In Australian studies by Dugdale(5,6), Crawford and Worsley(7,8), and the Australian Consumers Association (ACA)(9), Australian women were found to see themselves as more overweight in relation to height than they actually were by health criteria. The problem applies less to men, according to the ACA report. Of course women may be accurately reflecting public requirements and expectations(1,10). What is even more striking, however, is that, in the Brisbane sample of 277 adolescent girls, only one had a BMI in excess of 30, the level above which obesity is regarded as definite (Figure 1)(9). However, of those only 0–2 kg underweight (as defined by the American reference standard from the Build and Blood Pressure study of 1959), 71% wanted to lose weight and, of those only 0–2 kg overweight, 56% wanted to lose weight (Table 1).

Many reasons are advanced for these skewed perceptions of body weight and fatness(11-16). A consensus view, requiring more research, would be that a rela-

Table 1. Perception of weight status among Brisbane adolescent girls (n = 277)(9).

	Underweight				*Overweight*				
kg	*6–8*	*4–6*	*2–4*	*0–2*	*0–2*	*2–4*	*4–6*	*6–8*	*8*
Percentage wanting to lose weight	0	25	35	71	56	78	71	84	91

Figure 1. Distribution body mass index of adolescent girls in Brisbane, Australia(5).



* Professor of Medicine, Monash University, Prince Henry's Hospital, Melbourne.

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tively recent social phenomenon of valuing slimness, combined with inadequate understanding of human biology and susceptibility to pseudoscientific advice, is the problem. However, 68% of Crawford and Worsley's representative sample of Adelaide women used the fairly safe and reliable approach of exercise to regulate their degree of perceived fatness(8). It is possible that the value accorded to slimness depends on the need to be different from others, in a society prone to obesity; good cross-cultural or prospective studies may help resolve this question.

Public perceptions of others

A particular problem is that where individuals are perceived by others to be obese, there is strong prejudice against them and this is evident in children as young as 6 years of age(10,17).

This is a matter requiring more analytical research, but clinical experience suggests that possible reasons in order of importance are: (1) social acceptability; (2) self-esteem; and (3) physical health.

There are those, of course, who, for socioeconomic or other reasons, attach no priority to obesity, perceived or otherwise.

Body fatness and distribution

The components of body weight are fat, lean body mass, water, and bone.

It is particularly important for those who seek to attend to weight, rather than fat, that they have an understanding of the factors which alter non-fat contributors to body mass. Such poor understanding leads to a great deal of commercial exploitation and to a sense of unnecessary failure in efforts to alter weight. For example, marked energy and also carbohydrate restrictions lead to a reduction in glycogen stores in liver and muscle and, with this loss, loss of body water. Thus in the early days of restrictive dieting, most of the loss of body weight is water, rather than fat. The corollary is that, as energy intakes return to levels required to maintain body mass, body water content is restored; with it there will be a re-gain in body weight, but not necessarily body fat. Somehow, people need to be encouraged to assess body fatness more directly. One approach, taken by the National Heart Foundation of Australia, is to encourage people to do a pinch test, whereby a fold of abdominal subcutaneous tissue is grasped between thumb and forefinger; the rough guide is that if this exceeds 25 mm (1 inch), it constitutes obesity. An alternative is to ask people to observe changes in abdominal circumference as an index of body fatness, either by way of systematic measurements with a tape measure, or by following changes in size or fit of clothing.

With a more direct assessment of body fat, it can be the focus for long-term management of obesity and encourage engagement in regular physical activity. This usually involves aerobic activity of one kind or another on at least alternate days, or four days out of seven, for about 20 or so minutes on each occasion. But physical activity can lead to an increase in lean body mass while allowing a reduction in body fat, with less effect, in the short term, on body weight. Thus the programs best for reducing body fat are not always the best programs for reducing body weight. Additionally, if the food intake pattern encouraged is one high in unrefined carbohydrate and low in fat (as most national nutrition committees now advocate(18)), in association with exercise, there will be a greater level of glycogen and associated water in the muscle.

More sophisticated direct measures of body fat are available: anthropometric (skin folds); densitometric (underwater weighing); electrical conductivity (impedance, tobec); and in vivo neutron activation analysis (IVNAA), combined with labelled water.

Body Mass Index, as an index of adiposity, is predictive of life expectancy, with a J-shaped curve relationship. But this relationship is interactive with age, risk decreasing with older age(19-21), with cigarette smoking(1), and with genetic predisposition to diseases such as diabetes(22).

Nevertheless, to say that obesity in later life is occurring among survivors is not to say that it is unassociated with increased morbidity. For example, in the elderly obese, medical care is often more difficult, the mechanical problems of obesity limit the lifestyle of the elderly person, and metabolic problems like diabetes impose the need for food restrictions and pharmacotherapy.

The fat predictors of health outcome include not only total body fat, however, but its distribution. Indeed, much of the predictive power of total body fat is accounted for by its distribution(3,4,23) (Figure 2). Of particular interest is that, once abdominal-to-hip circumference ratios are taken into account, the residual predictive power of BMI is in the reverse direction to that which it has when it stands alone. Such is not the case, however, for stroke, where the greater the BMI, the greater the risk of stroke, at least in the second and third tertiles for the abdominal to hip circumference ratio. As an alternative to the abdominal circumference, Donaghue and colleagues have reported a greater predictive power for subscapular skinfold thickness than for BMI in the 12-year incidence rate of coronary heart disease(23) (Figure 3).

It is, then, an interesting question: what determines body fat distribution? Several possibilities could apply: hormonal (genetic or environmental, including food components such as phyto-oestrogens); alcohol; and physical activity.

None of these possibilities has been evaluated adequately at this stage.

Energy intake and obesity

We can say, from four prospective studies summarised in Table 2, that coronary mortality rates, if not total mortality rates, are favourably influenced by increased energy intake.

As an example, the relationship of coronary incidence over 12 years in Swedish women in relation to quintiles of energy intake is shown in Figure 4. A further example is given for total mortality from the Zutphen study, a study of Zutphen men.

There are now at least two good prospective studies which indicate that energy expenditure increments in

Figure 2. Percentage probabilities of strokes, ischaemic heart disease and death from all causes in relation to tertiles of Body Mass Index and waist to hip circumference ratio in men. The Body Mass Index axes are reversed for both death and ischaemic heart disease(4).

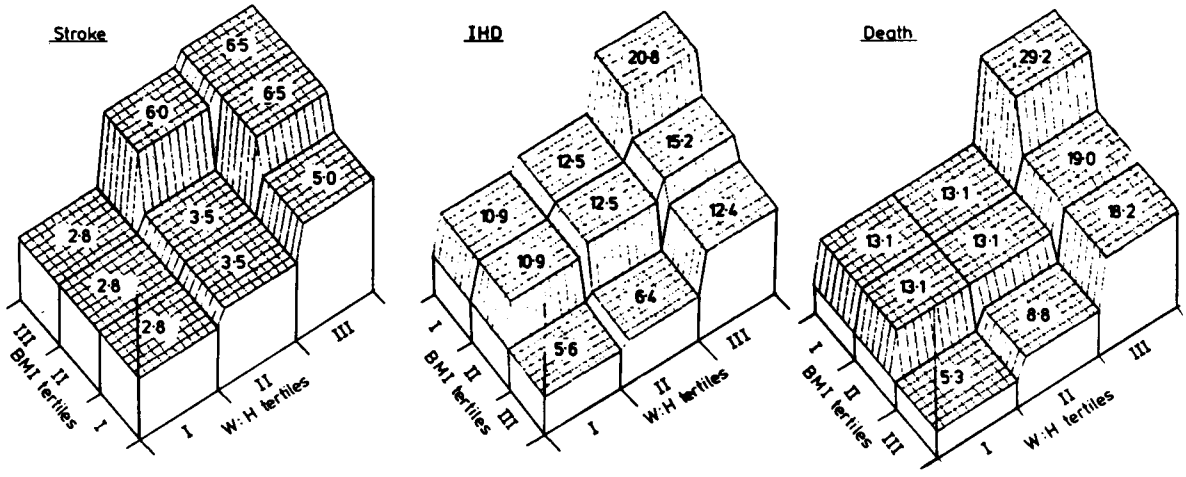


Figure 3. Age-adjusted 12-year incidence of definite coronary heart disease in tertiles of subscapular skin fold (SSF) thickness within each tertile of body mass index (BMI). Significant effect of SSF within lowest and highest ($p < 0.01$) and within middle ($p < 0.05$) tertiles of BMI. Figures along x-axis are numbers at risk(23).

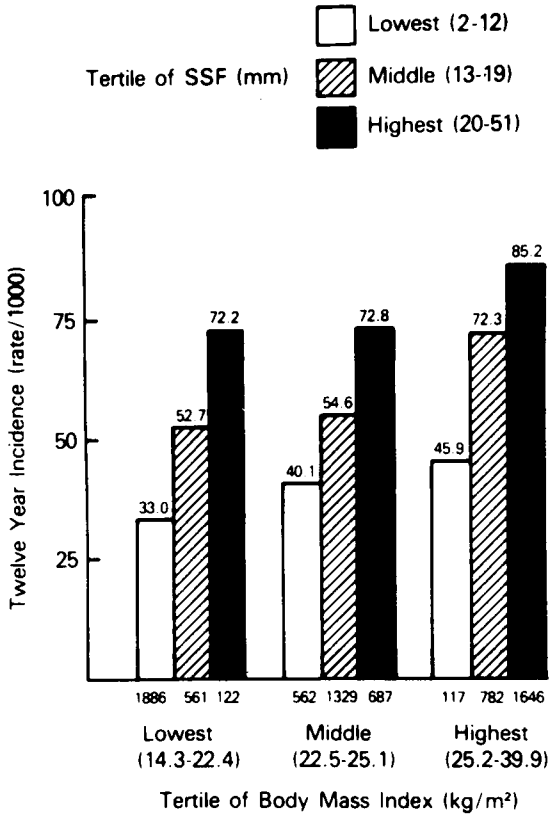


Table 2. Energy intake and mortality rates.

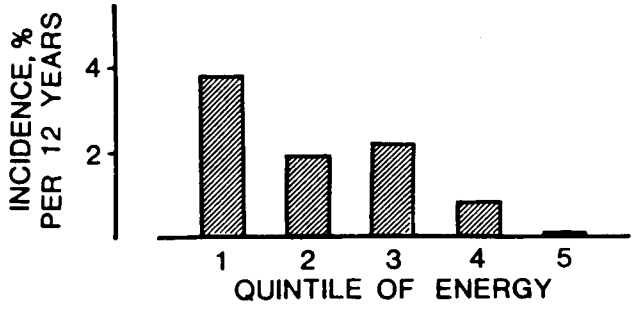
Study	*Kind of mortality rate influenced*	*Ref.*
1. London men	coronary	24
2. Zutphen men	coronary and total	25
3. Boston-Ireland study	coronary	26
4. Western Swedish women	coronary	27

Table 3. How much information is necessary to effect a change in body fatness? Plasma cholesterol levels of people found in 1986 to have levels greater than 6.5 mmol/L (n = 87) and informed of their risk factor profile compared to levels one year later.

	BMI	*cholesterol mmol/L*
1986	25.8 ± 0.3[a]	7.4 ± 0.1
1987	24.7 ± 0.3[b]	6.8 ± 0.1[c]

(a) Mean ± Standard Error. (b) Significant change after 1 year ($p < 0.01$). (c) Significant change in 1 year $p < 0.001$.

Figure 4. Age-standardised incidence (%) of myocardial infarction over 12 years by quintiles of intake of energy(27).



the order of and equivalent to the increases in energy intakes in the above studies (about 300–500 kilocalories or 1300–2100 kilojoules per day)(28) are related to increased life expectancy, although possibly not to an increase in achievable life span(29) (Figure 5).

Self-management

It may well be that much of the dismay in the health-care professional and public mind about the management of obesity comes from not knowing how well the public at large actually copes with the problem.

A possible example of this is the success that many people seem to have in maintaining their body fatness at acceptable levels, by way of regular activities such as jogging and walking. Further formal studies in this area would be valuable.

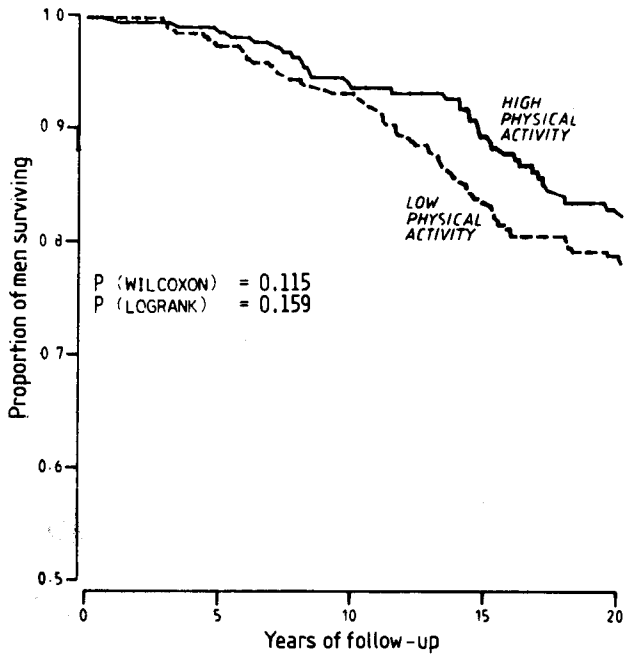
Another example of how the public may deal effectively with obesity comes from a study conducted by Prince Henry's Hospital, Melbourne; it started in National Heart Week in 1986. At the State Bank building, a precinct with no obvious link to a health-care institution, volunteers were offered an assessment of their coronary risk factor profile, including BMI and serum cholesterol concentrations. Volunteers were given immediate feed-back on their risk factor profile but no program was arranged and no indication of subsequent review given. One year later, 87 such volunteers with serum cholesterol concentrations greater than 6.5 mmol/L, had their BMI and serum cholesterol reviewed (Gill, Wahlqvist, Strauss and Balasz, unpublished data) and the results are shown in Table 3.

Aims in management of obesity

Too often, the end point for management of obesity is weight loss. Other valid end points include: a change in food intake; increased level of physical fitness; lessening of risk factors for chronic disease; improved self-esteem; and social interaction.

If people are encouraged to have in mind these end points, the social and psychological morbidity associated with preoccupation with weight may well be minimised.

Figure 5. Crude 20-year survival of a cohort of 636 men aged 45–64 at baseline, according to physical activity at baseline(29).



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Future events (continued from page 2)

First Asian Conference on Food Safety

2–7 September 1990, Kuala Lumpur, Malaysia. Contact Ms Yeoh Quee Lan, Organising Secretary, Malaysian Institute of Food Technology, c/- Food Technology Division, MARDI, GPO Box 12301, 50774 Kuala Lumpur, Malaysia.

First annual meeting Australian and New Zealand Bone and Mineral Society

26–27 September 1990, Langley Plaza Hotel, Perth, Western Australia. Contact Dr R.L. Prince, University Department of Medicine, Sir Charles Gairdner Hospital, Nedlands, WA 6009. Telephone (09) 389 2816.

6th International Congress on Obesity

21–26 November 1990, Kobe, Japan. Contact Shuji Inoue, 3rd Department of Internal Medicine, Yokohama City University, 3–46, Urafune-cho, Minami-ku, Yokohama 232, Japan.