Obesity has become one of the most discussed issues of our time. An Internet search on August 12, 2005 yielded 753,000 hits for ‘obesity epidemic’ and 9,680,000 hits on ‘obesity and health’. These numbers lag behind ‘relationships’ with 99,100,000 hits, but are impressive nonetheless. Campos et al. focus on whether or not the emphasis on obesity as a public health problem is warranted or whether it represents alarmist claims that are not well supported by current data. To make our position clear at the outset, we believe that (i) obesity is a public health problem, (ii) the health hazards of obesity have been overstated and a mismatch exists between the strength of empirical evidence for obesity as a health risk and the intensity and amount of attention this issue receives in the scientific and lay press, (iii) most of the large prospective studies on obesity and health outcomes (e.g. mortality or non-fatal incident disease) fail to account adequately for a major confounder of this association—physical activity, and (iv) the focus should not be on obesity per se but on poor diet and physical inactivity, which are the principal lifestyle factors leading to obesity. These themes will appear throughout this report as we comment on each of the four major points discussed by Campos et al.

**Issue # 1: Are we experiencing an obesity epidemic around the world?**

Time trend analyses in several populations indicate that the prevalence of body mass index (BMI)-defined obesity and the average body mass have increased in recent decades. A recent report on height and weight trends in US adults aged 20–74 years shows that the average height has increased by ~1 inch and average weight by 24 pounds from 1960–2002. The prevalence of BMI-defined obesity (BMI ≥ 30 kg/m²) has increased markedly during the previous two decades, from ~14.5% during 1976–80 to ~30% in 1999–2000. Consistent with the definition of epidemic, the prevalence of BMI-defined obesity is well in excess of expected population levels and there is a plausible propagating force underlying the excess phenotypic expression.

An average positive caloric balance of 5.5 kcal/day is all that is required to produce the average weight gain of 24 pounds in 42 years recently reported in the US. We agree with Campos et al. that this hardly indicates ‘an orgy of fast food binging and inactivity’. Nonetheless, if sustained over time, even this small positive caloric balance results in a sizable amount of fat accretion, and thus increases in average body mass and BMI at the population level. Energy balance is a complex issue and the causes of positive caloric balance are unclear. Our genetic constitution has not changed significantly in the past 10,000 years; thus, maladaptive homeostatic changes in body mass regulation are probably a result of environmental and lifestyle forces interacting with a given level of genetic susceptibility. Environmental potentiators include a more mechanized built environment and lifestyle potentiators include readily available and low-cost energy-dense foods and declines in daily physical activity-related energy expenditure. Considerably more research is needed to better define the specific roles of energy intake and energy expenditure in relation to sustained positive energy balance. Because currently available data do not identify a single (or most important) causal agent of the recent positive energy balance that has afflicted many, it is crucial for both the scientific and lay communities to be vigilant in promoting sensible healthy eating habits and regular physical activity as attainable strategies for long-term weight management in the population.
Obese 14 140 (55) 1.55 (1.14–2.11) 0.93 (0.66–1.30)

<table>
<thead>
<tr>
<th>Metabolic syndrome present</th>
<th>Normal weight</th>
<th>Adjusted for CRF</th>
<th>Not adjusted for CRF</th>
<th>Hazard ratio (95% CI)</th>
<th>Adjusted for CRF</th>
<th>Hazard ratio (95% CI)</th>
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<tbody>
<tr>
<td>Overweight</td>
<td>Normal weight</td>
<td>0.94 (0.75–1.17)</td>
<td>0.79 (0.63–0.99)</td>
<td>1.31 (0.86–2.01)</td>
<td>0.88 (0.57–1.36)</td>
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<td>Overweight</td>
<td>Overweight</td>
<td>1.09 (0.82–1.47)</td>
<td>0.80 (0.59–1.08)</td>
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<tr>
<td>Overweight</td>
<td>Obese</td>
<td>1.11 (0.64–1.92)</td>
<td>0.92 (0.53–1.60)</td>
<td>1.55 (1.14–2.11)</td>
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CRF, cardiorespiratory fitness.

\[ a \] Adjusted for age, year of examination, smoking, alcohol, prevalent CVD, and parental history of premature CVD.

\[ b \] CRF remained a significant predictor of mortality even after adjusting for BMI-defined weight category and the covariates listed below.

Source: Adapted from Ref. 19.

### Issues #2 and #3: Have the health hazards of obesity been overstated? How strong are the data linking overweight or obesity with adverse health outcomes?

We agree with Campos et al. that there is an apparent mismatch between the strength of prospective evidence relating BMI with mortality and the intensity and amount of attention this issue receives in the biomedical and lay communities. Although it is often purported that mortality risk becomes greater across incremental levels of BMI, much of the extant prospective data indicate that there is little difference in risk across a very wide range of BMI values, and these associations may be different for various population subgroups.7 For example, in healthy never-smoking African-American women in the American Cancer Society Cancer Prevention Study II, compared with women whose BMI was 23.5–24.9, multivariable risk estimates for all-cause mortality were 0.90–1.17 (not statistically significant) across BMI categories of 18.5–20.4 to 30.0–31.9, and were 1.02–1.21 (not statistically significant) across BMI categories of 32.0–34.9 to 40.0.8 However, for white women, each estimate of risk above the reference group was significant and ranged in magnitude from 1.07 to 1.30 and from 1.53 to 2.00, respectively, for the BMI categories noted above. The point of this example is that the strength of the association between BMI and all-cause mortality is often small, non-significant, and varies across a broad range of BMI phenotypes according to population subgroups. Thus, it is nearly impossible to make definitive statements regarding mortality risk according to BMI-defined categories of overweight and obesity.

As indicated by Campos et al., there are major challenges in disentangling the multifactorial etiology of obesity and its relationship with health outcomes. For example, physical inactivity could potentially be an antecedent or a consequence of obesity;9,10 and higher levels of physical activity may attenuate, whereas physical inactivity may accentuate the health risks of obesity.11,12 Based on an extensive review of published observational data,13 an expert review panel concluded that compelling evidence exists in support of higher levels of physical activity and cardiorespiratory fitness being associated with lower rates of disease and death within various strata of body habitus, and that overweight and obese individuals who are active and fit have lower morbidity and mortality risk than their normal weight but inactive peers.14 Nevertheless, studies that relate obesity exposures with health outcomes often do not include physical activity in the analysis,15 and for those that do, the assessment method is often crude and poorly described, and there is no discussion of its sample specific validity or limitations therein.8

We have published several reports showing that the association between overweight or obesity and mortality is markedly attenuated and in some instances eliminated when objectively measured cardiorespiratory fitness is included in the statistical models.16–19 Data from our most recent report19 on this topic are presented in Table 1. We followed 19 173 men, 3745 of whom had prevalent metabolic syndrome, for ~10 years, during which 477 deaths occurred. Compared with normal weight men who did not have metabolic syndrome, the mortality risk was 60% greater in obese men with metabolic syndrome; however, this risk disappeared after adjustment for cardiorespiratory fitness. We do not dismiss the adverse health consequences of obesity, but rather we emphasize the favourable influence that physical activity and fitness have on these risks.13 We assert that an incomplete quantification of obesity-related health risk will result if carefully measured physical activity is not included in the analyses.

### Issue #4: is long-term weight loss feasible and will it improve health?

It is axiomatic that overweight or obese individuals should be encouraged to lose weight. Although it is becoming established that weight loss of as little as even 5–10% of initial body weight improves clinical risk indicators such as blood pressure, lipid profile, and glucose control,20,21 the benefit of modest weight loss on hard clinical events is less understood. Some may interpret the findings from the US Diabetes Prevention Program and Finnish Diabetes Prevention Study as showing that modest weight loss prevents the development of type 2 diabetes in high-risk individuals.22,23 However, we do not fully agree with this conclusion. These two studies tested the effect of an intensive lifestyle change programme that combined diet and physical activity interventions on prevention of diabetes. Both studies show a 60% reduction in risk of developing diabetes in the lifestyle intervention group, as compared with usual care control participants. However, it is incorrect to assume that this benefit was due to weight loss. Though the lifestyle groups did lose a modest amount of weight, they also increased fibre intake, reduced saturated fat intake, and increased physical activity-related energy expenditure. It is difficult, if not impossible, to ascribe study benefits to any specific component of the lifestyle intervention. Both lifestyle intervention groups lost ~4 kg, whereas the usual care groups in both studies experienced little change in weight by the end of 1 year in the Finnish study and after 4 years in the US study. However, in the Finnish study those who increased physical activity by at least 4 h/week had
a significant reduction in diabetes risk even if they did not lose weight.\textsuperscript{23} Notwithstanding, in addition to the favourable influence that physical activity has on the adverse risks associated with obesity, it is becoming well established that regular physical activity is a principal component of successful maintenance of weight loss and the prevention of weight regain in formerly obese individuals.\textsuperscript{24–26}

**Summary**

Much attention has been focused on the increasing prevalence of overweight and obesity in many countries around the world. The causes of these increases over recent decades are not well understood, although they must be due to changes in various lifestyle factors. We think that the risks of overweight and obesity have often been overstated, but nonetheless believe that the upward trends in average weight and BMI do not augur well for public health. In our opinion, there has too often been an uncritical acceptance by many of any claim about the health hazards of obesity, and there has been an overemphasis on weight loss as a clinical target. A focus on weight loss is often counterproductive and unsuccessful, and sometimes may even be unnecessary. Too many health professionals appear to not look past the BMI when performing clinical risk stratification or making health recommendations. We do not think that the individual with a BMI of 31 who has normal values for lipids, blood pressure, and glucose; is physically active every day; and follows other lifestyle and preventive medicine recommendations needs to attempt weight loss. We prefer to focus attention, both for clinical interventions and for public health programmes, on healthful lifestyle behaviours. Everyone should be encouraged to follow a healthful dietary pattern that emphasizes fruits, vegetables, and whole grains; limits intake of saturated and trans fat; and includes a wide variety of foods. Everyone also should be encouraged to engage in moderate intensity physical activity for at least 30 min on at least 5 days/week. These recommendations clearly lead to improved health and function and will provide benefits whether or not they result in weight loss. Let us keep the focus on lifestyle behaviours and their effect on biological risk factors and health outcomes rather than their effect on the scale.

**Acknowledgements**

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References


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\textsuperscript{23} Tuomilehto J, Lindstrom J, Eriksson JG et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among...
Commentary: The epidemic of obesity—what’s in a name?

Katherine M Flegal

Increases in body mass index and in the prevalence of obesity have been observed in many parts of the world. Campos et al. 1 criticize the description of obesity as ‘epidemic.’ Leaving aside for the moment the use of the word epidemic to describe obesity, they may be dismissing this phenomenon too hastily. Nationally representative data on measured heights and weights in the United States from the National Health and Nutrition Examination Survey (NHANES) programme, show that from the first Health Examination Survey in 1960–62 through the second NHANES in 1976–80, there was little change in the population. 2 Mean body mass index for men varied from 25.1 in 1960–62 to 25.6 in 1976–80 and for women from 24.9 to 25.3. These changes in BMI would be equivalent to a change in weight of ~1.5 kg for men of average height and of a little over 1 kg for women.

After this 20 year period of relative stability through 1980, data from the subsequent survey (NHANES III; 1988–94) showed unanticipated increases in mean BMI and in the prevalence of overweight. As one who participated in the events leading up to the initial publication in 1994 3 of these findings, I can attest that we were initially surprised by these results. We were concerned that we might have overlooked some error in data collection or processing, but no errors were found. The increases that were first noted in NHANES III have continued. Age-adjusted mean BMI for men increased to 26.8 in 1988–94 and again to 27.9 in 1999–2002. Comparable figures for women are 26.6 and 28.2. These BMI changes are equivalent to a >7 kg increase in weight since 1976–80 for both men and women of average heights.

Our investigations show that in fact the entire distribution of BMI has shifted slightly to the right in the US population, as well as becoming more skewed. 4 Even the lowest percentiles of BMI in NHANES III were slightly above the corresponding percentiles in NHANES II and the distributions also became more skewed; thus, the prevalence of obesity is increasing faster than would be expected from the increase in mean BMI. The increasing prevalence of overweight or obesity is due to this shift in the entire distribution of BMI; it is a manifestation of underlying changes that are taking place in the entire distribution of BMI in the population.

These observations have proved difficult to explain. Clearly some kind of change in energy balance has occurred, but we have surprisingly little ability to explain exactly why this has happened. Why was body mass index relatively stable and why did it begin to increase fairly suddenly? Why is the distribution becoming more skewed? Despite the intense attention paid to obesity and the numerous hypotheses that have been put forward, we still lack explanations supported by data and we lack understanding of the mechanisms driving these changes.

Is this an epidemic?

A technical definition of ‘epidemic’ from the Dictionary of Epidemiology 5 reads in part ‘The occurrence in a community or region of cases of an illness ... or other health related events clearly in excess of normal expectancy.’ According to this definition, the crucial defining aspect is whether the cases, regardless of their number, exceed ‘normal’ expectations. A more general definition of the word epidemic can be found in any standard dictionary of the English language, for example: 6

Adjective: 1. Affecting many individuals throughout an area at the same time (Cholera was epidemic). 2. Widely prevalent (epidemic anxiety)


As can be seen from this definition, the word epidemic may be used in metaphorical ways not related to health and disease (anxiety, robberies). This definition also highlights two different