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OBESITY AND BALANCED NUTRITION

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Abstract

Objective: To review the evidence on the diet and nutrition causes of obesity and to recommend strategies to reduce obesity prevalence.

Design: The evidence for potential etiological factors and strategies to reduce obesity prevalence was reviewed, and recommendations for public health action, population nutrition goals and further research were made.

Results: Protective factors against obesity were considered to be: regular physical activity (convincing); a high intake of dietary non-starch polysaccharides (NSP)/fibre (convincing); supportive home and school environments for children (probable); and breastfeeding (probable). Risk factors for obesity were considered to be sedentary lifestyles (convincing); a high intake of energy-dense, micronutrient-poor foods (convincing); heavy marketing of energy-dense foods and fast food outlets (probable); sugar-sweetened soft drinks and fruit juices (probable); adverse social and economic conditions, especially in women (probable). A broad range of strategies were recommended to reduce obesity prevalence including: influencing the food supply to make healthy choices easier; reducing the marketing of energy dense foods and beverages to children; influencing urban environments and transport systems to promote physical activity; developing community-wide programmes in multiple settings; increased communications about healthy eating and physical activity; and improved health services to promote breastfeeding and manage currently overweight or obese people.

Conclusions: The increasing prevalence of obesity is a major health threat in both low- and high income groups. Comprehensive programmes will be needed to turn the epidemic around.

Keywords: Public health, Overweight, Obesity, Evidence-base

Introduction

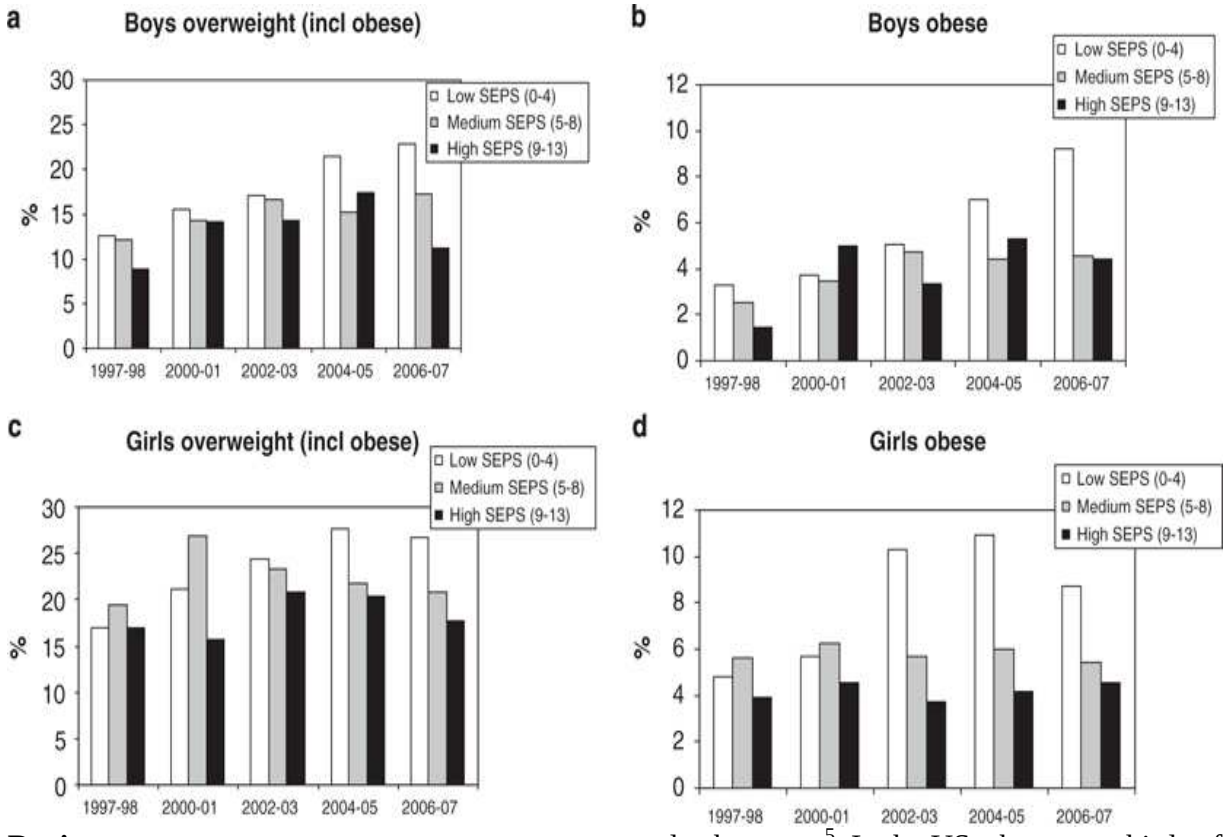
This review paper has been structured to provide an overview of the likely etiological factors in the development of eight gain and obesity, to propose related population nutrient goals and content areas for food-based dietary guidelines, and to evaluate some of the potential food and diet related intervention strategies that might help to attenuate and eventually reverse this global .epidemic[13]. It is important to note that this review on obesity has not covered the energy expenditure side of the energy balance equation in any depth. Physical activity is at least as important as energy intake in the genesis of weight gain and obesity and there are likely to be many interactions between the two sides of the equation in terms of etiology and prevention. It is acknowledged that increases in abdominal fatness (particularly, intra-abdominal fat) pose a greater risk to health than increases in fatness around the hips and limbs. In general, the causes of weight gain and abdominal weight gain are the same. As populations become more urban and incomes rise, diets high in sugar, fat and animal products replace more traditional diets that were high in complex carbohydrates and fibre. Mortality rates increase with BMI and they are greatly increased above a BMI of 30 kg/m2[17]. Type-2 diabetes is becoming increasingly prevalent among children as obesity increases in those age groups. A high BMI is associated with higher blood pressure and risk of hypertension, higher total cholesterol, LDLcholesterol and triglyceride levels and lower HDLcholesterol levels[7]. The overall risk of coronary heart disease and stroke, Gall bladder disease therefore, increases substantially with weight gain and obesity. While there is no one definition of snacking, it is probably best to consider the content of snack foods and the increased eating frequency[15]. The high energy density of common snack foods, however, may do the opposite and promote weight gain[4]. Breastfeeding has been suggested as a potential protective factor against weight gain in childhood and this is important because overweight children and adolescents are at risk of becoming overweight adults[5]. The conclusion from the fixed energy studies is that if a high percent fat diet promotes weight gain, the mechanism appears to be mediated by promoting a higher total energy intake[2]. Reducing the fat content of the diet consistently produces modest reductions in body weight but one could argue that instructions to individuals to reduce other macronutrients in the diet or to restrict the intake of certain high volume foods (such as staple carbohydrates) would also result in weight loss. Foods high in fat are less satiating than foods high in carbohydrates[7]. When isocaloric amounts of foods are fed, a high satiety score is associated with a high volume of the food which in turn is related to a high complex carbohydrate content[18]. Messages about reducing fat in the diet appear to have been used interchangeably with increasing carbohydrate and this may have contributed to overconsumption of carbohydrates and total energy which then promotes the storage of dietary fat as body fat. Sugar in foods: There is a reciprocal relationship between the percent fat and percent carbohydrate in the diet because these two nutrients generally contribute over 80% of total energy[9]. Therefore, the previous section on percent fat could also be stated as: diets with high carbohydrate content provide protection against weight gain. Some fruit drinks and cordial drinks can also be high in sugar and may promote weight gain if drunk in large quantities but this has been less extensively studied than soda drinks. Glycemic index: A further mechanism by which carbohydrate Non-starch polysaccharide: A high intake of dietary NSP/fibre is generally, but not always associated with a lower BMI in epidemiological studies, carbohydrates may influence energy intake and body weight is

by their GI[10]. Different carbohydrate foods increase blood glucose and serum insulin to varying extents even when the same amount of carbohydrate is eaten. The range of mean protein intakes across populations and across time is relatively small (10–15% of total energy) and this limits the scope for influencing protein intake as a population measure to combat obesity[1]. Nevertheless, protein is generally agreed to be the most satiating of macronutrients1. Alcohol is an energy dense nutrient (7 kcal/g) [8] and because of its place at the top of the oxidative hierarchy, its potential for sparing fat oxidation and promoting fat storage is significant. However, some metabolic studies show that isocaloric substitution of alcohol for food energy results in weight loss. not promote weight gain. The portion size in pre-packaged, ready-to-eat and restaurant foods is increasing.

Body Mass Index (BMI)

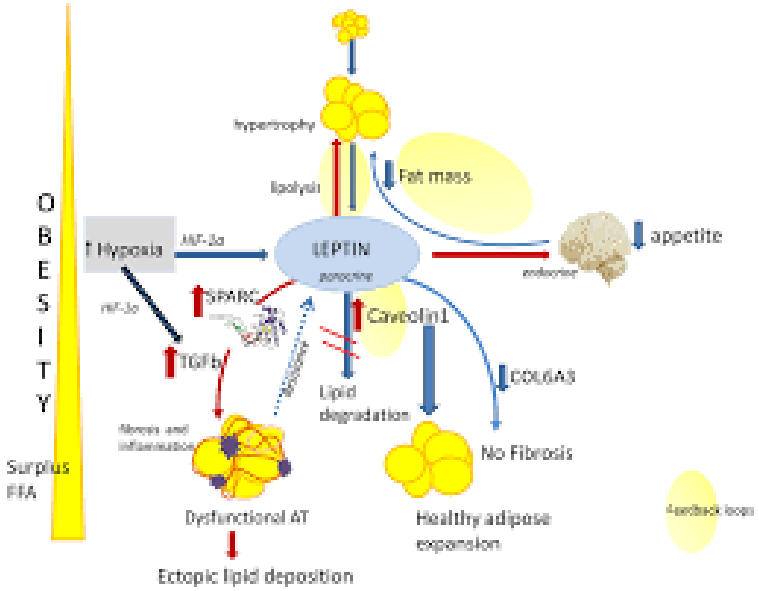
- A measure of body weight relative to height.
- By calculating your BMI you can determine if you're overweight, obese, or underweight
  - **Overweight -** heavier than the standard weight range for your height
  - **Obese -** having an excess of body fat, serious health risks
  - **Underweight -** below the standard weight range for your height, also carries health risks

While socioeconomic status (SES) is a characteristic of an individual (often measured by personal income or educational attainment), its underlying determinants are the home and family environment which is undoubtedly the most important setting in relation to shaping children's eating and physical activity behaviors, loosely linked to the wider environment, especially to social, economic, employment and education policies[15]. Fast food restaurants and energy-dense foods and drinks are among the most advertised products on television and children are often the targeted market[11]. The fat, sugar and energy content of foods advertised to children is very high compared to their daily needs and most of the foods advertised fall into the 'eat least' or 'eat occasionally' sections of the recommended dietary guidelines. The prevalence of overweight and obesity is higher among children who watch more television. Food marketing sector Fast food restaurants [2]and energy-dense foods and drinks are among the most advertised products on television. And children are often the targeted market. The fat, sugar and energy content of foods advertised to children is very high compared to their daily needs and most of the foods advertised fall into the 'eat least' or 'eat occasionally sections of the recommended dietary guidelines[4]. Many studies have documented that the overwhelmingly dominant messages that are directed at children, particularly through the powerful medium of television advertising, are the antithesis of what is recommended for a healthful die[t4].



Review

A number of potential strategies to reduce obesity prevalence are described below and summarized in Table 2. The content of the potential I intervention is outlined, along with a summary of the evidence of effectiveness and the implications for governments, civil society, the private sector and the international agencies[3]. This is not an exhaustive list of potential interventions and indeed each intervention activity would need to be specific to the locality and culture of the intervention population. Strategies to increase physical activity levels would be a key part of any overall approach to obesity prevention, however, these are not considered in detail in this review of diet and nutrition approaches[4]. Food prices have a marked influence on food buying behavior and consequently nutrient intakes. In the case of cardiovascular disease, Marshall has estimated that a tax (17.5% value added tax) on the main sources of saturated fat in the diet would prevent between 900 and 1000 deaths a year[5]. In the US, about two thirds of people report using nutrition panels and this appears to significantly influence food choices. One survey reported that nutrition panels had changed food choices for 56% of respondents and in another survey, nutrition panels had stimulated some food selections and averted other selections in 22 and 34% of respondents, respectively[14]. People with some existing conditions such as obesity, hypertension or high cholesterol are more likely to use nutrition panels[6]. Obese people are more likely to refer to grams of fat or calorie information than normal-weight people170, and those who reported being on a low fat diet were almost ten times more likely to read the label. The difference in percent energy from dietary fat between label readers and non-label readers has been variously estimated as 13%174, 9% (unadjusted) and 5% (adjusted for demographic, Psychosocial and behavioral variables) [7].



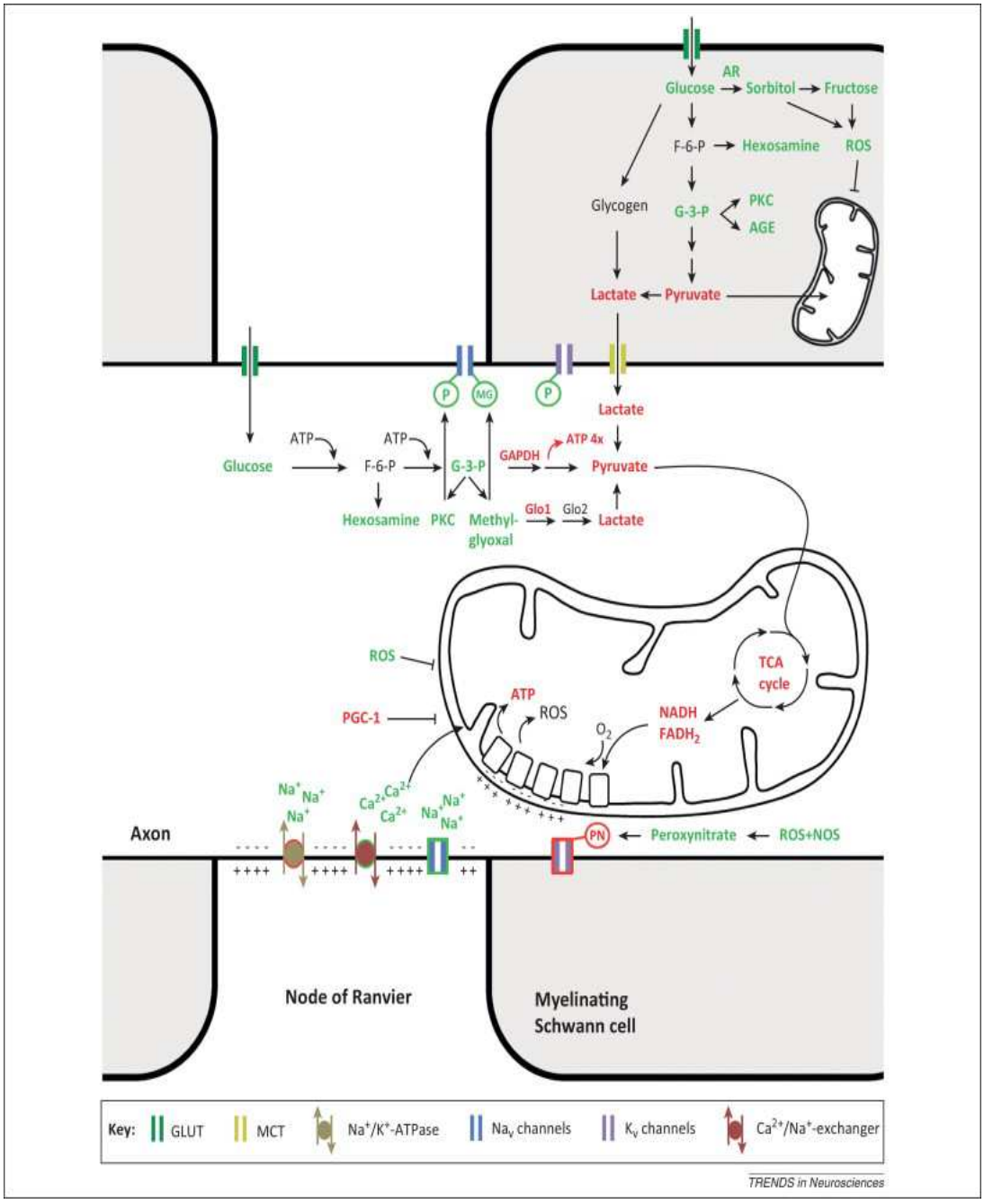
The relationship between label-reading and fruits and vegetables consumption is less clear[16]. On balance, mandated nutrition information panels appear to (1) facilitate the food choices of those who are trying to reduce their fat intake, (2) influence the food choices of a large proportion of the population, (3) have greater impact among women, higher educated people and those with established beliefs and knowledge about diet–disease relationships[3]. The impact of mandatory nutrition panels on the formulation and reformulation of manufactured foods may also be significant but it is not well documented[8]. The magnitude of the potential impact and wide reach of mandatory nutrition information panels argue for this to be a key strategy to improve the nutrition status of populations[2]. However, it needs to be complemented by other strategies that will influence the food choices of low income and less educated consumers.

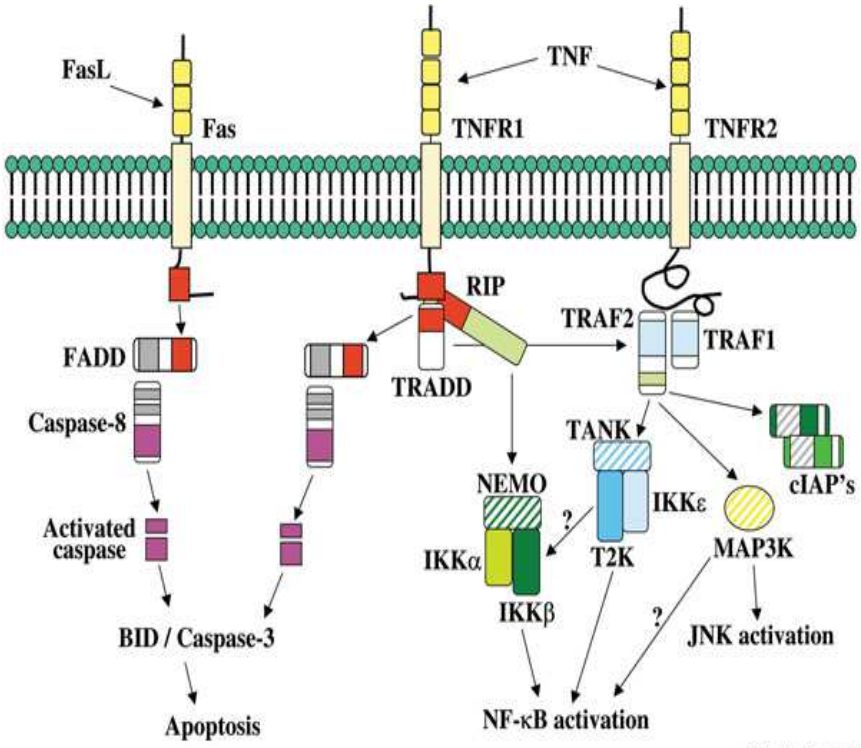
Observation

There have been at least seventeen community-based interventions to improve dietary patterns and related risk factors such as BMI or serum cholesterol levels. Most of these studies, however, did not find any significant change in dietary behaviors or risk factors. In those studies with statistically significant changes, the

magnitude of the change was only modest .At the moment there is insufficient evidence to support the widespread use of community-based interventions to reduce obesity[9]. The approach, however, remains attractive for further research because it has the potential to influence a large number of people in a variety of settings. Schools and other educational institutions Schools, pre-schools and after-school care settings are well placed to influence the food environment and learning opportunities around nutrition as well as being a potential vehicle to influence parents and the wider community[3]. A 1997 review of school-based cardiovascular disease prevention studies that involved classroom health education identified 16 such studies, of which 10 were from the US184. While the average percent of positive outcomes across the trials was 31% (effect ratio), for adiposity it was only 16%. The largest study (CATCH) involved over 5000 children in 56 intervention schools and 40 control schools over 3 school years185. The interventions were school food service modifications, enhanced physical education and increased classroom health curricula in 28 schools and the above components plus family education in another 28 schools[10]. While the interventions significantly decreased fat in the school lunches and increased vigorous activity, no differences in body size were seen between the intervention and control schools. The Planet Health study was a multi-dimensional intervention study that involved nearly 1300 children in 10 schools and it did show a decrease in obesity prevalence (in girls only).[4] The intervention was an educational one focused on decreasing television viewing, decreasing high fat food, increasing fruit and vegetable intake and increasing physical activity[11]. Changes in food sales were noted in some studies, but dietary behavior was unaltered in most cases. Overall, it appears that school-related behaviors can be influenced by school-based programmes but these are not usually of sufficient magnitude to influence changes in obesity prevalence[5]. This may not be surprising when one considers that the vast majority of children's waking hours over a year are spent outside school. The claims clearly provide information about some aspect of the content of the food but for some restrained eaters, 'low fat' or 'low calorie' claims can become an unconscious message to eat more of the product or accompanying foods[11]. In some manufactured products, the fat content has been reduced so that a low fat claim can be made, but the energy density remains high negating the potential benefit for reducing weight gain. Overall, nutrition claims are an important influence on the food choices of consumers and the formulation of food by manufacturers. There can be some negative consequences when the messages or signals are misleading or are taken in the wrong way[8]. The regulations for nutrition claims need to ensure that products with claims for 'low or reduced fat' also have comparable reductions in energy density so that low fat, high energy foods are excluded from making the claim[12]. Reducing the huge volume of marketing of high fat/sugar foods and drinks and fast food restaurants to young children, particularly through the powerful medium of television advertisements, is a potential strategy. The implementation of this strategy will, therefore, rest on a strong rationale and the political will to reduce the use of young children as a target for promoting foods that are not recommended in the dietary guidelines[10]. The whole area is very complex and any regulations would not be able to protect children from all aspects of marketing of fast food restaurants and high fat/sugar foods and drinks and nor would advertising bans solve childhood obesity[13]. A strong argument could be made for banning all television advertisements aimed at young children because the advertisements depend on 'pester power' and seek to undermine the parents' attempts

at providing healthy food choices for their children. The fact that children would still be seeing some television advertisements during adult programming times or through other marketing strategies such as billboards and print media does not negate the rationale for controls on the use of the most persuasive medium (television) aimed at the most vulnerable and gullible of audiences (young N children).[13]





Discussion

Nutrition 'signposts' are signals (such as logos) at point of choice which indicate to the consumer that a food meets certain nutrition standards. An example is the 'Pick the Tick' symbol programmed run by the National Heart Foundations in Australia and New Zealand[14]. While such signpost systems and endorsements have attracted some criticism, they do make identifying healthier food choices simpler for consumers, and are frequently used by shoppers when choosing products[15].A review of studies of workplace-based interventions on aspects of dietary intake, found 16 studies, 10 of which were from the US and seven were randomised trials. They used a mixture of educational and environmental strategies, mainly centred on the workplace canteen[4]. The results were mixed with some showing no impact of the program and others showing significant but modest benefits in dietary intake and food sales indicators[16]. A sustained impact on reducing BMI has been difficult to achieve, although reduced serum cholesterol levels have been achieved in some studies[6]. While workplaces remain an important setting to reach adult men, the impact of intervention programmes has been modest at best. In a systematic review of breastfeeding promotion programmes, Fairbank et al. found a positive effect of the programmes on increasing the initiation of breastfeeding in most studies reviewed, with a statistically significant difference being demonstrated in just under half of the intervention groups (20 of 48) when compared to control groups[17]. The provision of literature alone did not appear to be successful in increasing breastfeeding initiation; however, group or regular one on-one education not only increased the initiation but also duration of breastfeeding, especially among women who planned to bottlefeed[1, 15]. From these studies, it has been demonstrated that breastfeeding initiation and duration rates can be increased when information is delivered in small, informal, culture-specific groups[16]. Obesity is increasing at a time when healthy eating messages have never been more prevalent. Overall, the promotion of healthier eating choices appears to be a necessary strategy for improving dietary intake, but is unlikely to be sufficient for most people to change behaviors. It may be

an important motivating force for higher income people (who tend to live in less obesogenic environments) but for low income groups it is generally not sufficient to affect significant behavior changes[12].

Treatment

Substantial proportions of the population in many parts of the world are already overweight or obese, and therefore, efforts to reduce obesity prevalence must not only focus on the prevention of obesity in those who have not yet become obese (primary prevention), but also on prevention of further weight gain and promotion of weight loss in those who are already obese before they develop the complications of obesity (secondary prevention) [11]. In contrast to the primary prevention of obesity, where only limited evidence exists to support many of the potential interventions, substantial data exist on efficacious approaches to treatment[21]. The principal setting for weight loss is likely to be in physician offices or other health care settings[8]. In Studies with long term follow up, however, are disappointing as patients return towards their original weights. What is, therefore, lacking are positive 'effectiveness' studies whereby the efficacious interventions are translated into practice in settings where medical care is routinely delivered[19]. Gastroplastic surgery is virtually Diet, nutrition and the prevention of excess weight gain and obesity is the only intervention with long term proven effectiveness and cost effectiveness. Potential strategies for promoting physical activity are also shown in the table for completeness. The relevant population nutrient goals relate to dietary fat, free sugars and dietary NSP/fibre. The mean total fat intake of a population is an indicator of energy density and it should be less than 30% of energy. Similarly, a mean free sugar intake of less than 10% of energy would also reflect a low mean energy density of foods and drinks[2]. The free sugar population goal is particularly important for children. Population groups that are very physically active and have a diet those are high in vegetables, legumes, fruits and whole grain cereals.[7]

Conclusions

TABLE. Prevalence of obesity* among adults aged ≥18 years, by sex and selected characteristics — Behavioral Risk Factor Surveillance System, United States, 2007

Characteristic	Total (N = 404,300) %	Total (N = 404,300) (99% CI†)	Men (n = 155,525) %	Men (n = 155,525) (99% CI)	Women (n = 248,775) %	Women (n = 248,775) (99% CI)
Total	**25.6**	**(25.2–26.0)**	**26.4**	**(25.8–27.1)**	**24.8**	**(24.4–25.3)**
Age group (yrs)						
18–29	19.1	(18.0–20.3)	19.1	(17.4–21.0)	19.1	(17.9–20.5)
30–39	26.5	(25.5–27.5)	28.2	(26.6–29.8)	24.8	(23.7–26.0)
40–49	27.8	(27.0–28.6)	29.4	(28.1–30.7)	26.1	(25.1–27.2)
50–59	30.9	(30.1–31.8)	31.7	(30.4–33.0)	30.2	(29.1–31.2)
60–69	29.9	(29.1–30.8)	30.1	(28.7–31.5)	29.8	(28.8–30.9)
≥70	19.4	(18.7–20.1)	18.5	(17.4–19.7)	20.0	(19.2–20.9)
Race/Ethnicity						
White, non-Hispanic	24.5	(24.2–24.9)	26.3	(25.7–26.9)	22.9	(22.4–23.3)
Black, non-Hispanic	35.8	(34.4–37.2)	32.1	(29.7–34.6)	39.0	(37.4–40.6)
Hispanic§	28.5	(26.7–30.4)	28.3	(25.5–31.2)	28.8	(26.7–31.0)
Other	15.3	(13.8–16.9)	16.2	(13.9–18.8)	14.1	(12.5–15.9)
Educational level						
Less than high school diploma	29.4	(27.9–30.9)	26.4	(24.2–28.8)	32.6	(30.7–34.5)
High school diploma	28.8	(28.0–29.5)	29.1	(27.9–30.3)	28.5	(27.6–29.3)
Some college	27.8	(27.0–28.6)	29.5	(28.1–30.9)	26.3	(25.5–27.2)
College graduate	20.0	(19.5–20.6)	22.1	(21.2–23.0)	17.9	(17.2–18.5)
Census region						
Northeast	24.4	(23.6–25.3)	25.7	(24.3–27.1)	23.3	(22.3–24.3)
Midwest	26.5	(25.8–27.2)	27.6	(26.5–28.7)	25.3	(24.5–26.2)
South	27.3	(26.7–27.8)	27.5	(26.7–28.4)	27.0	(26.4–27.6)
West	23.1	(22.0–24.3)	24.1	(22.3–26.0)	22.1	(20.8–23.4)

* Persons with a body mass index (BMI) of ≥30.0; self-reported weight and height were used to calculate BMI (weight [kg] / height [m]^2).
† Confidence interval.
§ Might be of any race.

Obesity is arguably the biggest challenge among the epidemics facing the world because it is on the rise in lowland high income countries, no country has a track record in terms of attenuating and reversing the epidemic, and it has several major downstream health consequences in terms of diabetes, cardiovascular diseases, some cancers and arthritis that are very common and expensive to treat[8]. The Epidemiological Triad is helpful in identifying potential food and nutrition drivers of the epidemic and strategies for interventions. The main food-related vectors that promote the passive overconsumption of total energy are: energy dense foods (principally related their fat content but sometimes their carbohydrate content), high energy drinks, and large portion sizes. The environmental factors tend to be multiple in each of the settings in which food is consumed and include physical, economic, policy and socio-cultural dimensions[2]. There is an urgent need to focus attention on measuring these environmental influences, assessing their impacts on energy intake and testing interventions designed to make them less obesogenic. A variety of potential interventions and their implications have also been outlined[7]. Overall, the level of evidence for population-based interventions is weak either because they have been tried and shown to have a modest impact (such as dietary guidelines and workplace interventions) or they have not been tried and evaluated (such as fiscal food policies and banning sustain a total fat intake of up to 35% without the risk of unhealthy weight gain[6].

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