



# Best Practice

Evidence based information sheets for health professionals

## Effective dietary interventions for overweight and obese children

### Implications for practice

- Interventions that combine a dietary component, physical exercise and/or behavioural therapy are effective in treating childhood obesity in the short-term (A).
- The Traffic Light (or Stoplight) diet is effective in reducing total energy intake, especially from the non-core or “red” foods, however more studies are needed to establish long-term effectiveness (B).
- A specific dietary intervention rather than general or non-specific advice will achieve greater weight loss (B).
- Although there are a limited number of long-term studies, these suggest that effectiveness of a dietary intervention appears to decline over time (A).
- In the absence of consensus of expert opinion, a rational approach is to base interventions on observational and epidemiological data. Targeting an increase in fruit and vegetable consumption, a reduction in energy-dense, nutrient-poor foods and beverages is appropriate (B).
- Treatment initiated early may avoid the psychological and physical health consequences that may emerge if overweight and obese children progress to become obese adults (C).

### Information Source

This *Best Practice* information sheet is based on a systematic review of research published by Blackwell Publishing Asia and conducted by the Australian Centre for Evidence Based Nutrition and Dietetics.<sup>1</sup> The primary references in this review are available online at [www.blackwell-synergy.com](http://www.blackwell-synergy.com) and to members of the Joanna Briggs Institute via the website [www.joannabriggs.edu.au](http://www.joannabriggs.edu.au)

### Background

Within the last decade, child obesity has increased dramatically on a global scale. Obesity in young people is associated with complications involving many of the body's systems and these have been comprehensively reviewed.<sup>2</sup> The evidence base for the longer-term consequences of obesity in adolescents is smaller but compelling.<sup>3</sup> Overweight or obese boys have been shown in several studies to have higher mortality rates. Obesity also causes adverse psychosocial problems such as bullying, discrimination and in older children/adolescents low self-esteem. It has been shown that overweight or obese girls of 18 have lower educational and employment attainment, lower incomes and are more likely to be unmarried as adults.

Contributing factors include changes in the food supply (particularly the increased availability of affordable, energy dense foods and sweetened beverages that are marketed aggressively), reduction in physical activity and an increase in small screen sedentary options (television, computer and electronic games). Evidence indicates that a combination of dietary intervention, behavioural therapy and exercise will have a significant impact on weight reduction in overweight and obese children.

### Grades of Recommendation

These Grades of Recommendation have been based upon the JBI developed 2006 *Grades of Effectiveness*<sup>4</sup>

**Grade A** Strong support that merits application

**Grade B** Moderate support that warrants consideration of application

**Grade C** Not supported

## Definition of terms

For the purposes of this information sheet the following definitions were used:

**obesity** – when body mass index (BMI) is greater than or equal to the 95th percentile

**overweight** – when body mass index (BMI) is greater than or equal to the 85th percentile

**PSMF** – protein sparing modified fast. A low-carb, low-fat, low-calorie diet

**relative weight loss** - weight loss relative to height, recognising that some children may not lose much weight but will get taller, thus weighing less relative to their height

**Rohrer's Index** - weight in kilograms divided by the height in meters cubed (wt/ht<sup>3</sup>). May be less age-dependent during adolescence than other indices combining weight and height

**serve** - a serving or portion of food

## Characteristics of studies

**Study participants** either attended obesity clinical units, community programs, schools, camps or one-off programs. Programs included the child only, the whole family or focussed only on parents

of overweight or obese children and adolescents. Furthermore, participants were under 18 years of age and were considered overweight or obese if their body mass index (BMI) was:

- greater or equal to the age equivalent adult BMI of 25,
- greater than or equal to the 85th percentile of the age appropriate BMI, or
- greater than or equal to 120% of ideal body weight for height.

**Interventions** consisted of a dietary intervention either alone, or combined with one or more of the following:

- physical activity,
- behavioural therapy,
- modifying and reducing sedentary behaviour, or
- cognitive therapy.

In terms of effectiveness, it was found that diet plus another treatment component, for example, physical activity or behavioural therapy, was effective in the short-term.

## Quality of the research

The authors of the systematic review reported that there was a high degree of heterogeneity across the 88 studies, meaning that very few results could be

pooled for meta-analysis and effective comparison. The studies consisted of 49 reports from 37 randomised controlled trials (RCTs) and 51 non-RCTs. The RCTs involved over 2 200 participants while the non-RCTs totalled approximately 6 000. Of the 37 RCTs most occurred in the United States.

The most commonly used weight outcome measure in the RCTs was % overweight, then standardised BMI or BMI z-score, followed by BMI percentile, % body fat, % lean body mass, % weight loss. In non-RCTs methods included: % ideal weight, weight excess for height and % relative weight, Rohrer's Index, weight for length index, BMI or relative BMI change.

## Results of studies

A meta-analysis of a subset of eight RCTs that had both a dietary component and control group showed that interventions containing a dietary component are effective in achieving weight loss in overweight and/or obese children and adolescents. The pooled standardised mean difference after treatment was -1.82, 95% CI (-2.40 to -1.23). One study reported significant post-intervention reductions in percent body fat (3-6%) in obese adolescents, while another study noted that 20 weeks of treatment including diet and behaviour change (with or without exercise) resulted in a loss of approximately 3% body fat.

Regarding the non-RCTs, 12 studies indicated that when a control group was used (eg. waiting list control [control children were kept on a waiting list and offered treatment after the study period], non-obese control, obese control, alternative control), relative weight loss appeared to be greater when the control group were obese.

**Table 1: Suggested food selection guide<sup>5</sup>**

(Recommended number of **servings per day** from each food group—refer table 2 for serve size)

Children and teenagers	4–7 years	8–11 years	12–18 years
Cereals (including breads, rice, pasta, noodles)	3–7	4–9	4–11
Vegetables, legumes	2–4	3–5	4–9
Fruit	1–2	1–2	3–4
Milk, yoghurt, cheese	2–3	2–3	3–5
Lean meat, fish, poultry, nuts & legumes	0.5–1	1–1.5	1–2
Extra foods (have no more than)	1–2	1–2	1–3

Of 2 waiting list control studies, all patients in a program that utilised a low fat diet in conjunction with cognitive behavioural therapy and increased physical activity, lost weight relative to height in a 10-month intervention period. In one study that compared weight loss in a group following diet alone, as opposed to diet with physical activity training, both groups achieved a significant reduction in BMI z-score over the 6-week intervention period. In another study comparing preschool versus school-aged children for the effectiveness of intervention (treatment over a year), all children lost significantly more weight when their visits for treatment were frequent.

One diet-only trial with an appropriate control group resulted in a significant reduction, after 13 weeks' intervention, in Rohrer's Index and other anthropometric indices, for example waist to hip ratio and energy intake.

In studies with follow-up of at least one year, mean % ideal body weight fell from 154.2± 15.3% to 125.2± 36.1%, p<0.001, and mean reduction in BMI was -2.6, p <0.01. In a study using an initial 10-week PSMF, a fall in % overweight was shown at 14.5 months follow-up, p<0.02. In another study after a 2-year follow-up, children achieving a 10% relative weight reduction were classed as 'successful weight losers', and when followed-up at the end of five years this same group demonstrated sustained weight loss, p<0.001.

## Dietary Prescriptions

### Randomised Controlled Trials (RCT)

RCTs reported results immediately post-intervention or at one or more follow-up times. The Traffic Light (or Stoplight) diet is a hypo-caloric strategy that was common to many of the RCTs. This diet is calorie controlled, normally in the range of 1 200–1 500 kcal/day, with recommended frequencies for consuming food categorised as:

- **'green'** (very low in kilocalories and able to be eaten freely, eg. fruit and vegetables);
- **'yellow'** (core foods making up the bulk of food intake to provide a balanced diet, ie. dairy, carbohydrates and proteins); and
- **'red'** (high energy density, eg. chocolates, crisps [chips] and take-aways).

Typically, subjects were prescribed a core 900kcal/day and could freely select the remaining foods to their daily kilocalorie target. This approach recommends the number of daily/weekly serves of each food group, is reduced in total kilojoules and requires food intake to be monitored.

**Table 2: What is a serve? – some examples<sup>5</sup>**

<b>Cereals, breads, etc</b>	2 slices of bread, or 1 medium bread roll, or 1 cup cooked rice, pasta, noodles, or 1 cup porridge, or 1 cup breakfast cereal flakes or 1/2 cup muesli		
<b>Vegetables and legumes (choose a variety)</b>	<b>Starchy vegetables</b> 1 medium potato/yam, or 1/2 medium sweet potato, or 1 medium parsnip	<b>Dark green leafy vegetables</b> 1/2 cabbage, spinach, silverbeet, broccoli, cauliflower or brussel sprouts	<b>Legumes and other vegetables</b> 1 cup lettuce or salad vegetables, or 1/2 cup broad beans, lentils, peas, green beans, zucchini, mushrooms, tomatoes, capsicum, cucumber, sweet corn, turnips, swedes, sprouts, celery, eggplant, etc
<b>Fruit</b>	1 piece medium-sized fruit, eg. apple, orange, mango, mandarin, banana, pear, etc, or 2 pieces of smaller fruit (apricots, kiwi, plum, figs), or about 8 strawberries, or about 20 grapes or cherries 1/2 cup fruit juice 1/4 medium melon (eg. rockmelon), or dried fruit (4 dried apricots), or 1-1/2tblspn sultanas, or 1 cup diced pieces/canned fruit		
<b>Milk, yoghurt, cheese &amp; alternatives</b>	250 ml glass or one cup of milk (can be fresh, long life or reconstituted milk), or 1/2 cup evaporated milk, or 40g (2 slices) cheese, or 250ml (1 cup) custard, or 200g (1 small carton) of yoghurt, plain or fruit, or, <i>As an alternative try:</i> 1 cup of calcium-fortified soy milk, or 1 cup almonds, or 1/2 cup pink salmon with bones		
<b>Meat, fish, poultry &amp; alternatives</b>	65-100gm cooked meat/chicken (eg 1/2 cup mince or 2 small chops or 2 slices roast meat), or 80-120g cooked fish fillet, or, <i>As an alternative try:</i> 2 small eggs, or 1/3 cup cooked dried beans, lentils, chick peas, split peas or canned beans, or 1/3 cup peanuts/almonds		
<b>Extras (Foods which we can occasionally include for variety. They are generally higher in fat and/or sugar, kilojoules, salt, etc)</b>	<b>1 Extra =</b> 1 medium piece of plain cake, or 1 bun, or 3-4 sweet biscuits, or half a chocolate bar, or 2 glasses of cordial or 1 can soft drink, or 30g potato crisps (chips), 1 tablespoon (20g) butter, margarine or oil, or 60g (1 tablespoon) jam/honey or 2 scoops ice-cream	<b>2 Extras =</b> 1 slice pizza	<b>3 Extras =</b> 1 meat pie

## General guidelines

Some strategies to reduce fat intake.<sup>6</sup>

- Replace whole milk with reduced fat or skimmed varieties
- Replace sweetened beverages with water or reduced fat milk
- Replace high fat cereal based foods such as crisps (chips) and packaged snacks with lower fat choices or fruit
- Serve potato without fat
- Trim fat off meat
- Increase vegetables and fruit

Administering and monitoring the Traffic Light diet was shown to be effective and has been used as a family-based intervention, with parents helping to regulate the availability of 'green', 'yellow' and 'red' foods. Families have been able to reduce the absolute total food serves consumed, 'red' foods by half and to increase 'green' food consumption.

### Non Randomised Controlled Trials (Non-RCT)

While hypo-caloric diets were common to the non-RCT studies, four studies reported significant weight reduction when PSMFs were instituted as the dietary intervention. (Note that these require a high level of medical supervision). One study reported that after 8 weeks significant reductions in % overweight and increased lean body mass occurred for both pre-pubertal children and adolescents (7-17 age range). Another study using an 8-week PSMF-based intervention resulted in significant falls in BMI, plus a significant reduction in % ideal body weight (IBW) at one year follow-up. Similarly, a 10-week intervention using PSMF for 8-18 year olds

demonstrated improved markers of insulin resistance and relative weight loss.

Furthermore, another study using a 10-week PSMF diet showed that: firstly, at the six month follow-up, obese 7-17 year olds displayed a significant decrease in % overweight; secondly, the PSMF resulted in a greater reduction in % overweight at 14.5 months, and in super obese 8-13 year olds at 6 month follow-up.

In addition to conventional dietary approaches, limited evidence from the non-RCT studies suggests that novel approaches such as altering the macronutrient content of the diet (higher protein) or reducing the glycaemic index require further investigation.

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This *Best Practice* information sheet presents the best available evidence on this topic. Implications for practice are made with an expectation that health professionals will utilise this evidence with consideration of their context, their client's preference and their clinical judgement.<sup>7</sup>

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