This Evidence Note provides a summary of the recent evidence on the clinical and cost-effectiveness of weight management programmes in adults, and how they impact on various comorbid conditions. This report is focused on lifestyle weight management interventions, such as diet, physical activity and behavioural therapy. Pharmacotherapy and bariatric surgery weight management interventions were not considered. Bariatric surgery is considered in a separate Evidence Note1.

**Health technology description**

Weight management programmes encompass assessment and treatment approaches, with the aim of long-term weight reduction and maintenance of weight loss. Strategies that support effective weight loss usually include some form of dietary or lifestyle alteration, with or without pharmacotherapy or surgery2. New guidelines in Scotland however recommend the use of multiple strategies for effective weight loss3. These are delivered in a range of settings and may be individual or group based.

**Epidemiology**

Obesity is classified using the body mass index (BMI), in which weight (kg) is divided by height squared (m²). A person’s BMI can be compared to various thresholds that define whether they are underweight (<18.5 kg/m²), of normal weight (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²) or obese I (30–34.9 kg/m²), obese II (35–39.9 kg/m²) or obese III (40 kg/m²)3,4.

Scotland has one of the highest levels of obesity among developed countries, and there has been a steady rise in prevalence that is likely to continue5. In 1995, 55.6% of men aged 16–64 were overweight or obese; in 2008, this figure rose to 66.3%. The equivalent increase for women was from 47.2% to 59.6%5. Overall, obesity prevalence in 2008 (all adults aged 16 years and over) was 26.8%5, and it is predicted that it could reach 40% by 20306.
It is well established that obesity is associated with ill health. A person’s risk of adverse health increases as they progress from slightly overweight to obese. Individuals with obesity have an increased risk of chronic disease, impaired quality of life, disability and premature death. The Scottish Public Health Observatory estimates that 36% of hypertension, 18% of myocardial infarctions, 6% of strokes, 47% of Type 2 diabetes, 29% of colon cancer and 12% of osteoarthritis can be attributed to obesity. Other important health consequences include obstructive sleep apnoea, infertility, obstetric complications and psychiatric comorbidities.

In 2003, it was estimated that the cost of obesity and obesity-related illness to NHSScotland was £171 million. A report recently published by the Scottish Government estimates that by 2030 the total cost of obesity to Scottish society (direct and indirect costs) could range from £0.9 billion to £3 billion.

Clinical effectiveness

The SIGN recommendations on weight management include:

A. Weight management programmes should include physical activity, dietary change and behavioural components.

B. Dietary interventions for weight loss should be calculated to produce a 600 kcal/day energy deficit. Programmes should be tailored to the dietary preferences of the individual patient.

C. Overweight and obese individuals should be prescribed a volume of physical activity equal to approximately 1,800-2,500 kcal/week. This corresponds to approximately 225-300 min/week of moderate intensity physical activity (which may be achieved through five sessions of 45-60 minutes per week, or lesser amounts of vigorous physical activity).

For all recommendations on weight management programmes and weight loss, refer to the SIGN guideline on the management of obesity.

Impact on weight loss

The SIGN recommendation on the composition of weight management programmes is based on research reported in the recent National Institute for Health and Clinical Excellence (NICE) clinical guideline on obesity and reports that a combination of physical activity, behavioural therapy and diet is more effective for weight loss, compared with diet alone. Based on a meta-analysis of five studies, median weight change at 12 months was -4.60 kg (range -3.33 kg to -5.87 kg) for the combined intervention and -0.48 kg (range 0.53 kg to -2.40 kg) for diet alone.

An updated literature search for systematic reviews and meta-analyses, published after the main SIGN searches were conducted, identified three systematic reviews which assessed the clinical effectiveness of weight management strategies. The studies included in all three reviews were heterogeneous and varied in methodological quality. Two of these reviews largely support current evidence that combining diet with exercise and/or behaviour therapy produces significant weight loss that may be sustained up to 2 years or longer. The third review which did not include a behavioural component also confirms the evidence reported in the SIGN guideline that combined diet and physical activity is more effective for weight loss than diet alone. The review further noted that both diet-plus-exercise and diet-only interventions are associated with partial weight regain.

Relative effectiveness of group and individual weight management programmes

The relative effectiveness of individual or group weight management programmes has been identified as a question of particular interest to Scottish planners.

The SIGN guideline reported findings from a well conducted systematic review that compared group versus individual interventions using five randomised controlled trials (RCTs). At 12 months, significantly greater weight loss was found in the group based interventions with a weighted mean difference (WMD) of 1.4 kg weight loss (95% CI -2.7 to -0.1 kg, p=0.03). Subanalyses showed that increased effectiveness was associated with the use of financial reward and with psychologist-led...
interventions. In two of the five trials no explicit details were given on the training received by facilitators delivering group interventions.

Two further UK-based systematic reviews\(^2,11\) have addressed this question.

One review\(^2\) concluded that there was insufficient evidence to suggest that individual therapy was more effective in producing weight loss compared with group therapy at 12 and 18 months. Based on one study, a recent review\(^11\) reported no significant difference in weight between women seen individually by a nurse or physician in a clinic, and those seen by a dietitian in groups. Although both comparators received similar treatments (ie behaviour therapy, exercise and low-fat diet including meal replacements), it is important to note that the interventions were led by different health professionals.

**Impact of weight loss on comorbid conditions**

The SIGN guideline\(^3\) reports on studies that suggest that moderate sustained weight loss (5–10 kg) in adults can:

- reduce all-cause mortality
- improve lung function in asthma
- reduce self-reported disability
- lower blood pressure
- improve glycaemic control and incidence of diabetes, and
- reduce low-density lipoprotein, total cholesterol and triglycerides.

Four recently published systematic reviews\(^11,12,15,16\) which investigated the impact of weight management programmes on comorbid conditions were identified.

**Hypertension:** Similar to evidence in the SIGN guideline\(^3\), results from three reviews\(^11,15,16\) suggest that lifestyle weight loss interventions are associated with significant reductions in blood pressure. A review\(^15\), based on eight clinical trials and eight cohort studies of lifestyle interventions for adults with BMI of <35 kg/m\(^2\), concluded that overall a 3 kg weight loss may reduce blood pressure while a 5 kg weight loss may result in an average 5.6 mmHg drop in systolic blood pressure. No prediction was made regarding the impact of weight loss on diastolic blood pressure. It was noted that despite partial maintenance of weight loss, blood pressure reductions had a tendency to revert back to initial levels. Meta-analysis in another review\(^16\) also demonstrated favourable effects on systolic and diastolic blood pressure (WMD -4 mmHg, 95% CI -5 to -2 mmHg and -2 mmHg, 95% CI -3 to -1 mmHg, respectively).

**Diabetes:** One Cochrane review\(^16\), that investigated the impact of weight management programmes on diabetes, reported a significant reduction in the risk of diabetes with exercise plus diet interventions compared to standard care (relative risk (RR) 0.63, 95% CI, 0.49 to 0.79). A recent review\(^11\) also concluded that lifestyle interventions significantly reduced the risk of Type 2 diabetes and metabolic syndrome.

**Cardiovascular risk factors:** One review\(^12\) reported that lifestyle interventions significantly reduced cardiovascular risk factors with the exception of low density lipoprotein cholesterol (LDL) and glycosylated haemoglobin (HbA1c). Although the results were non-significant, there was still an observed reduction in LDL and HbA1c.

**Safety**

Lifestyle weight management interventions (ie diet, exercise and behavioural) are generally not associated with any serious adverse events\(^16\).

**Cost effectiveness**

Three secondary evidence reports\(^2,10,17\) on the cost effectiveness of weight management programmes were identified. All three highlighted the paucity of economic evidence, failing to identify any systematic reviews of either lifestyle interventions generally or weight management
programmes incorporating diet, exercise and behavioural interventions specifically. All three evidence reports identified a small number of potentially relevant primary economic studies. The cost effectiveness ratios calculated within these studies were typically within the acceptable UK thresholds (£20,000–£30,000 per quality-adjusted life year (QALY)). However, these studies were all undertaken in non-UK countries limiting the transferability of their findings to the UK health system given different patient populations, care pathways, incentive and cost structures.

In the absence of available review evidence, two of the secondary reports\(^2,10\) undertook primary economic modelling to estimate cost per QALY ratios.

The NICE clinical guideline on obesity\(^10\) developed a model that incorporated effectiveness estimates based on a review of relevant clinical literature investigating the impact of diet, exercise and behavioural interventions on weight loss compared with no treatment and estimated their associated resource implications in terms of staffing costs. Assuming weight loss relative to trend remained constant for 5 years post-intervention (at 0.5 kg per annum) before returning to baseline, the NICE model estimated costs per QALY of £174, £4,360 and £9,971 for diet, behavioural and exercise interventions respectively. Cost effectiveness was, however, highly sensitive to the duration of benefit. The model base case assumed a more rapid post-treatment weight gain (5.6 kg per annum) and generated higher cost per QALY estimates of £2,039, £10,729 and £41,149 for diet, behavioural and exercise interventions respectively. Overall, the NICE model suggests that diet, exercise and behavioural interventions appear to be cost effective. However, NICE urge caution in interpreting their model results due to: its sensitivity to the rate of weight regain post-intervention; the fact that the trials used to populate clinical-effectiveness parameters did not specifically investigate cost effectiveness; and potential concerns regarding generalisability of the results. They concluded that the model estimates should be regarded as corroborative as opposed to unequivocal evidence of cost effectiveness.

Avenell et al.\(^2\) constructed a Markov state-transition model examining the cost effectiveness of a low-fat diet and exercise intervention compared with the provision of standard information in obese adults with impaired glucose tolerance. The model applied UK costs based on results from a well-conducted Finnish RCT intervention that significantly reduced the onset of diabetes (by 58%). Costs per QALY were initially high (£113,905) but dropped to £13,389 by the sixth year of follow up. The model did not incorporate savings from reduced comorbidity care costs other than diabetes and therefore, may be conservative. However, authors cautioned that the intervention may not be applicable to the UK healthcare setting due to social and cultural differences.

A selective evidence review by Bachman\(^17\) identified three good-quality primary studies that investigated the cost effectiveness of behavioural weight management programmes in patients with pre-diabetes. Two studies modelled the US diabetes prevention project intervention, and the third modelled the Finnish diabetes prevention study (conducted by Avenell et al.\(^2\) which is reported previously). Two of the three studies reported cost per QALY estimates within acceptable thresholds and the third was markedly higher. In addition, the review reports a recent good-quality primary modelling study of healthy 35-year-old overweight and obese women in the US that found a comprehensive strategy of diet, exercise and behaviour modification to be more cost effective than diet alone, diet and exercise or diet with pharmacotherapy. Bachman\(^17\) concluded that interventions combining diet, exercise and behaviour elements are as cost effective as other common disease treatments and suggests that cost effectiveness can be further improved by targeting patients at higher risk, offering longer-term interventions and avoiding high-programme costs. However, none of these studies were UK based so the relevance of the comparators and the generalisability to NHSScotland are unclear.

Finally, one systematic review was identified that aimed to assess the cost effectiveness of group versus individual treatments for adult obesity\(^14\). Unfortunately, no economic literature was identified and thus it was not possible to
comment on the relative cost effectiveness of group versus individual weight management programmes. Review authors highlighted that group-based interventions should, in theory, be more resource effective and recommended that future research into these treatment delivery modes be accompanied by economic evaluations. Indeed, all included reviews highlighted the need for good-quality pragmatic studies of lifestyle interventions to treat obesity that evaluate risk factors, comorbidities, quality of life and cost effectiveness.

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References can be accessed via the internet (where addresses are provided), via the NHS Knowledge Network (previously eLibrary) http://www.knowledge.scot.nhs.uk or by contacting your local library and information service.

Equality and Diversity

NHS QIS is committed to equality and diversity in respect of the six equality groups defined by age, disability, gender, race, religion/belief and sexual orientation.

The Evidence Note process has been assessed and no adverse impact across any of these groups is expected. The completed equality and diversity checklist is available on www.nhshealthquality.org

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References


