

# Treating and Preventing Obesity

*Edited by*

*J. Östman, M. Britton, E. Jonsson*



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## Preface

### **Evidence-Based Medicine and The Swedish Council on Technology Assessment in Health Care**

Like many governments in the early 1980s, the government of Sweden faced an accelerating number of emerging technologies and medical innovations that were being rapidly diffused into the health care system. The related, and alarming, increase in the cost of health care became an urgent concern. This situation led in 1987 to the founding of the Swedish Council on Technology Assessment in Health Care (the official acronym is SBU).

As its name implies, the SBU assesses the technologies and methods used in providing health services. In these assessments, the medical and scientific literature from around the world is systematically evaluated and summarized. Leading experts, mostly from Sweden but also from other countries, are involved in conducting and reviewing the SBU assessment projects.

Striving to keep the needs of the patient – the whole patient – at the center of health care planning, each assessment project investigates not only the medical aspects of a treatment option, but also its economic, social, and ethical aspects.

Assessment projects aim to identify the most effective and, if possible, the most cost-effective interventions. They also aim to identify the technologies already in use that are not adequately supported by scientific evidence. Assessment findings can be used by clinicians, administrators, and policy makers to ensure that the limited resources available to health care are allocated in the most appropriate manner.

A Project Group composed of twelve investigators was selected to assess the wealth of scientific literature on the prevention and treatment of obesity. Eight additional contributors and three manuscript reviewers complemented the work of the Group. The Project Group performed the initial, integrated literature search, with guidance from a specially trained librarian. A checklist for rating quality was developed, based on already available methods.

Based on the completed reviews and guided by comments from several external reviewers, members of the Project Group and SBU staff wrote an Executive Summary. The SBU Board of Directors and the SBU Scientific Advisory Committee approved the Summary and Conclusions.

The scope of the SBU review was extremely comprehensive, covering all clinically relevant controlled trials on the prevention and treatment of obesity.

**Quality Assessment**

Many methods for assessing the quality of studies have been described, ranging from a few basic aspects to elaborate scales with weighting of the individual items.

The purpose of quality rating is to identify sources of bias, which could endanger the results of the study. In many cases, aspects of external validity or generalizability are also included in the quality assessment.

The studies included in our review were rated based on study design, the number of subjects included, followup time, and dropout. Conclusions were graded according to a three-level scale reflecting strong scientific evidence, moderate scientific evidence, and limited scientific evidence. Strong evidence was considered to be present when there were at least two high-quality, independent studies supporting the conclusion and nothing pointing in another direction. For limited scientific evidence at least two studies of medium quality were required. With less scientific evidence, no conclusions were drawn. A detailed description of the methodology used in the systematic literature review is presented in Chapter 2.

*Jan Östman, Mona Britton, Egon Jonsson, September 2003*



## Foreword

“No one wants to be obese”. This statement appears near the end of the summary of this important report, and catches many features of the problem. It appears in the section on “prejudice” against the obese. The search for remedies from obesity and the anguish it causes underlies the effort of this report. In addition to its relevance to the social issues posed by obesity, the statement “no one wants to be obese” also encompasses the entire range of health care issues that are caused or worsened by obesity. This valuable report provides a timely new analysis of a growing problem.

Assessment of risk, benefit and response to intervention is the heart of decision making related to prevention and treatment of obesity. Obesity poses a challenge to governments and health professionals alike as they confront the rising tide of obesity that now constitutes an epidemic. The publication “Treating and Preventing Obesity – An Evidence Based Review” provides a careful and thoughtful assessment of this disease and the options for its control and treatment. It started with the medical model where cure is the outcome. The authors, eminent Swedish physicians and scientists involved with obesity research, bring their perspective and experience to bear in evaluating the data.

They properly adopt the body mass index, which might be referred to as the Quetelet index after the man who first described it, as the first line for assessing the risk from obesity. They then recommend measurement of central fatness and correlated risks. Next they outline the causes of obesity, including the role of genetic and environmental factors, i. e. high energy intake and decreased physical activity. Health risks of obesity are an important medical reason for concern about obesity, and they are dealt with next, along with the economic impact and detrimental influence of obesity on the quality of life. Before beginning the review of prevention and the types of treatments that are available, they provide us with an assessment of the relative quality of the data and how they rated this data. Following this is a set of conclusions. Although many of these conclusions follow from the earlier discussion there are a few that merit comment.

Although prevention is obviously the heart of the challenge to prevent the onslaught of obesity, the report points out the limited success in this area. Prevention has been difficult for both adults and for children, but there are examples, especially among the young, that have been successful. It is the epidemic in children

with increased risk for early onset of type 2 diabetes that poses one of the most serious problems associated with the rising prevalence of obesity. New strategies need to be worked out, applied and evaluated.

For those already obese treatment is the only alternative. Evidence for various types of dietary treatment, including very low calorie diets is given a critical discussion. Evidence for the effectiveness of behavior therapy and physical exercise, the other two components of “lifestyle” are also reviewed. Even though there are only two medications approved by most health authorities for treatment of obesity, the evidence supporting use of these medications is reviewed in detail. The book includes a detailed section on surgery and includes the SOS (Swedish Obese Subjects) study that aims at answering the important question of whether or not weight loss will reduce mortality in obese subjects. Evaluation of alternative medicines such as acupuncture, aroma therapy, caffeine, hypnosis, chromium and vinegar are also included in the discussion. Finally, the book reviews the beneficial effects of modest weight loss on obesity-related disorders, presents limited information about the economic impact that might be expected if treatments are successful and addresses ethical aspects.

The conclusions state that one-fifth of those participating with successful results in a commercial program achieve “permanent” weight loss. This implies that obesity can be “cured” by commercial programs. This conclusion does not fit the usual paradigm of obesity. Rather it could be argued that obesity is a chronic relapsing neurochemical disease that is rarely cured. From this perspective, it would be unexpected to have any but a very few individuals maintain long term weight loss with any technique other than surgery. If obesity is not cured, then we should not be surprised over the observation that “weight loss is usually not maintained”. In their conclusion the authors say, “Therefore, it is particularly important to develop and assess long-term treatment aimed at permanent weight reduction”. For any method except surgery, permanent weight reduction seems out of line with the evidence and contrary to the chronic, relapsing nature of this disease. To conquer the problem posed by obesity, we need to utilize a broader array of preventive strategies. Here we might take a lesson from dental science where fluoride was found to be much more effective in combating dental disease than the usual “tooth brush” strategies. We need to identify the “fluorides” that can act to prevent obesity.

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## Treating and Preventing Obesity

### A Systematic Review of the Evidence

#### Summary

#### Background

In recent decades, the percentage of people with obesity has increased markedly in many countries. This trend is observed in most European countries, North America, and several South American and Asian countries.

The prevalence of obesity varies by country. In the United States, for example, the total percentage of the population with obesity is somewhat over 20%. The rates in England, Germany, and Poland exceed 15%, and the rates in Sweden are 8% for adults and approximately 4% for children and adolescents.

#### Definition of Obesity

The cutoff points for overweight and obesity are presented in the “Facts” box (p. 2). The definition of obesity most often used in a research context is based on body mass index (BMI), obesity being defined as BMI 30 or more. The measure is based on the combination of height and body weight. In general, men have a higher BMI than women, and in Western nations BMI increases with increasing age in both males and females.

The BMI measure has some deficiencies, particularly as regards obesity in children. It underestimates the degree of overweight in short children and overestimates overweight in tall children. Furthermore, BMI does not consider the relative percentage of fat and muscle; nor does it reflect the distribution of fat in the body. Clearly, this is a weakness, particularly since research in recent years has shown that the risks from obesity-related diseases are substantially higher when there is a high accumulation of abdominal adipose tissue, especially visceral (intraabdominal) adipose tissue. Waist circumference is a simple and informative measure that reflects total abdominal fat. Another common method is to determine waist circumference in relation to hip circumference, i. e., the waist-to-hip ratio. Both methods are beginning to appear in clinical practice. The measures used most often in the studies reviewed in this report are BMI, weight reduction in kilograms, and weight reduction as a percent of original weight.

**Facts** Defining Obesity

BMI (Body Mass Index) = body weight in kilograms divided by height in meters squared.

For example:

$$\frac{90 \text{ kg}}{1.70 \text{ m} \times 1.70 \text{ m}} = 31 \text{ kg/m}^2 = \text{BMI} = 31$$

Overweight = BMI 25–29.9

Obesity = BMI  $\geq$  30

At the following heights, the lowest weights for obesity are:

160 cm  $\rightarrow$  77 kg

170 cm  $\rightarrow$  87 kg

180 cm  $\rightarrow$  97 kg

Age-adjusted BMI limits are used in children. For example, for a 10-year-old girl the BMI cutoff points would be 20 for overweight and 24 for obesity.

The report defines obesity as BMI 30 or higher. Severe obesity is defined here as BMI 35 or higher.

The definition of obesity is based on studies of risks of getting different obesity-related diseases. The risks of serious complications increase markedly at a BMI around 30. There are arguments for and against considering obesity as a disease, and this is debated in scientific journals. The project group that worked on the SBU report defines obesity as a disease. However, obesity can exist even without serious complications or disabling conditions. A risk factor does not necessarily lead to disease in any individual case. The SBU Board of Directors, responsible for the introductory summary, has elected to regard obesity as a risk factor and not a disease. This, however, is not intended to tone down the threat that obesity presents to public health.

### Causes of Obesity

Research in this field suggests that many different factors, e. g., genetic, social, behavioral, and cultural, are involved in the development of obesity and that these factors influence each other in different ways.

Obesity can develop through a combination of genetic, lifestyle, and environmental factors. The strong role played by genetic factors in this context has been demonstrated in studies of twins and adopted children. Regardless of whether monozygotic twins grow up in the same home or in different environments, as adults their body weights and fat deposits are similar. Adopted children develop obesity in the same way as their biological parents rather than their adoptive parents. The genes that regulate this are basically unknown. Various genetic conditions can, however, help to explain why some individuals become obese, while others who live under the same conditions do not.

The increase in the prevalence of obesity in recent decades cannot, however, be fully explained by genetic factors, but can be attributed to changes in lifestyle, dietary habits, and physical activity. The risk of becoming obese is greater in societies where there is ample, 24-hour access to fat- and energy-rich foods and where the demand for physical activity is low.

Social factors can also influence the development of obesity. Obesity is substantially more common among children and adults who live under disadvantaged socioeconomic conditions.

### **Health Risks of Obesity**

Being slightly overweight does not necessarily cause health problems. Obesity, at least before the age of 64 years, clearly increases the risk of disease and premature death. The risk increases with increasing levels of obesity, particularly abdominal obesity. The most common obesity-related complications are type 2 diabetes, high blood pressure, myocardial infarction, gallstones, sleep apnea, joint problems, some cancers, and infertility.

### **Impact on Quality of Life**

Obesity, particularly severe obesity, often has a negative impact on quality of life in both a physical and psychological context. Studies of people with obesity have shown that the health-related quality of life can be very low.

The general stigma associated with obesity, which can lead to negative and prejudicial attitudes toward obese people, often results in major personal suffering and a burden of guilt. No one wants to be obese. The condition is largely genetically driven and triggered by a combination of social, cultural, and community factors, which the individual, particularly at a young age, finds difficult to combat.

### **Economic Aspects**

A comprehensive review of international studies addressing the costs of obesity and related complications suggests that the direct healthcare costs may be approximately 2% of the total expenditure for health and medical services. In addition, there are the indirect costs due to absence from work and early retirement, which are at least as high as the direct healthcare costs.

### **Report Design and Content**

This report reviews the scientific evidence concerning mainly the medical interventions against obesity. The report presents the results found in studies of various strategies for preventing and treating obesity. The evidence presented in the report was obtained through a systematic review of the international scientific literature on the subject. The introductory chapter on the background of obesity as a health problem and the chapter on ethics, however, are not based on a systematic litera-

ture review but on a synthesis of other reviews and studies, information from textbooks, questionnaires, and statistical data.

By searching various databases of scientific literature published from 1966 to 2002, the project group identified 2600 publications that addressed some aspect of interventions against obesity. The systematic review process found that most of these publications were either irrelevant or did not meet the standards established for definition, scientific rigor, and reliability. Some studies used definitions of obesity other than  $\text{BMI} \geq 30$ . Nevertheless, these were included in cases where it was obvious that many of the study subjects would meet the BMI criteria used to define obesity in the report.

Ultimately, around 300 studies were used to form the conclusions of the report. However, not all are equal in scientific quality. The conclusions were graded (i. e., given as Evidence Grade of 1, 2, or 3) based on the quality presented by the study, i. e., depending on study design, the number of subjects included, followup time, and dropout.

The evidence grades are defined as follows:

*Evidence Grade 1:* Strong scientific evidence. When at least two studies present high quality.

*Evidence Grade 2:* Moderate scientific evidence. When one study presents high quality and at least two studies present medium quality.

*Evidence Grade 3:* Limited scientific evidence. When at least two studies present medium quality.

### **Preventive Interventions against Obesity**

Studies that have investigated the possible methods of influencing body weight in a population have included relatively limited interventions. Often, the studies have been part of a campaign to reduce high blood pressure, smoking, blood cholesterol levels, and other cardiovascular risk factors. The programs are based on information concerning the importance of suitable diets and increased exercise and other health information directed at a particular group or region. Concurrently, changes in the variables are measured and assessed in a control group or a reference area that did not receive the information. Often, mass media are used for campaigns, and newsletters are used for reminders. In some instances, the programs involve professional organizations, voluntary associations, and workplaces. Those recruited for the intervention groups and the control groups are usually examined at the outset of the study and later at specific followup intervals for several years.

Studies on the effects of preventive interventions on children and adolescents are often designed to involve certain schools in providing education, advice, and encouragement toward good dietary habits and physical exercise, while other schools are used as control groups.



### **Preventing Obesity in Adults**

Twelve studies met the quality standards outlined in the report. In these studies, the goal was to prevent cardiovascular diseases. Limited attention was given to counteracting the incidence of obesity. The evidence presented in five studies is of low quality, mainly because the observation periods were too short or participation in the intervention program was low. Five of the studies presented medium quality, and only two of the studies presented high quality. A study from Sweden (Norsjö) did not report any favorable effects on the onset of obesity. Similar results were found in five large North American studies. Two of these studies, however, showed that the weight increase that usually occurs in many populations was somewhat less pronounced in cities with the intervention program in contrast to the control cities. In a region in Israel, an ambitious prevention program resulted in a lower prevalence of overweight.

Favorable effects on the prevalence of obesity have not been observed in most population-based prevention programs that have been scientifically assessed.

### **Preventing Obesity in Children and Adolescents**

Fourteen controlled studies were found on this topic. Eight of these provided high or medium quality, and all involved school children aged 5 years or older. Most included programs to promote physical exercise and good dietary habits. Some of the studies also included elements targeted directly at parents. The effects were studied in followup after 2–5 years.

Only two of the studies used the most relevant way to measure outcome, i. e., the percentage of children with overweight and obesity. One of these studies found no difference between the trial group and the control group. In the other study, a reduction was achieved in the percentage of overweight girls, but no change was reported among boys in the trial groups. The other studies monitored the mean BMI. This declined in two of the studies, but was not influenced in the other four studies. These conclusions were based on moderate-grade evidence. Overall, a positive result was achieved in three studies, but no effects were reported in five of the eight best studies concerning preventive interventions in children and adolescents. Hence, reliable conclusions cannot be drawn. Several studies noted improved blood lipid levels and reduced blood pressure in the trial groups.

In summary, most of the studies on preventive interventions against obesity have not reported any favorable effects. However, there are examples of programs in both adults and children where up to several kilograms in mean weight reduction has been achieved in the trial areas. Apparently, moderate success in influencing the mean weight in a population can have a major effect on the prevalence of obesity. Therefore, it is particularly important to use well-executed studies to design and assess new strategies adapted to the population, e. g., through better intervention for establishing good dietary habits in pre-school and school-aged children and by increasing the interest in physical activity in children and adults. Interventions

at the national level (e. g., tax and price policies) also need to be tested as a means to reduce the incidence of obesity.

### **Treating Obesity**

The fundamental element in all treatment for obesity in both children and adults is changing to a diet with less energy content, essentially by limiting the fat intake. Dietary counseling is often combined with recommendations to exercise regularly to increase energy expenditure. Drugs can be considered as complementary treatment in adults. Treatment using special protein formulas results in a much greater reduction in energy intake and thereby more pronounced weight reduction in the short term than that achieved by other methods.

Weight reduction achieved in this way can have an important impact on an individual's quality of life, morbidity, and future risks. The problem, however, is that obesity often returns. Studies show that most people have regained their original weight after 5 years. However, in some groups of obese patients, favorable results have been maintained for several years, particularly if the initial weight reduction was substantial.

To be successful, obesity treatment requires a long-term commitment, and patients must be highly motivated and involved. It is a matter of treating a chronic condition that threatens health, and is not about making cosmetic changes. However, no special measures are needed if the risk is insignificantly higher, such as in people over age 65 years. Earlier treatment strategies have assumed that short-term interventions could have permanent effects. A real problem, however, is to maintain the weight loss which has been achieved during shorter periods of time, often through different methods and a great deal of effort. It is uncertain whether long-term treatment and followup yield better and more permanent results than the methods that have been studied up to now. It is essential to apply and assess different types of long-term treatment.

Gastric surgery is a treatment alternative that can be considered in cases of severe obesity, since substantial and permanent weight loss has been achieved in this patient group.

### **Treating Obesity in Adults**

#### **Dietary treatment**

Dietary treatment involves counseling on the amounts and proportions of foods eaten, energy restrictions, limiting fat content with or without energy restrictions, or vegetarian diets. Dietary treatment can also focus on meals and their timing or on replacing meals with formula products.

Twenty-five studies that met the established criteria showed that weight reductions of between 3 and 10 kg can be achieved through energy-reduced diets for a 1-year period (Evidence Grade 1). Dietary counseling can be provided to individuals or groups by dietitians or other dietary experts. Replacement of one or more main meals with special products, such as milk or soy-based drinks like those used in

VLCD (Very Low Calorie Diets) or “bars” with high nutrient content, can enhance weight reduction (Evidence Grade 2). The few studies that followed weight trends for a longer period, up to 5 years, reported a return to the original weight in most cases (Evidence Grade 2).

Unlimited carbohydrate-rich diets (i. e., at least 50–55 % of the energy from carbohydrates and a maximum of 30 % of energy from fat, corresponding to 60–75 g fat intake per day) can yield several kilograms weight reduction in 6 months. More pronounced energy restrictions, where fat intake is usually limited to 20–30 g/day, yields more rapid weight reduction, but is more difficult to tolerate for longer periods. Abundant amounts of fruit and vegetables contribute to low fat content and low energy density. A protein-rich diet, with more fish, lean meat, and low-fat milk products, appears to promote weight reduction, probably mainly due to increased satiety. Studies offer no support for the idea that lactovegetarian diets lead to better weight reduction than mixed diets of the same energy content.

Dietary fiber is a constituent element in the diet. Three studies, two providing low and one providing medium quality, assess the effects of special dietary fiber supplements. The difference between the treatment and control groups was, at most, a few kilograms over 6 to 12 months, but the conclusions are uncertain. There are no studies of long-term effects. General dietary advice encourages a high fiber intake because of other health-promoting effects, which also applies to weight reduction.

#### **Very Low Calorie Diets**

Low energy diets, Very Low Calorie Diets (VLCDs), are protein-rich formulas manufactured mainly from milk or soy. Dietary recommendations are met by adding essential fatty acids, minerals, and vitamins. A VLCD can be used for several weeks as the only source of energy, or to replace some meals. Common treatment periods using VLCDs are 12 weeks or, in some cases, up to 16 weeks.

Eight randomized studies have been identified. Initially, substantial weight reduction is achieved, often 15–20 kg, which is more than with conventional energy-reduced diets. There is a strong tendency to return to the original weight after the treatment, however. Studies for 1–2 years, where a VLCD has been used intermittently for shorter periods, reported a maintained weight reduction of a few kilograms more than that achieved with conventional dietary treatment (Evidence Grade 3).

Starvation was used during the 1960s and 1970s as a treatment for severe obesity. The method involves one or more weeks of total fasting, except for liquids, minerals, and vitamins. The scientific evidence for starvation treatment is weak, and this method is no longer used, mainly because muscle mass also declines sharply during starvation.

#### **Behavior therapy**

Behavior therapy is used as a component of various types of treatment, but it is difficult to isolate its effects. The effects of different types of behavior therapy have been analyzed in four randomized controlled studies. In one study (high

quality), various behavior therapies in combination with different forms of dietary counseling/treatment led to weight loss that was moderate but significantly greater than in the control group. In two other studies (medium quality), no significant differences were found between weight loss after 1–2 years and equivalent weight loss in the control groups. Firm conclusions, however, cannot be drawn.

### **Physical exercise**

In the studies reviewed, increased physical activity consisted mainly of walking and, to some extent, jogging in younger individuals. Four studies, two of which provide high quality, highlight the effects of physical exercise as a supplement to traditional dietary treatment. A much greater weight reduction, on average about 4 kg within 1 year, could be achieved in exercise programs compared to that achieved in the control group (Evidence Grade 1).

Increased physical activity as the only intervention against obesity is substantially less effective than normal dietary treatment (Evidence Grade 3).

It cannot be confirmed whether regular physical exercise can counteract the weight increase that usually occurs within 1 to 2 years after successful weight loss.

### **Pharmacotherapy**

Two drugs used in weight reduction therapy are orlistat (Xenical<sup>®</sup>) and sibutramine (Reductil<sup>®</sup>). This report reviews nine drug studies. Six of the studies address orlistat treatment and include approximately 2500 patients on active therapy. They are based on medium quality as regards the effects after 1 year of treatment. Two of the four studies, which report results after 2 years, provide low quality due to high dropout. On average, weight reduction after 1 year was 8 kg (6–10 kg) after treatment with orlistat and 5 kg (4–6 kg) in groups treated with placebo – on average 3 kg more with pharmacological treatment after 1 year (Evidence Grade 2).

Three studies of sibutramine (approximately 1400 actively treated) all provide medium quality. After approximately 1 year, two studies with sibutramine show approximately 4 kg greater weight reduction than that in the placebo groups. In the largest study, weight reduction after 2 years was more than 5 kg greater than that in the control group (Evidence Grade 2).

The side effects associated with orlistat are linked to the active mechanisms of the drug. Diarrhea after intake of too much fat is an expression of deficient compliance with dietary advice. Sibutramine lowers blood pressure less than what would be expected from the weight reduction. Other side effects include sleep disorders, mouth dryness, and constipation.

Both orlistat and sibutramine treatment show a weight reduction of 2–5 kg more than that in the control group in treatment up to 2 years. Both drugs yield a weight reduction of at least 10% in one fourth to one fifth of the patients who started treatment, compared to half as many in the placebo group. None of the published drug studies report a treatment time exceeding 2 years. The effects on obesity-related morbidity and mortality are unknown.

## **Surgery**

Surgical treatment may be appropriate for severely obese individuals, but only after other treatment attempts have failed. BMI >40 is generally accepted as a cutoff point for surgery. In special cases, surgery can be appropriate even at a somewhat lower degree of obesity. Seventeen randomized studies and numerous long-term effects (at least 5 years) were assessed. Fifteen nonrandomized, comparative studies contribute to the conclusions, as do certain findings from an ongoing nonrandomized, but controlled, matched study, i. e., the SOS (Swedish Obese Subjects) study. The SOS study compares 2000 individuals treated by surgery with an equally large control group given routine treatment in primary care.

Over ten different surgical methods are available for treating obesity, and there are several variants of these methods. Of the surgical methods studied, gastric bypass has the strongest scientific documentation and the best effect on weight reduction (Evidence Grade 1).

Surgical treatment of individuals with severe obesity yields greater weight reduction than the nonsurgical methods that have been assessed in this patient group. Up to 5 years following surgery, weight reduction is 50% to 75% of the excess weight prior to surgery, which means 30–40 kg in individuals weighing 125 kg and with a height of 170 cm (Evidence Grade 1). A 10-year followup of the SOS study showed that the retained weight loss was, on average, 16% of the original weight. This corresponds to an average of 20 kg in permanent weight loss 10 years after surgical treatment. No weight loss was reported in the control groups.

Weight loss has a positive effect on health-related quality of life (Evidence Grade 2). With major weight loss following surgery, the number of new diabetes cases falls dramatically, and blood glucose levels are almost completely normalized in individuals with severe obesity and type 2 diabetes (Evidence Grade 1). It is not known whether weight reduction from surgery for severe obesity leads to reduced mortality or less morbidity from myocardial infarction and stroke. In any case, compared to the control groups, surgical treatment for obesity does not increase total mortality over a period of 8 to 10 years. Swedish data suggest that mortality associated with surgery is below 0.5%, and complications during the first episode of care appear in up to 15% of cases. In approximately 2% of new surgery cases, the complications are severe enough to require acute reoperation.

In people with severe obesity, surgical treatment has positive, well-documented long-term effects on weight, quality of life, and morbidity from diabetes.

## **Alternative medicine**

A relatively large number of methods and agents for the treatment of obesity are available outside of the ordinary healthcare system. Examples include acupuncture, aromatherapy, caffeine, hypnosis, chromium, and vinegar.

More than 500 articles on alternative treatment methods were identified. A thorough review was conducted of the 80 (approx.) articles that are based on studies and describe over 20 treatment alternatives. Eleven of the studies met the minimum criteria for scientific documentation. They included acupuncture, hypnosis, aromatherapy, and chromium-enhanced dietary supplements. The overall judge-

ment was that evidence is lacking on the effects of using alternative methods to treat obesity.

### **Treating Obesity in Children and Adolescents**

Twenty studies on treatment with diet, exercise, and behavior modification were found that met the minimum criteria. Three studies compared the treatment groups to control groups that received no treatment.

The treatment groups reported a weight loss of approximately 10%, while the control groups varied in weight between  $\pm 3\%$  for the first study year (Evidence Grade 3). Five studies examined long-term followup 3 to 10 years after treatment. Some of these studies found some, albeit weak, retained weight loss, while this could not be observed in other studies. The evidence is insufficient to draw conclusions.

In extremely overweight adolescents, surgery has shown positive treatment results, but the deficiency of adequate studies makes it impossible to draw reliable conclusions. VLCD treatment can also be applied in children and adolescents, but the value of this treatment for longer than a few months cannot be assessed. Rapid weight loss can influence height growth, at least in a 1-year perspective. Studies have reported elevated self-esteem following successful treatment and lowered self-esteem following treatment failure.

### **Quality of Life**

Probably the most important reason why obese individuals attempt to lose weight is the negative impact of obesity on the quality of life. This refers to how people feel and function in daily life and the effects that weight-loss treatment can have. Quality of life measurements can provide information on this issue, and we found 27 studies on the topic in the scientific literature.

Clearly, obese individuals perceive themselves to have a lower quality of life than that of the population on average, e. g., as regards physical function, general health status, and vitality (Evidence Grade 1). This association is stronger than that found with other concurrent morbidity, and increases as obesity becomes more pronounced and if the individual seeks health care (Evidence Grade 2). In many cases, quality of life is lower in those with severe obesity than in patients with other severe, chronic diseases (Evidence Grade 3).

Quality of life improves with weight loss. The greater the weight loss, the better is the quality of life (Evidence Grade 2). Substantial improvements have been measured in individuals with severe obesity who received surgery and maintained a substantial, long-term weight loss (Evidence Grade 2). Uncertain short-term effects on quality of life for less than 1 year are reported, but the evidence is insufficient to draw conclusions.