

Clinical Practice Guideline for the Prevention and Treatment of Childhood and Juvenile Obesity

NOTE:

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

The recommendations included should be considered with caution taking into account that it is pending evaluate its validity.

**CLINICAL PRACTICE GUIDELINES IN
THE SPANISH NATIONAL
HEALTHCARE SYSTEM**

MINISTRY FOR HEALTH AND SOCIAL POLICY

Clinical Practice Guideline for the Prevention and Treatment of Childhood and Juvenile Obesity

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

**CLINICAL PRACTICE GUIDELINES IN
THE SPANISH NATIONAL
HEALTHCARE SYSTEM**

MINISTRY FOR HEALTH AND SOCIAL POLICY



MINISTERIO
DE CIENCIA
E INNOVACIÓN



MINISTERIO
DE SANIDAD
Y POLÍTICA SOCIAL



Plan de Calidad
para el Sistema Nacional
de Salud



Generalitat de Catalunya
**Departament
de Salut**

This CPG (Clinical Practice Guideline) is an aid for healthcare decisions. It is not binding, and does not replace the clinical judgement of healthcare staff.

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Published by: Ministry for Science and Innovation
Layout: Arpirelieve
NIPO (Official Publication Identification No.): 477-09-056-X
ISBN: 978-84-393-8229-4
Legal depository: B-17414-2009
Printed by: Migraf Digital

This CPG has been funded via an agreement entered into by the Carlos III Health Institute, an autonomous body within the Spanish Ministry for Science and Innovation, and the Catalan Agency for Health Technology Assessment, within the framework for cooperation established in the Quality Plan for the Spanish National Healthcare System of the Spanish Ministry for Health and Social Policy.

This guideline must be cited:

Working Group of the Guideline for the Prevention and Treatment of Childhood and Juvenile Obesity; Iberoamerican Cochrane Centre, coordinator; Clinical Practice Guideline for the Prevention and Treatment of Childhood and Juvenile Obesity; CPGs: Quality Plan for the Spanish National Healthcare System of the Spanish Ministry for Health and Social Policy; Catalan Agency for Health Technology Assessment, 2009; Clinical Practice Guideline: CAHTA no. 2007/25.

Contents

Presentation	9
Authorship and Collaboration	11
Questions to answer	13
Summary of recommendations	15
1. Introduction	21
2. Scope and aims	25
3. Methods	27
4. Definition and initial assessment	29
5. Prevention	35
5.1. School-based interventions	35
5.1.1. Dietary interventions to prevent obesity	35
5.1.2. Exercise-based interventions to prevent obesity	36
5.1.3. Dietary and exercise-based interventions to prevent obesity	39
5.1.4. Interventions to improve diet	45
5.1.5. Interventions to increase physical activity levels	49
5.1.6. Interventions to reduce sedentary lifestyles	49
5.2. Healthcare interventions	53
5.2.1. Measuring height and weight	54
5.2.2. Screening programmes	54
5.2.3. Dietary interventions	56
5.2.3.1. Breastfeeding	56
5.2.4. Exercise-based interventions	58
5.2.5. Dietary and exercise-based interventions	59
5.3. Community interventions	62
5.3.1. Dietary interventions	63
5.3.2. Exercise-based interventions	64
5.3.3. Dietary and exercise-based interventions	65
5.4. Family-based interventions	67
6. Treatment	71
6.1. Lifestyle interventions	71
6.1.1. Dietary interventions	71
6.1.2. Exercise-based interventions	74
6.1.3. Interventions to reduce sedentary lifestyles	75
6.1.4. Psychological treatment	77

6.1.5. Combined interventions	79
6.2. Drug-based interventions	86
6.2.1. Sibutramine	86
6.2.2. Orlistat	88
6.2.3. Rimonabant	90
6.2.4. Metformin	90
6.3. Surgery	94
6.3.1. Intra-gastric balloon	94
6.3.2. Bariatric surgery	95
6.4. Alternative treatments	98
7. Dissemination and implementation	101
7.1. Guideline formats, dissemination and implementation	101
7.2. Proposed assessment indicators	101
8. Recommendations for future research	105
Appendices	107
Appendix 1: SIGN evidence statements and grades of recommendations	109
Appendix 2: Body mass Index Reference Curves and Tables	111
Appendix 3: Information for patients	123
Appendix 4: Acronyms and abbreviations	129
Appendix 5: Glossary	131
Appendix 6: Disclosure of interests	135
Appendix 7: Main clinical practice guidelines and other useful resources	137
Bibliography	139

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Presentation

Appropriate, efficient, safe clinical decisions require professionals with up-to-date knowledge and skills.

Although scientific information is more accessible now than ever, the sheer volume of information, a lack of time and the need to weigh up the relevance of scientific evidence lead to a need for certain tools which aim to support the clinical decision process. Clinical Practice Guidelines (CPGs) answer the most important questions that may arise when a patient has a specific disorder, and present scientific evidence in the form of recommendations which are weighted according to the quality of the studies which support them.

Realising that CPGs make thousands of clinical decisions easier every day in healthcare, and that they are a tool to improve healthcare outcomes, the Quality Agency supports their development, dissemination and use, and also monitors the quality of CPGs developed in Spain.

In 2003, the Inter-Regional Council of the Spanish National Healthcare System (SNHS) created a project known as GuíaSalud. This aims to improve clinical decisions based on scientific evidence via training activities and by establishing a register of CPGs within the SNHS. Since then, the GuíaSalud project has evaluated dozens of CPGs according to explicit criteria established by its scientific committee, and it has registered them and disseminated them via the Internet.

In early 2006, the Management Body of the Quality Agency of the SNHS developed a Quality Plan for the SNHS, based on twelve strategies. The Quality Plan aims to increase cohesion within the SNHS, and to help ensure that the healthcare received by all members of the public is of the utmost quality, regardless of where they live.

Strategy 10 of the Plan is designed to improve clinical practice. Its aims include reducing variability in clinical practice and stimulating the development and use of CPGs. The aims stated in the Quality Plan are being responded to by GuíaSalud regarding creation of a register, training and consultancy, and by the CPG Development Programme regarding the creation of new guidelines.

In 2006, the task of developing eight CPGs was assigned to various agencies and groups of experts in prevalent disorders related to health strategies. The task of defining a common methodology for developing CPGs within the SNHS was also assigned. This job was stated in a Methodology Manual for Developing CPGs¹, which has been available to all professionals since November 2007. This is the methodological point of reference for the guidelines developed within this programme.

Later on, in conjunction with the same institutions and with the participation of the scientific societies involved, another fourteen CPGs were begun. This CPG, which addresses the prevention and treatment of childhood and juvenile obesity, is part of this group of guidelines.

The GuíaSalud project was updated in 2007, and the CPG Library was created. This project deals with the development of CPGs in depth, and includes other Evidence-Based Medicine services and products intended to support the clinical decision process.

It also places particular emphasis on the publicising, disseminating and implementing CPGs in order to promote their use, and on evaluating outcomes for public health.

Childhood and juvenile obesity is a major health problem in Spain. This is due to its increasing prevalence, its persistence into adulthood and its association with other diseases, as well as its huge financial impact. Changes in diet and lifestyle have led to an increase in this disorder. Treatment and, essentially, prevention require the adoption of healthy eating and physical exercise habits, but government and institutional support is needed to implement many of the changes required.

The development of this CPG has been aided by a team of professionals in different disciplines. They have made major efforts to draw up an evidence-based CPG and explicit recommendations for various fields from which childhood and juvenile obesity can be addressed. It is also endorsed by various scientific societies. The external review process was also multidisciplinary, with the participation of healthcare system users who supplied their points of view.

We hope that this project can make an effective contribution to the treatment, and especially the prevention, of childhood and juvenile obesity. This is the key to halting the advance of this health problem.

PABLO RIVERO CORTE
Director of the Quality Agency
of the Spanish National Healthcare System

Authorship and Collaboration

Guideline Development Group of the CPG for the Prevention and Treatment of Childhood and Juvenile Obesity

Pablo Alonso Coello, general practitioner, Iberoamerican Cochrane Centre, Santa Creu i Sant Pau Hospital and CIBER for Epidemiology & Public Health (CIBERESP) (Barcelona)

Jesús Argente Oliver, specialist in paediatrics, Niño Jesús University Hospital for Children, Autonomous University of Madrid, CIBER for the Physiopathology of Obesity & Nutrition, Carlos III Health Institute (Madrid)

Juan José Arrizabalaga Abasolo, specialist in endocrinology and nutrition, Txagorritxu Hospital (Vitoria)

José Cristóbal Buñuel Álvarez, specialist in paediatrics, Girona 4 Basic Health Area Health Centre (Girona)

Alfonso Calañas Continente, specialist in endocrinology and nutrition, Reina Sofía University Hospital (Córdoba)

Mar Calvo Terrades, specialist in paediatrics and in physical education and sports medicine, Albera Salut Health Centre, Peralada Basic Health Area (Girona)

Julia Colomer Revuelta, specialist in paediatrics, Fuente San Luis Health Centre, University of Valencia (Valencia)

Fernando Cordido Carballido, specialist in endocrinology and nutrition, A Coruña University Hospitala Complex (A Coruña)

Rosario Corio Andújar, general practitioner, Martí Julià Health Centre, Cornellà de Llobregat (Barcelona)

Olga Cortés Rico, specialist in paediatrics, Canillejas Health Centre (Madrid)

Mercedes Fernández Rodríguez, specialist in paediatrics, Potes Health Centre (Madrid)

César García Vera, specialist in paediatrics, José Ramón Muñoz Fernández Health Centre (Zaragoza)

María Paz González Rodríguez, specialist in paediatrics, Barrio del Pilar Health Centre (Madrid)

Isabel González González, qualified nurse, Marqués de Valdecilla University Hospital (Santander)

Ascensión Marcos Sánchez, research lecturer, Cold Institute, Institute of Food & Nutrition Science & Technology, Higher Scientific Research Panel (Madrid)

Ana Martínez Rubio, specialist in paediatrics, Camas Health Centre (Seville)

Gabriel Ángel Martos Moreno, specialist in paediatrics, Niño Jesús University Hospital for Children, Autonomous University of Madrid, CIBER for the Physiopathology of Obesity & Nutrition, Carlos III Health Institute (Madrid)

Gloria Orejón de Luna, specialist in paediatrics, General Ricardos Health Centre (Madrid)

Jesús Román Martínez Álvarez, veterinarian, lecturer on diploma course in Human Nutrition and Dietetics, Complutense University of Madrid (Madrid)

Amaia Sojo Aguirre, specialist in paediatrics, Cruces Hospital (Bizkaia)

Ivan Solà Arnau, information department, Iberoamerican Cochrane Centre, Santa Creu i Sant Pau Hospital (Barcelona)

Sera Tort Donada, general practitioner, Iberoamerican Cochrane Centre, Santa Creu i Sant Pau Hospital (Barcelona)

Clinical Coordination

Jesús Argente Oliver, José Cristóbal Buñuel Álvarez, Gabriel Ángel Martos Moreno

External Review

María del Milagro Alonso Blanco, specialist in paediatric endocrinology, Ramón y Cajal Hospital (Madrid)

Javier Aranceta Bartrina, lecturer in public health and community nutrition, University of Navarre (Pamplona)

Albert Balaguer Santamaría, specialist in paediatrics, International University of Catalonia, Sant Joan de Reus University Hospital (Tarragona)

Ramón Cañete Estrada, specialist in paediatric endocrinology, Reina Sofía Hospital (Córdoba)

José Antonio Castillo Laita, specialist in paediatrics, Fuentes de Ebro Health Centre (Zaragoza)

Pilar Codoñer Franch, specialist in paediatrics, University of Valencia (Valencia)

Jaime Dalmau Serra, specialist in paediatrics, La Fe University Hospital for Children (Valencia)

Lefa-Sarane Eddy Ives, specialist in paediatrics, Sant Ramon Health Centre, Santa Coloma de Gramenet (Barcelona)

Joaquín Escribano Subias, specialist in paediatrics, Sant Joan de Reus University Hospital (Tarragona)

Emilio Fortea Gimeno, specialist in paediatrics, Girona 3 Basic Health Area Health Centre (Girona)

Javier González de Dios, specialist in paediatrics, Torrevieja Hospital (Alicante)

María Rosa Gutiérrez Grau, general practitioner,
Pineda de Mar Health Centre (Barcelona)

María José López García, specialist in paediatric endocrinology,
Clinical University Hospital (Valencia)

Pedro Martín Muñoz, specialist in paediatrics,
Virgen del Rocío University Hospital (Seville)

María José Martínez Zapata, pharmacology specialist, Iberoamerican Cochrane Centre,
Santa Creu i Sant Pau Hospital (Barcelona)

Carlos Ochoa Sangrador, specialist in paediatrics,
Virgen de la Concha Hospital (Zamora)

Itziar Pérez Irazusta, general practitioner, Gipuzkoa General Practice
Teaching Unit (Gipuzkoa)

Juan Ruiz-Canela Cáceres, specialist in paediatrics,
Virgen de África Health Centre (Seville)

Rafael Rotaeche García, general practitioner, Alza Health Centre (Gipuzkoa)

Carne Tort Donada, librarian/information specialist,
University of Barcelona (Barcelona)

Clotilde Vázquez Martínez, specialist in endocrinology and nutrition,
Ramón y Cajal Hospital (Madrid)

Expert Collaboration

Luís Alberto Moreno Aznar, specialist in paediatrics, University of Zaragoza (Zaragoza)

José Ramón Rueda Martínez de Santos, lecturer in preventive medicine and public
health, University of the Basque Country (Bilbao)

Development of information material for patients

Mar Calvo Terrades, specialist in paediatrics and in physical education and sports
medicine, Albera Salut Health Centre, Peralada Basic Health Area (Girona)

Joan Carles Sevilla Moya, physician specialist in internal medicine, Empordà Health
Foundation (Figueres, Girona); La Paz University Hospital (Madrid)

Sera Tort Donada, general practitioner, Iberoamerican Cochrane Centre,
Santa Creu i Sant Pau Hospital (Barcelona)

Final external review was performed by the external review team of the **Catalan Agency
for Health Technology Assessment and Research** before publication.

Acknowledgement of Scientific Societies and Professional Associations

Spanish Society of Primary Care Physicians (SEMERGEN)

Spanish Paediatric Endocrinology Society (SEEP)

Spanish Society for Paediatric Gastroenterology, Hepatology and Nutrition (SEGHNP)

Spanish Association for Primary Care Paediatrics (AEPap)

PrevInfad/PAPPS Groups and Evidence-Based Paediatrics (AEPap)

Spanish Endocrinology and Nutrition Society (SEEN)

Spanish Nutrition Society (SEN)

Spanish Society of Dietetics and Food Science (SEDCA)

Association of Qualified Nutrition and Dietetics Nurses (ADENYD)

Disclosure of interests: In developing information material for patients and performing external review, all members of the Guideline Development Group and those involved in expert collaboration have given the disclosures of interests provided in **Appendix 6**.

The development of this document has not been affected by the views or interests of the parties providing funding.

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Questions to Answer

DEFINITION AND INITIAL ASSESSMENT

1. How are overweight and obesity in childhood and adolescence defined?
2. What initial assessment should be made for an overweight or obese child or adolescent?
3. What are the criteria for referral to a specialist?

PREVENTION

4. Among children and adolescents of normal weight, how effective are school-based interventions in preventing obesity?
5. Among children and adolescents of normal weight, how effective are school-based interventions in improving diet, increasing physical activity levels or reducing sedentary lifestyles?
6. Among children and adolescents of normal weight, how effective are healthcare interventions in preventing obesity?
7. Among children and adolescents of normal weight, does measuring height and weight reduce the incidence of overweight and/or obesity?
8. Among children and adolescents of normal weight, do regular screening programmes prevent overweight and/or obesity?
9. Among children and adolescents of normal weight, does advice on diet and exercise and on reducing sedentary lifestyles prevent overweight and/or obesity? Does it improve knowledge of these three subjects? Does it lead to healthier habits?
10. In breastfed babies, does continuing breastfeeding prevent overweight and/or obesity when the children are older?
11. Among children and adolescents of normal weight, how effective are community interventions in preventing obesity?
12. Among children and adolescents of normal weight, how effective are community interventions in improving diet, increasing physical activity levels or reducing sedentary lifestyles?
13. Among children and adolescents of normal weight, how effective are family-based interventions in preventing obesity?
14. Among children and adolescents of normal weight, how effective are family-based interventions in improving diet, increasing physical activity levels or reducing sedentary lifestyles?

TREATMENT

15. Among overweight or obese children and adolescents, how effective is nutritional intervention in weight loss or maintenance and other specified outcomes?
16. Among overweight or obese children and adolescents, how effective is physical exercise or active play in weight loss or maintenance and other specified outcomes?
17. Among overweight or obese children and adolescents, how effective is reducing sedentary lifestyles in weight loss or maintenance and other specified outcomes?
18. Among overweight or obese children and adolescents, how effective is psychological treatment in weight loss or maintenance and other specified outcomes?
19. Among overweight or obese children and adolescents, how effective are combined interventions in weight loss or maintenance and other specified outcomes?
20. Among overweight or obese children and adolescents, how effective is sibutramine treatment in weight loss or maintenance and other specified outcomes?
21. Among overweight or obese children and adolescents, how effective is orlistat treatment in weight loss or maintenance and other specified outcomes?
22. Among overweight or obese children and adolescents, how effective is rimonabant treatment in weight loss or maintenance and other specified outcomes?
23. Among overweight or obese children and adolescents, how effective is metformin treatment in weight loss or maintenance and other specified outcomes?
24. Among overweight or obese children and adolescents, how effective is surgery in weight loss or maintenance and other specified outcomes?
25. Among overweight or obese children and adolescents, how effective are alternative treatments in weight loss or maintenance and other specified outcomes?

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Summary of recommendations

Evaluations of the quality of evidence and grading of recommendations were provided according to the system proposed by SIGN (*Scottish Intercollegiate Guidelines Network*) (**Appendix 1**), one of the systems recommended in the *Methodology Manual for Developing Clinical Practice Guidelines* of the Spanish National Healthcare System, the methodological reference framework of this CPG¹. Below are the recommendations proposed in this CPG:

DEFINITION	
√	The growth curves and tables of the semi-longitudinal study by Hernández <i>et al.</i> (1988) are recommended for diagnosing overweight and obesity in childhood and adolescence.
√	For a diagnosis of overweight, BMI must be greater than or equal to P90 and below P97 for the patient's age and sex according to the growth curves and tables of the semi-longitudinal study by Hernández <i>et al.</i> (1988).
√	For a diagnosis of obesity, BMI must be greater than or equal to P97 for the patient's age and sex according to the growth curves and tables of the semi-longitudinal study by Hernández <i>et al.</i> (1988).
INITIAL ASSESSMENT	
D	BMI should be calculated and excessive body weight classed as overweight or obesity using the growth curves and tables of the semi-longitudinal study by Hernández <i>et al.</i> (1988), according to age and sex.
D	A full clinical history should be taken and a complete physical examination should be carried out, to detect obesity secondary to underlying disorders or malformation syndromes, and to exclude associated comorbidities.
D	The possibility of psychopathological conditions (anxiety, depression, bulimic behaviour) should be assessed. Such conditions may determine childhood or adolescent obesity.
D	Referral to a leading endocrinologist is recommended for obese children or adolescents with suspected underlying diseases causing their obesity, obesity in very young children, concurrence of associated disorders or extreme obesity. Referral to a leading mental health unit is recommended if there is an associated psychiatric disorder.
√	Pre-existing family dynamics should be assessed, as should the willingness of both the child and adolescent and his/her family to make changes, so that any intervention to tackle overweight or obesity can be targeted appropriately.

PREVENTION	
School-based interventions	
B	Schools must promote physical education and sporting activities, both within and outside school.
C	Schools should include educational programmes which aim to improve diet, increase physical activity and reduce sedentary lifestyles. These should include families and teaching staff.
C	School-based interventions must be continued over time, both during school years and outside the school environment.
B	Food eaten in schools must be healthy, including a range of fruit and vegetables and meals low in fats and sugars.
B	Multidisciplinary interventions should be implemented in schools to encourage children and adolescents to eat fruit and vegetables.
√	A healthy dietary environment must be created in schools, reducing the availability of foods with high calorie contents (vending machines) and making healthy foods readily available.
B	Physical activity should be promoted among children and adolescents via interventions which target more than one environment (school, family, community). These should include environmental interventions.
√	Both families and professionals who work in schools must be included in school health education programmes. School activities aimed at reducing time spent watching television, playing video or computer games or using mobile phones should be encouraged.
Healthcare interventions	
B	Advice on nutrition and encouraging physical activity, suited to children's ages, should be included in child health monitoring visits.
√	At paediatricians' and general practitioner's appointments, children and the whole family should be encouraged to eat healthily and take exercise. All professionals within the primary healthcare team must be involved in receiving and disseminating messages about healthy eating and physical exercise.
√	Interventions to promote healthy eating and encourage physical activity must foster a positive body image and help build and reinforce young people's self-esteem. Particular care should be taken to avoid stigmatising or blaming overweight young people or their families.
√	Messages to young people must emphasise the light-hearted, enriching aspects of physical activity and a varied diet (fun, pleasure, new flavours, well-being, enjoying time with friends, etc.) and cater for their preferences. Health- and illness-related messages must play a secondary role.

√	In order to support healthcare professionals' educational work, public healthcare services must provide written or audiovisual materials to support professionals and families. The contents of these must be non-discriminatory and culturally adapted to different social groups.
√	Activities and messages must be suited to the specific characteristics of each young person and his/her family, in line with their needs and preferences. Strategies or techniques such as motivational interviews may be appropriate in these processes.
A	It is recommended that babies be exclusively breastfed for six months, due to the many benefits of breastfeeding to children's health.
Community interventions	
B	For children and adolescents, sugary drinks should be limited. Community programmes that encourage drinking fewer sugary drinks and contribute to drinking water should be promoted.
√	The relevant authorities should take steps to restrict the range and promotion of foods containing high levels of unhealthy fats or sugars (sugary drinks, pastries, deli products, etc.).
√	Production and availability of fruit and vegetables should be encouraged using fiscal policies or subsidies.
√	Advertising aimed at children and adolescents for products that contain high levels of unhealthy fats or sugars should be restricted.
√	It should be made compulsory to label processed food with nutritional information and information on potential health-damaging effects.
B	Physical activity programmes outside school hours are recommended for children and adolescents. These must be suited to their ages and preferences.
B	Community programmes that aim to encourage a healthy lifestyle, healthy eating and physical exercise are recommended for children and adolescents.
√	Safe, pleasant spaces and suitable infrastructures for playing and sport for children and adolescents should be created in public areas.
√	Specific actions (free entry, benefits, etc.) should be launched to provide access to municipal sporting facilities for children, adolescents and relatives from socially disadvantaged groups.
Family-based interventions	
B	It is important to involve parents in programmes which aim to improve diet and increase physical activity levels in order to prevent obesity.
√	Educational programmes that target the family so as to encourage a healthy lifestyle are needed. These must cover healthy eating, education to understand nutritional information on food labels and the promotion of active leisure activities.

√	Children should be involved in food shopping. Simple cooking techniques should be encouraged.
√	Children should eat regular meals, with their families and without distractions (television, etc.).
TREATMENT	
Dietary interventions	
√	A healthy, balanced diet according to the healthy eating pyramid is recommended for children and adolescents who are overweight or obese.
√	Dietary intervention for children and adolescents who are overweight or obese must not be a one-off event. Instead, it must be carried out as part of a change in lifestyle, including physical exercise, behavioural therapy and family-centred actions.
√	For children and adolescents who are overweight or obese, calorie intake must be lower than the energy they expend, and changes to their diet must be customised and consistent with healthy eating. The use of restrictive, unbalanced diets is not recommended, as these are not effective in the long term and may prove dangerous.
√	Advice on changes to diet must be given by healthcare professionals who deal with children and adolescents regularly.
D	Professionals in charge of looking after children and adolescents who are overweight or obese must pay particular attention to any risk factors or signs of eating disorders.
Exercise-based interventions	
√	For children and adolescents who are overweight or obese, spontaneous physical activity should be increased by more than one hour a day in order to encourage weight loss and cardiovascular health. Such physical activity may include outdoor play, helping with housework, walking to school, using stairs instead of lifts, etc.
√	Physical exercise suited to age and interests is recommended for children and adolescents who are overweight or obese. It should begin slowly and gradually increase in intensity and duration.
Interventions to reduce sedentary lifestyles	
D	In order to reduce their sedentary lifestyles, a maximum of 1½ hours a day watching television or playing video games is recommended for children and adolescents who are overweight or obese.
B	Reducing sedentary lifestyles is recommended for children and adolescents who are overweight or obese, in order to treat childhood and adolescent overweight and obesity.

√	Televisions, video consoles and computers should be removed from the bedrooms of children and adolescents who are overweight or obese
Psychological interventions	
B	Psychological support (behavioural or cognitive behavioural therapy) is recommended for the treatment of overweight and obesity in children and adolescents.
√	Therapy aimed at reducing stress and other psychological techniques (goal-setting, self-monitoring, etc.) are recommended for the treatment of obesity in children and adolescents.
√	Individual or group psychological treatment should be included in combined interventions for children and adolescents suffering from obesity.
Combined interventions	
B	Combined interventions including diet, physical exercise and changes to behaviour, with family involvement, are recommended for weight loss in children and adolescents aged 6-16 who are overweight or obese.
√	The clinical and family environments are the most appropriate settings for combined interventions for weight loss in children and adolescents who are overweight or obese.
Drug-based interventions	
C	For adolescents (aged 12-18) suffering from obesity and severe comorbidities who have not responded to dietary and lifestyle treatment, sibutramine* treatment (10 mg/day) may be considered as part of a programme of changes to lifestyle. This must be supervised by specialists in endocrinology and nutrition, family medicine or paediatrics who have been trained to treat obesity. Currently, marketing authorisation for Sibutramine is suspended as risks of its use outweigh expected benefits.
C	For adolescents (aged 12-18) suffering from obesity and severe comorbidities who have not responded to dietary and lifestyle treatment, orlistat* treatment (120 mg with breakfast, lunch and dinner) may be considered as part of a programme of changes to lifestyle. This must be supervised by specialists in endocrinology and nutrition, family medicine or paediatrics who have been trained to treat obesity.
√	Orlistat treatment must be supplemented with a fat-soluble vitamin complex (vitamins A, D, E and K). This must be administered before bed or two hours after taking orlistat.
C	In adolescents (aged 12-18) who are obese and insulin-resistant or glucose-intolerant and who have not responded to dietary and lifestyle treatment, metformin treatment (500-850 mg/12 hours) may be considered as part of a programme of changes to lifestyle. This must be supervised by specialists in endocrinology and nutrition, family medicine or paediatrics who have been trained to treat obesity.

√	As neither orlistat or sibutramine have been approved by the Spanish Agency for Medicines and Healthcare Products (AEMPS) or the European Medicines Agency (EMA) for use in those under 18, and as metformin is not indicated for the treatment of obesity in adults or children, informed consent must be obtained from relatives, guardians and the adolescent in question if any of these drugs is prescribed. Currently, marketing authorisation for Sibutramine is suspended as risks outweigh benefits.
D	The decision to begin drug treatment must be taken individually for each patient. Such a decision may only be taken if there are severe comorbidities and other, associated treatments are also performed.
√	Treatments and their indication must be reassessed regularly, and must not be used indefinitely.
√	Relatives or guardians should always be informed of the risks and benefits of drug treatments, as should adolescents themselves.

* Sibutramine and orlistat are not funded by Spanish Social Security.

Surgery	
C	Bariatric surgery should only be performed in adolescents suffering from severe obesity (BMI \geq 40 kg/m ²) and severe comorbidity or who are extremely obese (BMI \geq 50 kg/m ²), and only when attempts to control weight via intensive actions to alter lifestyle, with or without drug treatment, for at least six months have failed.
√	Candidates for bariatric surgery must be selected after careful assessment by a multidisciplinary team with expertise in medicine, surgery, psychiatry and nutrition for surgical treatment of obesity in adolescents. Bariatric surgery should only be performed in adolescents who are physically and psychologically mature and aware of the risks and benefits of surgery, and with their family's support.
√	Bariatric surgery must only be performed by highly-specialised surgeons. Follow-up of patients who undergo bariatric surgery must be lifelong, in order to ensure optimum weight loss and good health.
√	Patients must be examined for possible vitamin (B12, B6, B1, B2, D, folates) and mineral (iron, calcium, zinc) deficiencies after bariatric surgery. Supplements must be administered if required.
Alternative treatments	
C	The use of alternative treatments for overweight and obesity in children and adolescents is not recommended.

1. Introduction

The World Health Organisation (WHO) defines obesity and overweight as an abnormal, excessive accumulation of fat which may be harmful to the health, and which manifests itself as excess body weight and volume². The WHO considers obesity the “epidemic of the twenty-first century”, due to the scale it has acquired in recent decades and its impact on morbidity and mortality, quality of life and healthcare spending²⁻⁴. According to the WHO, in 2005 1.6 billion people aged over 15 and 20 million people aged under 5 were overweight, and 400 million people were obese. According to estimates, in 2015 approximately 2.3 billion adults will be overweight and more than 700 million will be obese.

The prevalence of overweight/obesity has been increasing in recent decades. Lindström *et al.*⁵ found that in the period 1986-1994, the prevalence of obesity increased from 4.6% to 11.4% in adult males, and from 6.1% to 9.8% in adult females. Overweight increased from 33.9% to 45.2% in adult males and from 19.6% to 29.1% in adult females. This is similar to the trend in Spain⁶.

The prevalence of overweight/obesity in children and adolescents is following a similar trend in both developed^{7,8} and developing countries⁹. In Spain, the 1984 study Paidós estimated the prevalence of childhood obesity at 4.9%¹⁰, while Serra *et al.* found that between 1998 and 2000 the overall prevalence of overweight and obesity were 12.4% and 13.9% respectively, both higher in males¹¹. Other studies conducted in Spain have also shown increased prevalence of overweight/obesity in children and adolescents¹²⁻¹⁴, and increased body fat percentages in the same population.

Obesity is considered a chronic disease in its own right, but also a major risk factor for other diseases which cause high morbidity and mortality rates in adults¹⁷. Thus obesity in this population has been associated with type II diabetes mellitus, high blood pressure, dyslipidaemia, ischaemic heart disease, bone and joint disorders, venous insufficiency, strokes, hyperuricaemia and gout, sleep apnoea, respiratory failure, psychological disorders, hepatic steatosis, hiatus hernia and malignant tumours in various locations (colon, rectum, prostate, ovaries, endometrium, breast, gall bladder). In women, it has also been associated with menstrual dysfunction, polycystic ovary syndrome, infertility, increased perinatal risk and urinary incontinence.

A link between childhood and juvenile obesity and the persistence of obesity in adulthood has been demonstrated¹⁸⁻²⁴. It has been shown that in children and adolescents with obesity an increased body mass index (BMI) is associated with high concentrations of total cholesterol (TC), low-density lipoprotein cholesterol (LDL C), apolipoprotein B (apo B) and triglycerides (TG), and low concentrations of high-density lipoprotein cholesterol (HDL C) and apolipoprotein A (apo A)²⁵. It seems that there is already a trend towards several different cardiovascular risk factors occurring early in life. A link has been found between a high BMI in childhood/adolescence and a higher incidence of ischaemic heart disease in adulthood^{26,27}.

To summarise, obesity in adolescence has been associated with a greater risk of overall mortality and specific mortality due to particular diseases in adult males²⁸. Morbid-

ity due to coronary disease and arteriosclerosis also increased in adults of both sexes²⁸. Adolescent obesity was also associated with an increased risk of colorectal cancer and gout in adult males, and arthritis in women²⁸. Adolescent-onset obesity was a more reliable predictor of these diseases than adult-onset obesity^{28,29}. A higher incidence of endocrinology disorders (hyperinsulinaemia, increased insulin resistance, glucose intolerance, type II diabetes mellitus and menstrual irregularity)³⁰⁻³³ and psychological disorders (depression, low self-esteem) has been reported.

Alongside this, and as a result of all of the above, the increased prevalence of obesity is associated with an increase in financial costs arising from the treatment of the diseases associated with it. Most studies have been carried out in adults. In 1999, the direct costs of obesity in United States (USA) represented 7% of total healthcare spending. In Europe these costs are somewhat lower, between 1.5% and 4% according to a study which combined data from five countries (United Kingdom, France, Germany, Portugal and the Netherlands), probably because the prevalence of obesity in Europe is lower than in North America³⁶.

In Spain, the Ministry for Health estimates that obesity-related costs represented 7% of healthcare spending in 2007, i.e. a yearly expenditure of 2,500 million euros³⁷. Cost studies involving children and adolescents are few and far between. In the USA, hospital healthcare spending attributable to diseases related to adolescent-onset obesity increased from 35 million dollars in the period 1979-1981 to 127 million dollars in 1997-1999³⁸. Greater use of healthcare services by obese children and adolescents than by children and adolescents of normal weight has been found³⁹.

Treatment of overweight/obesity yields varying results. A systematic review (SR) of 18 clinical studies of the treatment of childhood obesity concluded that the interventions evaluated did not provide conclusive results, as they were heterogeneous in nature (exercise, increased physical activity levels or reduced sedentary behaviour, treatment with behavioural therapy programmes) and individual studies had no statistical power to detect the efficacy of intervention⁴⁰. More recently, a meta-analysis of 14 studies evaluated the efficacy of an intervention to alter lifestyles and concluded that it led to short-term weight loss, with some evidence that the loss could be sustained over time⁴¹. The efficacy of dietary interventions, if any, is short-lived. Drug and surgical treatment, meanwhile, must be used only in exceptional circumstances, in particular if there are severe comorbidities⁴³.

For all these reasons, as overweight/obesity which begins in childhood and adolescence shows a strong tendency to persist into adulthood, and as it has been amply demonstrated that overweight in adulthood reduces life expectancy because of the comorbidity associated with it, prevention in childhood is vital³⁷. Some studies have yielded encouraging results of various interventions designed to promote healthy behaviour such as a balanced diet and physical exercise, behaviour which is necessary if overweight/obesity are to be prevented^{44,45}.

The results of studies of dietary habits conducted in Spain indicate that a high percentage of the population does not comply with recommendations for a diet which is considered healthy, and that the traditional Mediterranean diet is being abandoned in favour of others which have higher total fat and saturated fat contents because of the higher proportions of red meat, cold meat and eggs associated with lower consumption of fruit,

vegetables, cereals and pulses⁴⁶. Studies conducted in the Spanish population aged 4-14 show that only 34% eat two or more portions of vegetables every day, 60% eat two or more pieces of fruit a day, 32% eat sweets several times a day and 37% eat rice or pasta on almost every day⁴⁶.

Turning now to adolescents' physical fitness (aerobic capacity and muscle strength), studies conducted in Spanish children and adolescents show that they are less fit than adolescents from other European countries⁴⁷. Spanish children take the least exercise outside school hours: more than 60% take no exercise or take exercise less than twice a week, a figure which rises to 75% for girls^{48,49}.

Whatever the figures, prevention of overweight/obesity in childhood and adolescence requires institutional involvement of the governments of countries affected by this disease, since the interventions required go far beyond the strictly medical sphere^{50,51}. To tackle the issue, since 2005 Spain has been driving the NAOS Strategy ('NAOS' is an acronym for 'Nutrition, Physical Exercise, Obesity Prevention and Health' in Spanish), which is promoted by the Spanish Ministry for Health and Consumption as part of the Quality Plan⁵². The aim of the NAOS Strategy is to promote actions which encourage healthy eating and physical exercise, in conjunction with health professionals, councils and regional governments, families, the education sector and business. Other actions within NAOS are protocols for primary care, designed in conjunction with scientific societies, in order to detect obesity early, and the development of follow-up programmes. Another aim is to drive obesity research, carry out an epidemiological assessment (via the Obesity Observatory) and establish a plan of action for prevention, with initiatives such as the PERSEO and THAO programmes.

This CPG, which addresses the prevention and treatment of childhood and adolescent overweight/obesity, is one of the actions of the NAOS Strategy. There are many CPGs throughout the world which deal rigorously with the prevention and treatment of childhood and adolescent obesity^{43,53-58}, but in Spain this initiative had not previously been put into practice. This is why this project aims to make an effective contribution to the prevention and treatment of overweight/obesity in this age group.

2. Scope and Aims

2.1. Scope

This CPG covers the prevention and treatment of overweight and obesity in childhood and adolescence. To define overweight and obesity in this guideline the growth curves and tables of the semi-longitudinal study by Hernández *et al.* (1988)⁵⁹ were chosen. These were created in Spain, which means they are probably more directly applicable than those of other countries, and they were compiled before overweight/obesity began to rise. Regarding cut-off points, the 90% and 97% percentiles were agreed upon as the definitions of overweight and obesity respectively. However, the recommendations of this CPG can also be applied to patients with overweight and obesity diagnosed using alternative criteria.

The target population of this guideline are children and adolescents under 18, both those of normal weight and those who are overweight or obese. The treatment of secondary causes of childhood and juvenile obesity, eating disorders and comorbidities are explicitly excluded.

2.2. Aims

This CPG aims to establish a set of recommendations to prevent and treat overweight and obesity in childhood and adolescence. For prevention, the aim is to recommend strategies for schools, healthcare, community and health policy which make it possible to prevent overweight and obesity and maintain a suitable weight. Regarding treatment, the guideline covers clinical management of overweight and obesity in childhood and adolescence.

This guideline is intended for paediatricians, general practitioners/family doctors and nursing professionals who work mainly in primary care. Another target group are healthcare professionals working in specialist care, such as psychologists, nutritionists and dieticians. The recommendations of this CPG include some initiatives which will only be possible with the participation and involvement of public authorities and food and leisure companies which sell to children and adolescents. This means that these companies and institutions are a secondary target group of this CPG, as are those engaged in politics and managers. Finally, this guideline is also aimed at families, educators and the general public.

3. Methods

The methods used are described in detail in the *Methodology Manual for Developing Clinical Practice Guidelines* of the Spanish National Healthcare System (SNHS)¹.

The steps taken were as follows:

- The group which would develop the guideline was established, consisting of professionals in paediatrics, primary care (family and community medicine) and specialist care (endocrinology, gastroenterology and paediatric nutrition, physical education and sports medicine, psychiatry, nutrition). These professionals were contacted via the various scientific societies related to the subject of the CPG. Materials for patients were inspected by various members of the public.
- Clinical questions were formulated according to the PICO model: Patient, Intervention, Comparison, Outcome.
- A search of the literature, prioritising the identification of SRs and other documents which provided a critical synthesis of the scientific literature, such as health technology assessment reports. For this purpose, an initial phase comprised a search of other CPGs in order to ascertain which SRs they had considered as a basis for their recommendations. The main CPGs used as secondary sources are listed in Appendix 7. They were all evaluated using the AGREE Instrument. Additional SRs were identified subsequently, following the date on which the selected CPGs were searched. The following electronic databases were consulted in this initial stage:
 - TRIP Database
 - NHS National Library of Guidelines
 - AHRQ National Guideline Clearinghouse
 - Cochrane Database of Systematic Reviews (the Cochrane Library)
 - Database of Abstracts of Reviews of Effects (DARE)
 - Health Technology Assessment (HTA) Database
 - NHS Economic Evaluation Database (NHS EED)
 - MEDLINE (accessed via PubMed)
 - EMBASE (accessed via Ovid)
- The publications of a number of technology assessment agencies were also consulted. These included the National Institute for Clinical Excellence (NICE) and agencies which issue CPGs, such as the Scottish Intercollegiate Guidelines Network (SIGN).
- In the second stage, an extended search of individual studies was carried out, in order to update the relevant SRs and answer the questions of the CPG. The main aim was to identify randomised clinical trials (RCTs) and observational

studies, respecting the original search strategies of the relevant SRs. When these were not available, a specific strategy was designed for each question, adding validated filters in each case to identify RCTs and observational studies. The following electronic databases were consulted in this phase: the Cochrane Central Register of Controlled Trials (CENTRAL) (the Cochrane Library), MEDLINE, EMBASE and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (accessed via Ovid).

- No language restriction was established for the searches carried out, but most of the studies considered were written in Spanish, English or French. Searches were carried out up to August 2008, although relevant studies were identified in the highest-profile biomedical journals throughout the CPG development process.
- The search strategies used for each section of the guideline are available on request from the Iberoamerican Cochrane Centre (tsc@cochrane.es).
- Evaluation of the quality of evidence and grading of recommendations were provided according to SIGN's system (**Appendix 1**). Controversial recommendations or those with no evidence were resolved by simple consensus of the group that developed the guideline.
- The group of authors took part in all stages of the process except searching and evaluation of the quality of scientific literature. These were carried out by the authors who belong to the Iberoamerican Cochrane Centre.
- The text was reviewed by a multidisciplinary group of external reviewers. The final text of the guideline was reviewed and approved by the group of authors.
- It is intended that the CPG will be updated every three years. More frequent updating of the electronic version of the guideline is not ruled out, should this prove necessary.

4. Definition and initial assessment

Questions to Answer

- How are overweight and obesity in childhood and adolescence defined?
- What initial assessment should be made for an overweight or obese child or adolescent?
- What are the criteria for referral to a specialist?

4.1. Definition of childhood and juvenile overweight and obesity

Obesity is defined as an excessive accumulation of adipose tissue which determines the appearance of associated comorbidities or represents a risk factor for these². To define overweight and obesity, an indirect estimate of the body's fat content is usually carried out using the BMI, which is calculated by dividing weight in kilograms by the square of the height in metres (kg/m²). In adults, the WHO² defines overweight as a BMI greater than or equal to 25 kg/m², and obesity as a BMI greater than or equal to 30 kg/m².

It is difficult to measure overweight and obesity in children and adolescents because there is no standard definition of childhood obesity applied all over the world. This means that professionals have to use reference curves and tables which are valid and useful in their particular environment. A second problem is selecting cut-off points to define the categories of normal weight, overweight and obesity. At the time of going to press, there is no international consensus on these matters.

There are many organisations and initiatives, both in Spain^{59,61-71} and internationally⁷²⁻⁸⁵, which work hard to provide reference curves and tables which give an accurate representation of the population in which they are developed. All of these have their advantages and disadvantages, arising mainly from the following factors: 1) the geographical location in which they are developed, which makes it difficult to generalise tables to other places; 2) when they are developed. It is known that the incidence of overweight and obesity in childhood and adolescence has increased over the last decade, which may make it difficult to apply recently-published tables, as they may classify as normal cases which older tables classed as overweight, or may classify as overweight cases which older tables classed as obese; 3) the variation in cut-off points used by different authors to define overweight and obesity, generally established using percentiles (P).

As the most recent growth references, while having the advantage of reflecting the long-standing trend towards increasing height, have the disadvantage of updating the long-standing undesirable trend towards a disproportionate increase in weight in relation to height, and therefore in BMI, some countries have proposed not updating BMI references^{86,87}. As a result, when the reference graphs and tables for weight and BMI which are currently available in the USA were compiled, the most recent weight (and therefore BMI) data, corresponding to children under 6 or more in the NHANES III Study con-

ducted between 1988 and 1994, were excluded. This was because of the greater prevalence of obesity in this sample than in those from earlier studies conducted in the USA. Similarly, it has been recommended that BMI references based on data collected between 1978 and 1990 in the United Kingdom not be updated⁸⁷.

In the USA and Canada, local BMI references from growth graphs developed by the Centres for Disease Control and Prevention (CDC) in the USA⁷⁸ are used in clinical practice, with percentiles P85 and P95 recommended as cut-off points for the diagnosis of overweight and obesity respectively^{53,58,78,88}. In contrast, European countries which have their own BMI references use percentiles P90 (P91 in the UK) and P97 (P98 in the UK) respectively for the same purposes in clinical practice^{72-76,79,80}. This latter recommendation is included in both European CPGs which cover childhood and adolescent obesity^{56,43}.

Of the BMI references available in Spain, three have been most popular among the CPG working group members: 1) those included in the Growth Curves and Tables (Longitudinal and Cross-Sectional Studies) of the Institute for Growth and Development Research of the Faustino Orbegozo Foundation, published in 2004⁶⁷; 2) those based on the data of the 2008 Spanish Cross-Sectional Growth Study, published in 2008; 3) those established in the Growth Curves and Tables of the semi-longitudinal study of the Institute for Growth and Development Research of the Faustino Orbegozo Foundation, published in 1988⁵⁹. Below are the main characteristics of each of these (Table 1):

Table 1: BMI reference curves and tables compiled in Spain

REFERENCE	METHODS & DATE	STRENGTHS	WEAKNESSES
LONGITUDINAL AND CROSS-SECTIONAL STUDIES (FAUSTINO ORBEGOZO FOUNDATION) ⁶⁷	<ul style="list-style-type: none"> Based on data obtained during a longitudinal study over the 18 years of complete growth of 300 girls and 300 boys born in 1978-1980, ending in 1998, and 2) based on the data of a cross-sectional study conducted in 2000-2001 with 6443 subjects, ages ranging from 0 to 18 years. Percentile cut-off points established for the diagnosis of overweight and obesity: P85 and P95 respectively. 	<ul style="list-style-type: none"> Reflect an essential aspect of the long-standing acceleration of growth by bringing together the long-standing trend towards increasing height. P85 and P95 are the BMI diagnosis cut-off points with which many healthcare professionals are most familiar and identify the most, as a result of the greater dissemination of US scientific publications, in which these BMI thresholds are generally used exclusively to diagnose overweight and obesity. 	<ul style="list-style-type: none"> The study population consisted of children from middle and lower socioeconomic groups in Bilbao and the region surrounding it. The data on body weight and BMI for the second half of growth from the longitudinal study were collected when BMI was already increasing and obesity was becoming more prevalent in industrialised societies. This leads to undesirable aspects of the long-standing acceleration of growth, such as the disproportionate increase in weight in relation to height and increased BMI, being classified as normal.

<p>2008 SPANISH CROSS-SECTIONAL GROWTH STUDY⁶⁹</p>	<ul style="list-style-type: none"> • Based on data from 32,064 subjects, ages ranging from 0 to 24 years, who made up the total sample of four cross-sectional studies conducted between 2000 and 2004 in Andalusia, Barcelona, Bilbao and Zaragoza. • Percentile cut-off points established for the diagnosis of overweight and obesity: P85 and P95 respectively. 	<ul style="list-style-type: none"> • The sample size and great geographical distribution of the population studied, which consisted of 32,064 subjects from Andalusia, Barcelona, Bilbao and Zaragoza. • Reflect an essential aspect of the long-standing acceleration of growth: the long-standing trend towards increasing height. • P85 and P95 are the BMI diagnosis cut-off points with which many healthcare professionals are most familiar and identify the most, as a result of the greater dissemination of US scientific publications, in which these BMI thresholds are generally used exclusively to diagnose overweight and obesity. 	<ul style="list-style-type: none"> • The data on body weight and BMI were collected when the prevalence of obesity was already significantly increasing all over the world, and references established in these circumstances update undesirable aspects of the long-standing acceleration of growth, such as the disproportionate increase in weight in relation to height and increased BMI, classifying these as normal.
<p>SEMI-LONGITUDINAL STUDY (FAUSTINO ORBEGOZO FOUNDATION)⁶⁹</p>	<ul style="list-style-type: none"> • Based on data from three groups of 600 children selected at random, whose ages at the beginning of the study in 1978 were 0, 5 and 9 years respectively, and in whom longitudinal monitoring was carried out over 9 years. Those who missed two successive control evaluations were systematically excluded. • Percentile cut-off points established for the diagnosis of overweight and obesity: P85 and P95 respectively. 	<ul style="list-style-type: none"> • Until very recently, these were the most widely-used references in Spain. • The time at which the data used to establish the references were collected: data were obtained right up until BMI and the prevalence of obesity in children and adolescents began to increase in some of the world's most industrialised countries, from the second half of the 1980s onwards. • Their application in clinical practice is completely in line with practice in other European countries which also have their own BMI references, with percentile cut-off points which are identical or practically identical for the diagnosis of overweight and obesity (P90/91 and P97/98), such as Germany, France, Italy, the UK, Sweden and Switzerland. 	<ul style="list-style-type: none"> • The study population consisted of children from middle and lower socioeconomic groups in Bilbao and the region surrounding it. • An essential aspect of growth, namely the long-standing trend towards increasing height, has not been updated. This means that these tables should not be used for isolated evaluation of height, with the notable exception of the BMI references, whose advantage over updated references has already been highlighted in the previous column

At the time of going to press, it has not been possible to establish a unanimous agreement as to which references should be considered valid. In this situation, faced with the need to provide a frame of reference for all healthcare professionals in charge of health-

care for Spain's child and juvenile population, the authors propose the use of the tables of the semi-longitudinal study begun in 1978-80 by the Faustino Orbegozo Foundation, compiled by Hernández *et al*⁵⁹. These tables were compiled in Spain, before the beginning of the increase in overweight/obesity, which means that they are more directly applicable than those of other countries. We therefore propose using BMI as the parameter to establish the cut-off points for overweight and obesity, as follows:

- Overweight: BMI \geq P90 and $<$ P97 for the corresponding age and sex
- Obesity: BMI \geq P97 for the corresponding age and sex.

Recommendations

√	The growth curves and tables of the semi-longitudinal study by Hernández <i>et al.</i> (1988) are recommended for diagnosing overweight and obesity in childhood and adolescence.
√	For a diagnosis of overweight, BMI must be greater than or equal to P90 and below P97 for the patient's age and sex according to the growth curves and tables of the semi-longitudinal study by Hernández <i>et al.</i> (1988).
√	For a diagnosis of obesity, BMI must be greater than or equal to P97 for the patient's age and sex according to the growth curves and tables of the semi-longitudinal study by Hernández <i>et al.</i> (1988).

4.2. Initial Assessment

Detecting overweight and obesity in children or adolescents at primary-care paediatric and general practice/family medicine appointments must be based on a series of key points so that the decisions taken are the most suitable for developing an intervention strategy which will be effective in addressing this health problem⁸⁸⁻⁹².

These key points are as follows⁸⁸⁻⁹²:

1. Calculate BMI and classifying excessive body weight as overweight or obesity using the growth curves and tables of the semi-longitudinal study by Hernández *et al.* (1988), for the appropriate age and sex.
2. Take a full family history, including ethnic group, country of origin, family history of obesity and associated disorders (high blood pressure, type II diabetes mellitus, dyslipidaemia or early heart disease), socioeconomic setting, family dynamic regarding food and physical exercise. If possible, record the BMI of the members of the family unit.
3. Take an exhaustive personal history, including obstetric history and neonatal

Experts' opinion
4

anthropometry; breastfeeding guidelines and the beginning of weaning, psychomotor development milestones, previous or current illnesses and/or treatments; when weight gain began and progressed; and any trigger factors.

4. Evaluate the child or adolescent's lifestyle, exploring in particular their dietary habits (meal structure, distribution of meals throughout the day, any compulsive eating, number of snacks or drinks between meals and their composition) using a prospective dietary survey (seven days) and a physical exercise survey (objective recording of time spent on sedentary behaviour and daily exercise).
5. Evaluate the willingness to make changes (to acquire healthy eating and physical exercise habits) of both the child or adolescent and his/her family.
6. Consider the possibility of concurrent disorders associated with obesity (high blood pressure, type II diabetes mellitus, dyslipidaemia) when overweight/obesity is diagnosed in a child or adolescent.
7. Perform a general physical examination, emphasising the following:
 - General appearance (distribution of adipose tissue, muscle tone, signs of psychomotor delay).
 - Record blood pressure, evaluating percentiles for the appropriate age, height and sex. Record girth, evaluating percentiles for the appropriate age, height and sex.
 - Attitude and behaviour (signs of anxiety or depression).
 - Examination of skin and mucous membranes (jaundice, dry skin, abnormal pigmentation, acanthosis nigricans, stretch marks, acne and/or hirsutism).
 - Dysmorphic facial and body features
 - Inspection and palpation of the thyroid.
 - Any hepatomegaly.
 - State of pubic development, gynaecomastia in boys. Any premature adrenarche.
 - In girls, the age of the menarche should be evaluated, as should any menstrual irregularities.
 - Consider a full blood chemistry test to determine levels of glucose, cholesterol, triglycerides and thyroid hormones, in order to detect any other associated disorders.
 - Compensatory orthopaedic alterations.
8. Consider referral to a leading endocrinology specialist in selected cases which require subsequent diagnostic evaluation or specific treatment. This may be due to suspected underlying diseases causing obesity, diagnosis in small children, associated disorders or extreme obesity.

Recommendations

D	BMI should be calculated and excessive body weight classed as overweight or obesity using the growth curves and tables of the semi-longitudinal study by Hernández <i>et al.</i> (1988), according to age and sex.
D	A full clinical history should be taken and a complete physical examination should be carried out, to detect obesity secondary to underlying disorders or malformation syndromes, and to exclude associated comorbidities.
D	The possibility of psychopathological conditions (anxiety, depression, bulimic behaviour) should be assessed. Such conditions may determine childhood or adolescent obesity.
D	Referral to a leading endocrinologist is recommended for obese children or adolescents with suspected underlying diseases causing their obesity, obesity in very young children, concurrence of associated disorders or extreme obesity. Referral to a leading mental health unit is recommended if there is an associated psychiatric disorder.
√	Pre-existing family dynamics should be assessed, as should the willingness of both the child and adolescent and his/her family to make changes, so that any intervention to tackle overweight or obesity can be targeted appropriately.

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

5. Prevention

5.1. School-based interventions

This guideline classifies preventive interventions according to where they were carried out: schools, the healthcare system, the community and the family, although this classification

Questions to Answer

Among children and adolescents of normal weight:

- How effective are school-based interventions in preventing obesity?
- How effective are school-based interventions in improving diet, increasing physical activity levels or reducing sedentary lifestyles?

system may seem arbitrary as the interventions often include actions in two or more of these spheres. Most studies conducted to date have taken place in schools, which is why this is the longest section of the guideline.

Many randomised clinical trial (RCTs) have been published regarding the prevention of childhood and juvenile obesity in schools, often with major methodological shortcomings. There have also been many SRs^{9,44,45,93-103} and some CPGs^{43,53,88}. However, the trials evaluated show a great deal of variation in the strategies implemented (diet, physical exercise, less time spent watching television, etc.), location (school, workplaces, etc.), family involvement or even the outcomes considered. This section has classified the information identified into interventions designed to prevent obesity (with results outcomes to measure this) and interventions designed to improve diet, increase physical activity levels and reduce sedentary behaviour. The main outcome used to measure obesity in the studies evaluated is BMI.

5.1.1. Dietary interventions to prevent obesity

A RCT conducted in the UK (644 schoolchildren aged 7-11 years) evaluated the efficacy of reducing the consumption of carbonated drinks in decreasing BMI in the children over the course of a school year. Each class taking part in the intervention received three one-hour sessions which encouraged the children to drink water or diluted fruit juice¹⁰⁴. In evaluation at 12 months, consumption of carbonated drinks (number of glasses) fell significantly in the group taking part in the intervention (-0.6, CI 95%, -0.1 to -1) but not in the control group (0.2, CI 95%, -0.2 to 0.5). However, there was no significant difference in the change in the BMI z-score (BMIz) between the intervention and control classes. The percentage of overweight or obesity increased by 7.5% in the control group, while a drop of 0.2% was recorded in the group taking part in the intervention (mean difference: 7.7%, CI 95%, 2.2% to 13.1%). The authors acknowledge a shortcoming due to potential contamination, as classes rather than schools were randomised. This may have minimised the beneficial effect of the intervention and therefore reinforces the results observed.

RCT
1+

Subsequent evaluation¹⁰⁵ (434 schoolchildren) analysed the results of this trial two years after the intervention ended. This found no differences in the prevalence of overweight, which had increased in both groups. RCT 1+

5.1.2. Exercise-based interventions to prevent obesity

Trials lasting one year or more

Pre-school children

Three-hundred and ten Thai pre-school children with a mean age of 4.5 years, in ten classes within two different schools, were randomised in a RCT¹⁰⁶. The groups taking part in the intervention received additional physical education lessons for 29-30 weeks. In the initial evaluation at 29.6 weeks, a drop in the prevalence of obesity was found in the group taking part in the intervention as compared to the control group, but the difference was not statistically significant. RCT 1+

At the end of the trial, the overall prevalence of obesity (using P95 of the thickness of the triceps skin fold test as the cut-off point) had fallen significantly in the group taking part in the intervention, from 12.2% (initially) to 8.8%, while in the control group it fell from 11.7% to 9.7%, which was not statistically significant.

Schoolchildren

A RCT conducted in the USA (349 schoolchildren, 9.25 years) evaluated the SPARK (Sports, Play and Active Recreation for Kids) intervention, which consisted of three 30 minute sessions of physical education per week, as compared to the usual school physical activity programme¹⁰⁷. Four schools were randomised into the groups that took part in the intervention (two led by specialists and two by teachers), and another two were randomised into the control group. RCT 1-

Adiposity was evaluated using triceps and calf skin fold tests, and the BMI was measured at 6 month intervals over 18 months. No significant differences between the groups were found.

In another recent RCT conducted in Australia (311 schoolchildren, 10 years), participants were divided into four groups: behavioural modification, movement skills, a combination of the two and a control group¹⁰⁸. RCT
1-

At 12 months, after adjusting for calorie intake and physical activity levels, a significant decrease in BMI was observed in the combined intervention group: -1.53 (CI 95%, -2.82 to -0.24). In comparison to the control group, those in the combined intervention group had a 60% lower probability of suffering from overweight or obesity between the beginning of the study and the end of the intervention. The children in the movement group enjoyed physical activity more, and those in the behaviour group showed higher physical activity levels but also spent more time watching television.

Trials lasting less than a year

Schoolchildren

A RCT conducted in the USA (198 schoolchildren aged 8-10 years) analysed the efficacy of an intervention which aimed to reduce time spent watching television and playing video games. This consisted of adding eighteen 30 50 minute lessons to children's standard study programme¹⁰⁹. Results were measured initially and after six months. The change in BMI between the beginning and six months later was from 18.38 to 18.67 in the group taking part in the intervention, and from 18.10 to 18.81 in the control group. The average difference adjusted for initial values, age and sex was -0.45 (CI 95%, -0.73 to -0.17). There were also significant differences in the change in thickness of the triceps skin fold test and in girth between the group taking part in the intervention and the control group. RCT
1+

The RCT trial Action Schools! BC¹¹⁰⁻¹¹³, conducted in Canada (268 schoolchildren aged 9-11 years) evaluated an intervention designed to increase physical activity levels over nine months and found no differences in BMI between the intervention and control groups. The intervention consisted of 75 extra minutes of intense physical activity per week, combined with changes in the school, family and community environments to promote the concept of "active school". RCT
1+

The clinical RCT by Martínez *et al.*¹¹⁴, conducted in Spain over 24 weeks (1,044 schoolchildren, 9.4 years), analysed the effect of non-competitive physical recreational activities carried out at school outside school hours, and showed no differences in BMI between the intervention and control groups. However, significant differences were observed in the thicknesses of the triceps skin fold test in both sexes, and in girls also in body fat percentages. RCT
1+

The four-week RCT by Jago *et al.*¹¹⁵, conducted in the USA (30 girls, 11 years), analysed an intervention involving one hour's Pilates a day five days a week as an extracurricular activity at school. A significant decrease of 3.2 points was observed in the BMI percentile of the group taking part in the intervention, versus an increase of 0.8 points in the control group (with statistically significant differences between the groups). In another RCT (425 schoolchildren, 7 years), two extra hours of physical activity per week significantly improved body composition as compared to the control group after six months, although BMI did not change and the effect was greater in obese schoolchildren than in non-obese schoolchildren¹¹⁶. Neither were there any changes in BMI in a RCT that evaluated the PLAY intervention¹¹⁷ and lasted for 12 weeks (606 schoolchildren aged 9-10 years).

RCT
1-

RCT
1-
RCT
1-

Adolescents

A RCT conducted in the USA (the *New Moves* trial)¹¹⁸ involved 201 girls aged 14-18 years. They were offered physical exercise four times a week, and fortnightly dietary and social support sessions. In follow-up at eight months, there were no significant differences in BMI between the schools that took part in the intervention and the control schools. The participants in the schools where the intervention had been carried out reported positive changes in their behaviour and personal factors, but the majority were not statistically significant.

RCT
1-

A 12 week RCT conducted in the USA (110 adolescents aged 10-13 years) randomised participants to carry out dance activities (three 50minute sessions per week, plus a health education programme twice a week) or to the control group, which carried out normal physical activities¹¹⁹. At the end of the trial, significant reductions in BMI were observed in the girls in the group taking part in the intervention as compared to those in the control group (change in BMI: -0.8 and 0.3 respectively). In boys, a similar trend was observed but was not statistically significant, and there were no differences between groups.

RCT
1-

A controlled trial¹²⁰ in which 58 adolescent girls were randomised to a group taking part in an intervention (special physical education lessons and theoretical support) or a control group for four months showed no significant effects on BMI. Another RCT¹²¹ involving 2,744 girls (average age 13.6 years), in which a school environment that encouraged physical exercise was promoted in the group taking part in the intervention, also failed to find any significant differences in BMI.

RCT
1-

5.1.3. Dietary and exercise-based interventions to prevent obesity

Trials lasting one year or more

Pre-school children

A RCT analysed the intervention ‘*Hip-Hop to Health*’ in encouraging physical exercise in schools with high percentages of Afro-American pre-school children¹²², and observed significantly smaller increases in BMI in the group taking part in the intervention than in the control group in follow-up both at one year (-0.53 [CI 95%, -0.91 to -0.14]) and at two years (-0.54 [CI 95%, -0.98 to -0.10]), adjusted for baseline age and BMI. Turning to positive changes in diet or physical activity levels, only the percentage of calories in the diet which came from saturated fat was significant in follow-up at one year (11.6% vs 12.8%, $p=0.002$).

RCT
1-

A RCT conducted in schools with high percentages of Latino pre-school children¹²³ showed no differences between the group taking part in the intervention and the control group in follow-up at either one year or two years in terms of BMI, or in changes to diet or physical activity levels, although the intervention was very well received.

RCT
1-

Schoolchildren

The Pathways¹²⁴ RCT was conducted in the USA and involved 1,704 Caucasian US children (aged 8-11 years) in 41 schools. Pathways was a multicentre, multifactor, school-centred intervention lasting three years. It aimed to reduce the body fat percentage and was led by existing school staff. The intervention consisted of four components: 1) changes in food intake; 2) increased physical activity levels; 3) a study programme centred on healthy eating and lifestyle; 4) a family involvement programme.

RCT
1+

At the end of the three-year intervention no significant differences were found in BMI, skin fold tests or body fat percentages. School lunches showed a reduction in the percentage of calories from fat. Knowledge improved in the schools where the intervention was implemented over the course of the three years.

The Planet Health RCT¹²⁵, conducted in ten US schools, involved 1,295 schoolchildren (aged 11-12 years). The intervention lasted two academic years, was multidisciplinary and included encouragement of physical exercise, alterations to diet and a reduction in sedentary behaviour.

RCT
1+

The primary results were BMI and the triceps skin fold test, measured initially and at 18 months. In girls, the prevalence of obesity in the control group increased (from 21.5% to 23.7%), while in the group taking part in the intervention it fell (from 23.6% to 20.3%). Follow-up evaluation showed that with the intervention the percentage of obese girls in the schools fell in relation to the controls, adjusted for initial obesity (adjusted OR 0.47, CI 95%, 0.24 to 0.93). Among boys, obesity fell in both the control group and the group taking part in the intervention (from 29.3% to 27.8% in the group taking part in the intervention, and from 34.7% to 31.5% in the control group).

The RCT of the Kiel Obesity Prevention Study (KOPS)¹²⁶, conducted in Kiel (Germany), provides results on the effect of the KOPS programme in 1,640 schoolchildren aged 5-7 years (67.2% of the 2,440 who were randomised). The programme lasted eight years. The educational and behavioural interventions were aimed at both schoolchildren and their families (eating fruit and vegetables every day; reducing intake of high-fat foods; physical exercise for 1 hour/day or more; watching television for less than 1 hour/day).

RCT
1-

At one year, there was no difference in the average change in BMI between the adolescents in the two groups. In contrast, the changes in the triceps skin fold test at one year were statistically significant in favour of the group taking part in the intervention (11.3 mm in the schools taking part in the intervention 11.3 mm, versus 13.0 mm in the control schools).

The results of the KOPS programme¹²⁷ at four years showed no differences in mean BMI between the two groups (1,764 schoolchildren aged 6-10 years). The cumulative incidence rates of overweight in the intervention and control groups were similar. The intervention did have a significant effect on the prevalence of obesity and overweight in children from families with high socioeconomic status (adjusted OR 0.35, CI 95%, 0.14 to 0.91), and a smaller difference in children whose mothers were of normal weight (OR 0.57, CI 95%, 0.33 to 100).

RCT
1-

The RCT APPLES (Active Programme Promoting Lifestyle in Schools) conducted in England (634 schoolchildren aged 7-11 years), evaluated a one-year multidisciplinary programme designed to influence dietary and exercise-related behaviour. The whole school community was involved, including families, teachers and meal supervisors¹²⁸. Controls received the usual study programme.

RCT
1+

At one year, there were no differences in the change in BMI between the schoolchildren in the two groups, and no differences in dietary behaviour. However, participants in the group taking part in the intervention reported that they now ate more vegetables. Sedentary behaviour was greater in schoolchildren with overweight in the group taking part in the intervention than those of overweight in the control group, and the overall score for personal value was greater in obese schoolchildren in the group taking part in the intervention than obese children in the control group.

Be Smart¹²⁹, a RCT conducted in England, randomised 218 schoolchildren aged 5-7 years from three schools to four options: 1) a nutrition group; 2) a physical exercise group; 3) a combined nutrition and physical exercise group; 4) a control group. The intervention took place over 20 weeks, spread over four terms (approximately 14 months), and was held in the lunch areas. The research team provided an interactive nutrition or physical exercise programme suited to the children's ages. These programmes included the children's families. The control group received an education programme which covered non-nutritional aspects of food and human biology.

RCT
1-

At the end of the study, no significant changes in overweight or obesity rates were observed as a result of the three different approaches, and the number of subjects was too small for statistical analyses. Significant changes were found in the level of knowledge reported personally and in diet. This trial may have been affected by ceiling effects, as the population studied had received a fairly good education and 39% of their parents held a degree and/or postgraduate qualification.

The Wise Mind Project¹³⁰ RCT, conducted in the USA in 670 children in the 2nd 6th grades of primary school in four schools, evaluated the efficacy of a multidisciplinary school-based intervention over two academic years. Results were collected from the 586 schoolchildren who remained in the study (87.5% of those who began it).

RCT
1+

No significant differences in BMI percentile were found between the treatment and control groups. Neither were significant differences found regarding prevention of weight gain or body fat percentage.

Differences were observed, however, in diet, choice of food and leftovers. Those in the group taking part in the intervention consumed fewer calories, less protein and less total and saturated fat. A marginally significant improvement was also found in physical activity levels, as measured by the SAPAC (Self-Administered Physical Activity Checklist) questionnaire.

The RCT on the School Nutrition Policy Intervention¹³¹, conducted in the USA in 1,349 schoolchildren in the 4th 6th grades in schools where more than 50% of pupils were from low socioeconomic levels, analysed a two-year multidisciplinary intervention: self-assessment of the school, nutritional education, changes in meal policy, social marketing and workshops with families.

RCT
1+

The intervention resulted in a significant, 50% reduction in the incidence of overweight in the group taking part in the intervention versus the control group: 7.5% versus 14.9% at two years (adjusted OR: 0.67, CI 95%, 0.47 to 0.96). No significant differences were found in the incidence of obesity between the two groups. The prevalence of overweight fell at two years in the group taking part in the intervention (from 16.3% to 14.6%), whereas it increased in the control group (from 15.9% to 20%) (adjusted OR: 0.65, CI 95%, 0.54 to 0.79). No significant differences were found regarding the prevalence of obesity between the two groups. The intervention was not effective in reducing the prevalence of overweight/obesity in schoolchildren who had these disorders at the beginning of the study.

A controlled, non-randomised trial¹³² conducted in the USA involving 338 schoolchildren (aged 8-11 years) analysed a two-year multidisciplinary intervention intended to reduce calories, fat and sodium in school meals and hold formal meetings with kitchen staff five times a year. Nutritional education modules and a 30-40 minute physical exercise programme three times a week were also carried out. The physical exercise programme emphasised aerobic lifestyle activities rather than competitive games.

Controlled,
non-randomised
trial
1-

Follow-up found that although there were some positive changes in objective behaviour, at the end of two years there had been no effect on obesity.

Adolescents

The Haerens RCT¹³³⁻¹³⁵ was conducted in Belgium with 2,840 adolescents in classes 7 and 8 of technical and professional training schools (mean age 13.0±0.8 years). 2,287 adolescents (80.5%) completed the trial. The intervention lasted for two years and included a healthy-eating programme (consumption was measured using questionnaires) and an exercise programme (measured using questionnaires and accelerometers), combining various changes in the school environment with an interactive IT program. One group also included a family intervention.

RCT
1+

In girls, BMI and BMIz increased significantly less in the combined group taking part in the intervention with family support as compared to the control group and the group without family involvement. In contrast, no significant effects were found in boys.

Studies lasting less than a year

Pre-school children

A RCT¹³⁶ involving 54 children in the group taking part in the intervention and 47 in the control group, all aged 5-6 years, analysed a 14 week multidisciplinary intervention involving dietary education and an exercise plan for the children (45 minutes/day, six days a week), accompanied by an educational intervention for their families.

RCT
1+

Positive changes were observed in the group taking part in the intervention as compared to the control group in weight (0.35 ± 0.08 kg versus 0.9 ± 0.1 kg, $p < 0.0005$), BMI percentile (-3.8 ± 1.3 kg/m² versus 2.9 ± 1.5 kg/m², $p < 0.001$), fat percentage in skin fold test ($-0.55 \pm 0.3\%$ versus $1.64 \pm 0.3\%$, $p < 0.028$) and physical condition, estimated using the time taken to run a 600 m race. Physical activity levels were significantly higher in the group taking part in the intervention than in the control group.

Schoolchildren

A controlled trial conducted in Chile¹³⁷ analysed the effects of a six-month intervention which consisted of improving nutritional information education and encouraging physical exercise in 2,375 primary-school children.

Controlled,
non-randomised
trial
1-

In the evaluation at the end of the intervention, there was no significant difference in BMI between the children taking part in the intervention and the controls: BMI 19.5 (SD 3.7) vs 18.9 (SD 3.3), or at six-month follow-up: 19.5 (SD 3.5) vs 19.2 (SD 3.1). The z scores for girth and BMI did improve in the children involved in the intervention, but none changed significantly and there were no similar findings for the triceps skin fold test. Girls showed no significant differences in anthropometric measurements, but like boys did improve in the same tests of physical condition with the intervention, and there were differences between the intervention and control groups.

One RCT evaluated an educational intervention carried out by teachers. The intervention consisted of altering the school curriculum and increasing aerobic physical exercise (1,013 primary-school children)¹³⁸. At the end of the study (which lasted one school year) a significant decrease of 2% was observed in overweight (BMI>85%) in the group taking part in the intervention, along with an increase in fruit and vegetable consumption (in both groups) and in physical activity (in the group taking part in the intervention).

RCT
1-

The Amaro RCT¹³⁹, conducted in Italy (307 children aged 11-14 years) analysed an educational intervention in the form of Kaledo, an educational board game played by the children, in 15-30 minute weekly sessions for 24 weeks. No differences were found between the Kaledo and control groups regarding the daily time spent on physical exercise or in changes in BMIz. The children who had played Kaledo did show a significant increase in nutritional knowledge and weekly vegetable consumption, 3.7 portions (CI 95%, 3.5 to 4.1) in the group taking part in the intervention versus 2.8 portions (CI 95%, 2.4 to 3.3, p<0.01) in the control group.

RCT
1-

A RCT that evaluated changes in the canteen and school environment and a programme which promoted healthy eating, physical exercise and changes to behaviour, with changes to the school curriculum (1,000 adolescents aged 12-13 years) showed no significant differences in BMI between the intervention and control groups after eight months¹⁴⁰.

RCT
1-

5.1.4. Interventions to improve diet

Several SRs have evaluated the efficacy of interventions designed to improve diet. The SR by Thomas¹⁴¹ had the following aims: to evaluate the efficacy of interventions intended to promote healthy eating and increase the intake of fruit and vegetables, to explore what enabled and prevented children aged 4-10 years from eating healthily, and to collate information on the perceptions of the children themselves.

SR of RCTs
1++

Almost all studies concerned multidisciplinary interventions, including class activities and activities which involved the whole school. Around half of them also included family or community-based interventions. In most studies, it was the teachers themselves who carried out the interventions. 19 studies were included, 11 of which were RCTs.

– Fruit consumption: meta-analysis of ten studies involving various interventions showed a statistically significant increase in the number of portions of fruit consumed. The difference was equal to two thirds of a portion of fruit per day (standardised mean difference [SMD] 0.10, CI 95%, 0.03 to 0.17). Three of the studies showed no differences between intervention and control groups.

– Vegetable consumption: meta-analysis of twelve studies showed a statistically significant increase in vegetable consumption, slightly less than 1/5 of a portion extra per day (SMD 0.23, CI 95%, 0.11 to 0.34). One study did not reveal any differences and another showed lower consumption in the group taking part in the intervention.

– Combined fruit and vegetable consumption. Meta-analysis of thirteen studies found a statistically significant increase in combined fruit and/or vegetable consumption, slightly less than half a portion extra per day (SMD 0.23, CI 95%, 0.11 to 0.35).

– Knowledge, attitudes and self-efficacy. Meta-analysis of seven studies showed a significant improvement in knowledge (effect size 0.67, CI 95%, 0.54 to 0.79), equivalent to an increase of one grade in compulsory subjects. Meta-analysis of the three studies which analysed attitudes found a significant improvement (effect size 0.65, CI 95%, 0.38 to 0.91). Meta-analysis of seven studies which analysed self-efficacy showed a small improvement (effect size 0.69, CI 95%, 0.00 to 0.17).

The authors conclude that various different interventions have a positive, though small, effect on children's fruit and vegetable consumption. The interventions which have the greatest positive effects are those involving parents with cardiovascular risk factors and those which concentrate explicitly on fruit and vegetable consumption, excluding other aspects such as exercise or reduced salt or fat intake. Interventions which take only one approach, such as lessons or shops selling only fruit, are ineffective.

The most effective interventions were those which concentrated on enjoyment or pleasure in food rather than health-related aspects and authors considered it necessary to involve children in the design of interventions and messages. It is easier to increase fruit consumption than vegetable consumption. Making school-centred interventions effective requires skill, time and the support of a range of people.

Shepherd's SR¹⁴² had the following aims: to draw a systematic picture of what helped and hindered young people aged 11-16 eating healthily, particularly young people in 'socially excluded' groups (those with few financial resources and ethnic minorities); to evaluate the efficacy of interventions designed to improve the diets of these groups in priority areas; and to collect information on the perceptions of young people themselves.

SR of RCTs
1++

Four RCTs and two controlled, non-randomised studies met Shepherd's criteria. Nearly all of these were studies on multidisciplinary interventions, including class-based, school-based, home-based and sometimes community-based activities.

Two RCTs showed efficacy of increasing the availability of fruit and vegetables^{143,144}. Another two RCTs^{143,145} and one controlled, non-randomised study¹⁴⁶ showed that teachers, school staff and other pupils are effective ways for nutrition-related interventions in schools to increase fruit and vegetable consumption and knowledge and to improve attitudes.

This SR concluded that there is some evidence that multidisciplinary interventions can be effective, although the effect tends to vary according to age and sex. The authors think that interventions that design messages tailor-made for each group are promising and worthy of evaluation. One key factor is the value young people attach to being able to choose and their autonomy regarding food. The authors also believe that increasing the range and variety of healthy snacks and meals available in schools and recreational facilities allows them to choose healthy, tasty options.

Another SR includes information from 15 controlled studies: 11 randomised and 4 non-randomised¹⁴⁷. Twelve of the studies were conducted in the USA, two in the UK and one in the Irish Republic. Because of the varied nature of the interventions and the ways in which the results were measured, no meta-analysis was carried out. There were no differences between the effects of the randomised and non-randomised studies.

Of the 11 studies in primary-school children, nine showed a significant increase in fruit and vegetable consumption, with an interval of 0.3 to 1 piece or portion per day, while two studies showed no differences. Of the four interventions in secondary-school children, only one had a positive effect, and only in girls¹²⁵. The other three revealed no differences between the treatment groups and the control groups^{144,148,149}.

The factors which appeared to be associated with greater impact were as follows (the order in which they appear here is not the order of importance): concentrating on fruit and vegetables rather than nutrition in general; direct exposure to fruit and vegetables (tasting and/or cooking); particular attention to teachers' training; pupils' participation as leaders or the use of comic-book characters; kitchen staff involvement; family involvement at school and at home; community involvement; and length of intervention (generally, the longer an intervention lasted the more effective it was).

SR of RCTs
1++

The authors conclude that there is evidence in favour of multi-disciplinary interventions to promote fruit and vegetable consumption in children.

One SR (8,156 schoolchildren, seven studies, of which only three were RCTs) aimed to evaluate whether or not school-based interventions could be effective in increasing fruit and vegetable consumption, and if the effect of these interventions was altered by dose, duration and/or type of intervention¹⁵⁰

SR of RCTs

1-

By combining the results of several individual studies, meta-analysis revealed a difference of 0.38 (CI 95%, 0.31 to 0.44) more portions of fruit or vegetables in children who received an intervention versus control groups. They had access to individual data, and combined analysis of them found a slightly greater effect (0.45 portions more), which was also statistically significant. Meta-analysis of the seven studies showed that the net relative change in fruit and vegetable intake was a 12% increase in pupils in groups taking part in interventions, whereas it had fallen by 6% in the control group. This result is statistically significant.

Analysis of covariables revealed that both being in a higher class at the beginning of the study (older children) and the time-intensive-ness of interventions were inversely correlated to the net favourable relative change in fruit and vegetable consumption. In other words, the most effective interventions were those involving the youngest children and those lasting the least time. The authors recommend that this latter finding be treated with caution, as analysis is based only on school-based interventions and does not take into account the relative influence of the other aspects of interventions (family, canteen, community, media).

Another SR aimed to learn from five studies funded by the UK Food Standards Agency on various different interventions designed to alter eating habits in UK schools and reflect on the outcomes which might make an intervention viable and effective¹⁵¹. Only two of the studies were randomised. Although they had different approaches, all showed a moderate increase in fruit consumption and could potentially be put into practice in schools.

SR of RCTs

1-

An SR of observational studies¹⁵² which aimed to analyse the environmental factors related to consumption of calories, fat, fruit, vegetables, snacks, fast food and sugary drinks in children and adolescents did not find any evidence in favour of making fruit and vegetables available in schools.

SR of observational studies

2+

Some subsequent RCTs have evaluated various environment and curriculum-based interventions, with inconsistent results: three RCTs showed no significant differences in fruit and vegetable consumption¹⁵³⁻¹⁵⁵, while another one (1,730 schoolchildren aged 5-14 years) compared two interventions over a full school year and found them to be equally effective in increasing fruit and vegetable consumption¹⁵⁶. Meanwhile, the Bere RCT¹⁵⁷ (517 schoolchildren, mean age 11.3 years) followed children for 2.1 years and showed a statistically significant difference in fruit and vegetable consumption of 0.6 portions per day more in the group taking part in the intervention than in the control group.

RCT
1-

5.1.5. Interventions to increase physical activity levels

One SR, designed to review the efficacy of educational, environmental and multidisciplinary interventions to encourage physical exercise in children and adolescents, included 47 RCTs¹⁵⁸.

SR of
RCTs
1+

It was impossible to combine the results of different trials, as they included many different types of intervention, target population and quality of design. Results were also reported in various different ways. Trials with significant results were variable. For example, in those which yielded significant results increases ranged from 2.6 minutes in physical education (PE) lessons, 42% in taking regular physical exercise, up to 83 min/week of moderate or intense physical exercise.

In children, results were found only in favour of interventions involving children of low socioeconomic status and environmental interventions. Even this evidence was limited. In adolescents, clear evidence was found in favour of multidisciplinary and school-based interventions, but with family or community involvement. No positive effect was observed for other types of intervention.

One RCT involving 2,840 adolescents from 15 schools^{159,160} compared the results of an intervention that encouraged exercise and a healthy diet (including environment-based activities and computer support) with the same intervention with family support and a control group. At nine months, physical activity had increased significantly in the intervention group with family support (6.4 minutes more per day) and in the group with the intervention alone (4.5 minutes more per day) in comparison to the control group. However, low-intensity physical activity fell significantly, by 21 minutes per day in the intervention group with family support and by 57 minutes in the control group.

RCT
1-

Other RCTs evaluated PE-based interventions in schools: one¹⁶¹ showed increases of around 7% in children who walk to school and in the time spent on moderate/intense physical activity in PE lessons in the intervention group as compared to the control group. Another RCT¹⁶² showed a 7% increase in maximum oxygen consumption. Lastly, another RCT¹⁶³ found no increase in the distance run in nine minutes in girls, but did find a slight increase in boys, of around 3%.

RCT
1-

5.1.6. Interventions to reduce sedentary lifestyles

Pre-school children

A RCT conducted in the USA (176 pre-school children aged 2.6- 5.5 years) analysed an intervention which consisted of seven 20 minute interactive educational sessions over six months, plus supplementary materials and activities suggested for lessons and families¹⁶⁴. In the intervention group, there was a drop in the number of hours spent watching television of 3.1 hours/week, whereas there was an increase of 1.6 hours/week in the control group (p=0.02). The percentage of pre-school children who watched television for more than two hours per day fell from 33% to 18% in the intervention group, while it increased from 41% to 47% (p=0.047) in the control group.

RCT
1-

Another two RCTs^{122,123} analysed the intervention 'Hip-Hop to Health' in schools with high percentages of Latino and African American pre-school children. Hip-Hop to Health included three educational sessions a week for 14 weeks, accompanied by 20 minutes of aerobic exercise. No differences were found between the intervention and control groups in terms of the number of hours per day spent watching television.

RCT
1-

Schoolchildren

In one recent RCT, 70 schoolchildren aged 4-7 years (BMI \geq P75) were randomised to an intervention group, in which the time spent watching television was gradually reduced and families suggested alternative activities, or a control group with free access to television¹⁶⁵. After 24 months, significant reductions were observed in the mean number of hours spent watching television in the intervention group (-17.5, standard deviation [SD] 7.0 per week, vs -5.2 [11.1] in the control group) and in BMIz as compared to the control group (-0.24 [0.32] vs -0.13 [0.37]). There was a greater reduction in calorie intake in the intervention group than in the control group, with significant differences between baseline and 18 and 24 months.

RCT
1+

In another RCT conducted over six months in the USA, 221 girls in 9th grade were randomised to a standard PE lesson or an in-class educational intervention plus reinforced physical exercise¹⁶⁶. The intervention emphasised social interdependency, environmental factors and problem-solving skills.

RCT
1-

The percentage of girls who spent three hours or more per day watching television fell from 22.3% to 17% in the intervention group, and remained constant at 26.7% in the control group.

Another three RCTs have shown inconsistent results: one of them (198 schoolchildren aged 8-10 years), with an intervention consisting of 18 lessons over seven months¹⁰⁹, showed a statistically significant decrease of 5.53 hours/week (CI 95%, -2.42 to -8.64 hours/week) of television, and 2.54 hours/week (CI 95%, -4.48 to -6.0 hours/week) spent playing video games as compared to the control group. The RCT APPLES (Active Programme Promoting Lifestyle in Schools) (634 schoolchildren aged 7-11 years) with a multidisciplinary programme lasting one year found no significant differences between the control and intervention groups in terms of sedentary behaviour, measured as the number of hours spent watching television in the previous 24 hours (0, CI 95%, -0.1 to 0.1), except that it was greater in overweight children in the intervention group than in overweight children in the control group (0.3, CI 95%, 0.0 to 0.7)¹²⁸. However, the Planet Health RCT (1,295 schoolchildren aged 11-12 years) evaluated a multidisciplinary intervention which reduced the number of hours spent watching television in girls (-0.58 hours/day, CI 95%, -0.85 to -0.31 hours/day, p=0.001) and in boys (-0.4 hours/day, CI 95%, -0.56 to -0.24 hours/day, p<0.001)¹²⁵.

RCT
1+

RCT
1+
1+

A 16 week controlled study in 312 schoolchildren with an average age of 10.2 years (+/- 0.7) in ten schools in socially-deprived areas¹⁶⁷ analysed the educational intervention 'Switch Off-Get Active', designed to increase physical activity levels and reduce the number of hours spent watching television. No significant differences were found between the control and intervention groups in terms of time spent watching television.

Controlled,
non-randomised
trial
1-

Evidence summary

Dietary interventions to prevent obesity	
1+	School-based interventions aimed at reducing the consumption of carbonated drinks do not significantly reduce overweight or obesity ^{104,105} .
Exercise-based interventions to prevent obesity	

1-	<p>In trials lasting one year or more, school-based interventions aimed at encouraging organised physical exercise in pre-school children are moderately effective in preventing obesity while the interventions last¹⁰⁶. Those conducted in primary schools have shown inconsistent results: one RCT did not show any difference in BMI¹⁰⁷, whereas another did¹⁰⁸.</p> <p>In trials lasting less than a year, school-based interventions aimed at increasing physical exercise alone showed no significant change in BMI^{109,110,114 121}.</p>
Dietary and exercise-based interventions to prevent obesity	
1+	<p>Multidisciplinary interventions to prevent obesity which include encouraging physical exercise, diet improvement, reduction of sedentary behaviour and family involvement do not lead to significant decreases in BMI, although they do significantly increase fruit and vegetable consumption^{122-133,136 140}. There have been no trials analysing the Spanish population.</p>
1+	<p>Multidisciplinary interventions aimed at preventing obesity in schools have a greater effect in girls^{125,133}, and may be more effective in groups of high socioeconomic status¹²⁷.</p>
Interventions to improve diet	
1-	<p>Multidisciplinary interventions improve fruit and vegetable consumption and diet^{128-130,132,139}.</p>
CHILDREN	
1++	<p>Information from various SRs^{141,147} shows positive effects on diet as a result of multidisciplinary interventions which include in-class activities and activities based in the school as a whole, in combination with a family or community-based intervention.</p> <p>The interventions with the greatest positive effects are those in children whose parents have cardiovascular risk factors and those which concentrate explicitly on fruit or vegetable consumption, excluding other aspects such as exercise or reducing salt or fat consumption. Single-component interventions seem ineffective.</p> <p>The most effective interventions are those which emphasise taking pleasure in food rather than health-related issues. It has been shown to be easier to increase fruit consumption than vegetable consumption.</p>
ADOLESCENTS	
1+	<p>Multidisciplinary interventions that include in-class activities, activities in the school as a whole and in families and communities can be effective in improving diet, although efficacy tends to vary according to age and sex¹⁴².</p>
Interventions to increase physical activity levels	

1++	<p>One SR¹⁵⁸ shows that some educational, environmental and multidisciplinary interventions are effective in promoting physical exercise in children and adolescents. These interventions achieved increases in physical activity levels from 2.6 to 83 minutes of overall physical activity per week.</p> <p>In interventions involving schoolchildren, there is only limited evidence in favour of interventions in children of low socioeconomic status and environmental interventions. In adolescents there is firmer evidence in favour of school-based interventions, but with an added component of family involvement.</p>
Interventions to reduce sedentary lifestyles	
1+	Interventions aimed at reducing sedentary lifestyles in pre-school children and primary-school children yield inconsistent results ^{109,122,123,125,128,164-166} .

Recommendations

B	Schools must promote physical education and sporting activities, both within and outside school.
C	Schools should include educational programmes which aim to improve diet, increase physical activity levels and reduce sedentary lifestyles. These should include families and teaching staff.
C	Interventions in schools must be continued over time, both during school years and outside the school environment.
B	Food eaten in schools must be healthy, including a range of fruit and vegetables and meals low in fats and sugars.
B	Multidisciplinary interventions should be implemented in schools to encourage children and adolescents to eat fruit and vegetables.
✓	A healthy dietary environment must be created in schools, reducing the availability of foods with high calorie contents (vending machines) and making healthy foods readily available.
B	Physical activity should be promoted among children and adolescents via interventions which target more than one environment (school, family, community). These should include environmental interventions.
✓	Both families and professionals who work in schools must be included in school health education programmes. School activities aimed at reducing time spent watching television, playing video or computer games or using mobile phones should be encouraged.

5.2. Healthcare interventions

Questions to Answer

In children and adolescents of normal weight:

- How effective are healthcare interventions in preventing obesity?
- Does measuring height and weight reduce the incidence of overweight and/or obesity?
- Do regular screening programmes prevent overweight and/or obesity?
- Does advice on diet and exercise and on reducing sedentary lifestyles prevent overweight and/or obesity? Does it improve knowledge of these three subjects? Does it lead to healthier habits?
- In breastfed babies, does continuing breastfeeding prevent overweight and/or obesity when the children are older?

Identifying children and adolescents who are overweight or have a high risk of developing obesity is an activity usually performed by healthcare services. In our context, it is carried out essentially in primary care services, by both paediatricians and nursing staff. These consultations can also explore and detect unhealthy food-related behaviour and sedentary lifestyles, identify children at greater risk of becoming overweight and begin taking steps to prevent this, involving both children and their families. This section summarises the information available on the interventions carried out within the sphere of healthcare to prevent childhood and juvenile obesity.

5.2.1 Measuring height and weight

Children's height and weight can be measured at healthcare services using standardised techniques and well-calibrated tools, either routinely or opportunistically, in children who consult a doctor for reasons other than regular check-ups. The measurements recorded must be compared with the specific standard percentiles for the child's sex and age in a reference population (see the section *Defining Overweight and Obesity*).

One SR which aimed to evaluate the efficacy of monitoring and screening for overweight and obesity in children¹⁶⁸ was unable to identify any controlled studies which compared height and weight measurement with not taking these measurements in the detection and treatment of childhood and juvenile obesity. Eleven studies of various diagnostic tests for overweight and obesity in children were identified, but they did not include any information on long-term usefulness. No other studies evaluating the efficacy of measuring height and weight in preventing and treating childhood and juvenile obesity have been identified.

SR of studies of diagnostic tests

2-

5.2.2 Screening programmes

Two SRs^{168,169} were identified. They found no direct information to show that screening for overweight or obesity in children and adolescents (with the relevant intervention if necessary) improves food- or exercise-related behaviour, physiological measurements (BMI or body fat) or health outcomes.

SR of studies of diagnostic tests

2-

The first of these¹⁶⁹, which served as the basis for the recommendations of the US Preventive Services Task Force on screening and interventions in childhood obesity, reviewed the information available to find out which diagnostic tests to screen for overweight in children are reliable and valid in predicting obesity in adulthood.

SR of studies of diagnostic tests

2-

Nineteen cohort studies of good methodological quality on BMI and other weight measurements in childhood and adulthood were identified. These confirmed that BMI measurements show a lifelong correlation as good as or better than other measurements of overweight (e.g. ponderal index or skin fold measurements). Isolated BMI measurements in childhood or adolescence (6-18 years) are similar to BMI measurements in early adulthood (20-37 years), with moderate correlations observed in follow-up studies between BMI measurements in childhood and adulthood.

The second SR¹⁶⁸ evaluated the reliability and validity of diagnostic tests to screen for overweight in children for predicting results in adulthood.

SR of studies of diagnostic tests

2-

It identified 11 observational studies conducted in the USA which examined the risks associated with childhood overweight and its repercussions in adulthood, including socioeconomic outcomes, mortality rates and several diseases and cardiovascular and other risk factors. These studies rarely controlled for BMI in adulthood, which is a major cause of confusion. In the one study that did do so, the apparent association between BMI at 10 years of age and various increased cardiovascular risk factors (total cholesterol, LDL, insulin levels, blood pressure) disappeared in the analysis.

The opinion of the Childhood Obesity Working Group of the US Preventive Services Task Force¹⁷⁰ is that although BMI is a simple measurement which is convenient and widely recommended in identifying obesity, it is not clear which BMI values are correlated with good future health. BMI in children seems to correspond to BMI in adulthood, although prediction is weak at early ages and improves mainly from pre-adolescence onwards. Other risk factors, such as genetics, good fitness levels, ethnicity or sex, may significantly affect health outcomes, so that the long-term risk may be greater for children of “normal” weight than for those classified as overweight on the basis of their BMI alone.

Expert
opinion
4

Regarding a potential negative effect of screening, no specific studies analysing possible harm caused by a programme to detect overweight or obesity in children and adolescents have been located.

Expert
opinion
4

The potential negative effects that have been mentioned include the following^{169,171}:

- Stigma, due to people being labelled as ‘obese’ or ‘ill’,
- Low self-esteem, unhappiness with one’s own body, feelings of guilt,
- Unsuitable, unhealthy diets of those affected or members of their families with adverse consequences, such as yo-yo dieting,
- Exercise-related injuries,
- Family anxiety,
- Inefficient use of resources if this has no positive effect or resources could be used for another activity with a better cost/benefit ratio.

5.2.3. Dietary interventions

No specific RCTs in children or adolescents have been found regarding healthcare interventions aimed exclusively at diet in preventing obesity. This section reviews the effect of breastfeeding.

5.2.3.1. Breastfeeding

Four SRs have analysed the information available on the impact of breastfeeding on childhood obesity¹⁷²⁻¹⁷⁵. These include only observational studies.

SR of
observational
studies
2+

The Arenz SR¹⁷² concluded that breastfeeding has a small but consistent protective effect against childhood obesity (OR 0.78, CI 95%, 0.71 to 0.85). A dose-effect ratio was also observed: the longer breastfeeding lasts, the lower the risk of obesity.

The Harder SR¹⁷³, which explicitly analysed the relationship between duration of breastfeeding and obesity, also confirmed an inverse relationship between the length of breastfeeding and the risk of obesity, which was lower the longer breastfeeding lasted. For each month of breastfeeding, there was a 4% drop in the risk of obesity. This effect lasted up to nine months of breastfeeding, and was independent of the definition of overweight and the age of follow-up.

The Owen SR¹⁷⁴, which analysed the effect on subsequent obesity in both childhood and adulthood, showed that the mean BMI was slightly lower in those who had been breastfed (-0.04, CI 95%, -0.05 to -0.02). However, the authors felt that the difference was small and may be significantly influenced by a publication bias and other causes of confusion. Analysis adjusted for socioeconomic status, maternal tobacco consumption during pregnancy and maternal BMI showed that in many of the studies the effect disappeared.

One final SR¹⁷⁵ showed that it is more unlikely that people who have been breastfed can be classed according to obesity or overweight criteria (OR 0.78, CI 95%, 0.72 to 0.84) with no adjustments for age group, length of breastfeeding or control of outcomes that might cause confusion (socioeconomic status and parents anthropometry).

Regarding the promotion of breastfeeding to prevent overweight or obesity, several Cochrane SRs have been identified that analyse the effect of various interventions designed to encourage breastfeeding, but none of these evaluate the potential effect on preventing childhood obesity or on children's BMI¹⁷⁶⁻¹⁷⁹. Other systematic or narrative reviews analyse interventions designed to encourage breastfeeding in various environments, but these do not evaluate the effect on obesity prevention, either¹⁸⁰⁻¹⁸².

Only one cluster RCT analysed the effect of encouraging breastfeeding in the prevention of childhood obesity (Prevention Promotion of Breastfeeding Intervention Trial, PROBIT)¹⁸³. This analysed the effects of an intervention designed to encourage exclusive breastfeeding over long periods on height, weight, adiposity and blood pressure at 6.5 years, in comparison to the breastfeeding directives used in the hospitals in the control group. No significant differences in any of these outcomes were observed between the children in the intervention group and those in the control group.

RCT
1+

On the basis of several SRs, the World Health Organization¹⁸⁴ recommends that newborns be exclusively breastfed up to the age of six months wherever possible, as there is conclusive proof of the benefits of breastfeeding for the short- and long-term health of mothers and newborns. These benefits include the following¹⁷⁸:

SR of
RCT
1+

- Short-term: reduced mortality in premature babies, lower infant mortality due to digestive, respiratory, urinary and middle-ear infections, fewer atopic diseases.
- Medium-term: protection from childhood diseases such as juvenile-onset insulin-dependent diabetes mellitus and high blood pressure, and diseases later in life, such as atopic diseases and high blood pressure. Breast milk is also associated with significantly higher cognitive development scores.
- On the mother's health: lower incidence of breast and ovarian cancers and hip fractures.

5.2.4. Exercise-based interventions

A narrative review of interventions designed to promote physical exercise in children and adolescents¹⁸⁵ located three primary-care studies: one in Spain¹⁸⁶, one in Ireland and one in the USA¹⁸⁸.

Schoolchildren

Two low-quality studies were found. The most recent is a pilot study¹⁸⁸ conducted in 28 African American families with low income levels and children aged between 7 and 12. Both the control group and the intervention group received a family session advice session lasting 5-10 minutes and a leaflet on the risks of spending excessive amounts of time watching television. The intervention group also received an extra 20 minute session to explain how much time was permissible, as well as an electronic device to manage time spent watching television. At four weeks, a significant increase was found in the intervention group in terms of participation in organised sports (2.5 hours more per week) and in time spent playing outdoor games (1 hour more per week).

Controlled,
non-randomised
trial

1-

The Irish Galway Health Project¹⁸⁷, which was not controlled, targeted schoolchildren (aged 8-15 years) in primary healthcare centres. The intervention, which lasted ten minutes, consisted of an interview with a doctor or nursing staff and an educational leaflet. At one year no significant changes were observed in exercise habits.

Before-&-
after study

2-

Adolescents

A RCT conducted in Spain involving 448 adolescents aged 12-21 years was identified. The adolescents were tracked for one year¹⁸⁶. In the intervention group, doctors gave the adolescents three ten-minute advice sessions on physical exercise, while the control group received no exercise and no intervention. On the basis of the data from 392 adolescents who completed the study, there were increases in physical activity levels in the intervention group at 6 and 12 months of 36 and 48 min/week respectively, while in the control group there were decreases of 28 and 36 min/week. RCT 1-

The Childhood Obesity Working Group of the US Preventive Services Task Force¹⁷⁰ states that although intensive medical advice given in specialist obesity clinics to selected groups of children achieves sustained drops in overweight of between 7% and 25%, no proof has been found for interventions conducted in paediatric primary care services. Similarly, although community-based interventions that may contribute to healthy lifestyles have been identified, little is known as to whether primary care professionals can be effective in generating and serving as links between patients and their families and these community-based services.

Also, there is no information available on the efficacy of paediatrics or primary care interventions, or on their effect on families. Except in the case of older children, interventions should be aimed at the whole family.

5.2.5. Dietary and exercise-based interventions

Three RCTs in adolescents have been located in this field¹⁸⁹⁻¹⁹¹. A RCT conducted in the UK¹⁹⁰ involving 1,516 adolescents aged 14-16 years, recruited from primary care registers, analysed a 20 minute nursing intervention. This consisted of giving advice on healthy behaviour, including diet and exercise. No significant changes were identified in physical activity levels at three months or at twelve months. Far more adolescents in the intervention group reported positive changes in relation to diet and exercise at three months, but the differences between them and the control group could not be demonstrated objectively twelve months after the intervention. RCT 1+

The first PACE+ (Patient-Centred Assessment and Counseling for Exercise plus Nutrition)¹⁸⁹ study was conducted in the USA in 117 adolescents aged 11-18 years, in primary healthcare. Each participant underwent a computer-assisted evaluation on their exercise and dietary habits, and chose which area or behaviour they wanted to change (moderate physical activity, vigorous physical activity, fat intake or fruit and vegetable intake). Next, a plan and targets for change were established and then approved by the medical professional, who gave specific advice. The participants were then randomised to either having no more contact with the professional or receiving more advice from him/her by email or telephone. At four months, improvements were found in all target areas except vigorous physical exercise. No significant differences were observed between the results of those who had been randomised to have more contact with professionals and those who had not.

RCT
1+

The second PACE+ study¹⁹¹, conducted in 878 children and adolescents aged 11-15 years, included a control group that received advice on protection from sun exposure. The intervention group included the PACE elements of the previous study, plus 12 months of advice by email or telephone. No differences in BMI were found between the two groups, but those in the intervention group significantly reduced their sedentary behaviour levels, by around one hour per day, while in the control group sedentary behaviour remained the same or increased by 0.2 hours per day. In the intervention group there was also a significant increase in the average number of active days per week (+0.3) in boys, and in fruit and vegetable consumption in the girls, with 0.3 portions more per day than in the control group. In the intervention group the percentage of girls who put recommendations on saturated fat consumption into practice was significantly higher, as was the number of days per week with physical exercise for boys.

RCT
1+

One controlled, non-randomised trial evaluated the efficacy of motivational interviews in preventing childhood obesity¹⁹². Fifteen paediatricians and five dieticians were assigned to a control group, a minimum intervention group (one interview with the paediatrician) or an intensive intervention group (two interviews with the paediatrician and dietician). The professionals for the intervention groups were trained in giving motivational interviews. Ninety-one children were enrolled in the trial (aged 3-7 years, BMI P85-P95 or one family member with BMI>30), and saw the paediatrician for a follow-up visit. At six months' follow up, there were decreases in the BMI percentiles of all three groups, with no significant differences, although 94% of families reported that the intervention had made them think about their lifestyles.

Controlled,
non-randomised
trial
2+

NICE's guideline⁴³ provides indirect evidence on preventive studies in healthcare conducted in adults, with the following conclusions: CPG 4

- Long-lasting interventions carried out by primary care professionals and targeting diet and/or physical exercise are effective in maintaining a healthy weight.
- Interventions that combine dietary advice and support and physical exercise are more effective in achieving weight control aims than interventions that concentrate on physical exercise alone. There is no reliable information on interventions that target diet only.
- Although some interventions do not achieve favourable weight changes, they can achieve positive changes in diet and physical activity.
- Educational or behavioural interventions to increase physical activity levels are moderately effective, particularly in promoting moderate exercise outside facilities or sites, such as walking, although these improvements may not be maintained over time.
- There is some evidence, though limited, that free access to sports facilities, used as an incentive, increases physical activity levels, but only while the intervention lasts.
- Moderate or intensive dietary interventions tend to achieve significant reductions in fat intake and increases in fruit and vegetable consumption.
- Brief interventions consisting of dietary advice given by health professionals may be effective in improving diet, but they achieve smaller changes than more intensive interventions.
- The most effective interventions are usually those that combine the highest number of components.

The following conclusions can be drawn on the implementation of interventions, in relation to adults in each case:

- For the efficacy of interventions consisting of dietary advice, customising the advice to the specific barriers and circumstances of each individual case (tastes, costs, availability, points of view of family members, time) is more important than where the advice is given.
- For the efficacy of interventions which encourage physical exercise, it is essential that advice is suited to the specific barriers and circumstances of each individual case: lack of time, access to sports facilities, need for moral support or individual beliefs.

- The specific type of professional that gives the advice is not a key factor, provided that they are sufficiently trained and experienced, enthusiastic about providing motivation and able to provide long-term support.
- It is not clear whether or not interventions conducted by multi-disciplinary teams are more effective.

Evidence summary

Measuring height and weight	
2-	It is not known for certain whether measuring height and weight reduces the incidence of overweight and obesity ¹⁶⁸ .
Screening programmes	
2-	The effects of screening for overweight and obesity in children and adolescents (and the relevant intervention if necessary) on food- or exercise-related behaviour, physiological measurements (BMI or body fat) or health outcomes are not known ^{168,169} .
Physical exercise	
1-	Advice on taking physical exercise may contribute to a moderate increase in exercise taken (36-45 min/week in adolescents, 2.5 hours/week in children) ^{186,188} .
Combined interventions	
1+	Giving adolescents advice on healthy eating and taking physical exercise is moderately effective in improving diet and increasing physical activity levels, particularly if various different methods are used to provide advice, such as email, telephone and personal consultations ¹⁸⁹⁻¹⁹¹ .
Breastfeeding	
2+	Breastfeeding may have a moderate protective effect against childhood and juvenile obesity ¹⁷²⁻¹⁷⁵ , although the efficacy of promoting breastfeeding in preventing overweight and obesity is not known.
1-	One RCT showed no significant differences in weight or adiposity between children involved in an intervention to promote breastfeeding and children who had not, at the age of 6½ years.
1+	Exclusive breastfeeding for six months is beneficial to babies' short- and long-term health ¹⁷⁵ .

Recommendations

B	Advice on nutrition and encouraging physical activity, suited to children's ages, should be included in child health monitoring visits.
---	---

√	At paediatricians' and general practitioner's appointments, children and the whole family should be encouraged to eat healthily and take exercise. All professionals within the primary healthcare team must be involved in receiving and disseminating messages about healthy eating and physical exercise.
√	Interventions to promote healthy eating and encourage physical activity must foster a positive body image and help build and reinforce young people's self-esteem. Particular care should be taken to avoid stigmatising or blaming overweight young people or their families.
√	Messages to young people must emphasise the light-hearted, enriching aspects of physical activity and a varied diet (fun, pleasure, new flavours, well-being, enjoying time with friends, etc.) and cater for their preferences. Health- and illness-related messages must play a secondary role.
√	In order to support healthcare professionals' educational work, public healthcare services must provide written or audiovisual materials to support professionals and families. The contents of these must be non-discriminatory and culturally adapted to different social groups.
√	Activities and messages must be suited to the specific characteristics of each young person and his/her family, in line with their needs and preferences. Strategies or techniques such as motivational interviews may be appropriate in these processes.
A	It is recommended that babies be exclusively breastfed for six months, due to the many benefits of breastfeeding to children's health.

5.3. Community interventions

Questions to Answer

In children and adolescents of normal weight:

- How effective are community interventions in preventing obesity?
- How effective are community interventions in improving diet, increasing physical activity levels or reducing sedentary lifestyles?

Various published RCTs have analysed community interventions, i.e. those based outside schools or healthcare centres, in preventing childhood obesity. With some exceptions, many of these studies were conducted in the USA. They were generally small and lasted less than a year, and several of them were conducted in socially disadvantaged groups. Nearly all found modest improvements in diet- and exercise-related behaviour.

No studies have been identified which evaluated interventions based on a broader community, or interventions in health policy.

5.3.1 Dietary interventions

One RCT analysed an intervention designed to reduce the consumption of sugary drinks in 103 adolescents (aged 13-18 years) who drank at least one portion of fizzy drinks per day¹⁹³. Drinks with low calorie contents (water or soft drinks) were delivered to the homes of the adolescents in the intervention group every week for 25 weeks, free of charge, and they were also advised not to drink higher-calorie drinks. RCT 1-

Consumption of sugary drinks fell by 80% in the intervention group and remained unchanged in the control group. The change in BMI was not statistically significant. Subgroup analysis, according to BMI at the beginning of the study, did show significant differences in the subgroup with the top third of BMIs before the beginning of the study: the difference was -0.75 ± 0.34 kg/m² compared to the control group.

5.3.2 Exercise-based interventions

A RCT conducted in 953 12 year-olds and lasting for four years aimed to alter their attitudes towards physical activity, promote moral support from families and teaching staff and provide environmental and institutional conditions so that the children would use their knowledge and skills to change their habits¹⁹⁴. Children in the schools randomised to the intervention group were offered chances to take physical exercise in break times and lunch hours and after lessons. RCT 1+

After four years, results were obtained for 732 participants and small, significant decreases in BMI were observed in the intervention group (difference between groups: 0.25 [CI 95%, -0.51 to 0.01]). Participants of normal weight showed a smaller increase in body fat index, while in those who were overweight the results were not sustained over time. Increases in physical activity levels and decreases in time spent watching television were also observed, independently of initial weight.

One RCT¹⁹⁵ evaluated the efficacy of a team football programme at the end of the school day in preventing obesity in 21 Americans aged 9-10 years who were overweight (BMI \geq P85) and of low socioeconomic status and belonged to ethnic minorities. The children were randomised to the football programme for six months, or to a health education intervention. In comparison to the control group, those who played football showed significant decreases in BMIz (difference 0.08, statistically significant in comparison to the control group) and significant increases in physical activity. This was an acceptable intervention for this group. RCT 1-

Three controlled, non-randomised community trials involving physical exercise interventions have been identified. The first of these¹⁹⁶ involved 28 children aged 8-11 years, including physical exercise after school and exercises to develop strength and muscle resistance. These activities lasted up to one hour per day, depending on the task, three times a week for ten weeks. There were no changes in body fat measured using skin fold tests at the end of intervention.

Controlled,
non-
randomised trial
2+

Another study¹⁹⁷ involved 22 families (23 children) aged 6-16 years. It evaluated educational and physical activities for children and their families, including aerobic exercise, healthy snacks and nutritional education, with eight weekly sessions over three months. No differences were found in BMI and there were no changes in physical activity levels, but there was a drop in saturated fat consumption.

Controlled,
non-
randomised
trial
2+

Lastly, another study¹⁹⁸ evaluated an intervention in 79 children aged 7-11 years. This was based on a physical training programme with financial rewards, lasting 40 minutes per day, five days a week, for four months. A 2.2% reduction in body fat and abdominal subcutaneous adipose tissue was observed.

Controlled,
non-
randomised
trial
2+

5.3.3. Dietary and exercise-based interventions

The Girls' Health Enrichment Multi-Site (GEMS) study included four RCTs with a target population of African American pre-teen girls (aged 8-10 years) and their families¹⁹⁹⁻²⁰². These trials were conducted over 12 weeks in USA, and aimed to evaluate GEMS' acceptability and viability.

RCT
1-

The RCTs concentrated on changing dietary and exercise-related behaviour and improving self-esteem, with a different emphasis in each one. The control groups of each trial were offered a less wide-ranging intervention (reinforcement of self-esteem and awareness programme). All four had common data-collection methods initially and at 12 weeks. The authors acknowledged that the small number of participants gave insufficient statistical power to compare changes in BMI, and no significant differences were observed, although all showed positive trends in the anthropometry of the intervention groups. Positive trends were also found for behavioural changes in all four trials, some of them significant.

One RCT compared a community intervention with a control group in 730 children (aged 5-12 years), randomised by school²⁰³. Coordinators were provided in the intervention schools, and they promoted community activities to encourage the children to be more physically active, increasing extracurricular activities in break times and lunch breaks and participation in after-school activities (games, housework, gardening, etc.).

RCT
1+

In the second year, simple messages on healthy eating (reduced consumption of sugary drinks, increased fruit and vegetable consumption), a triathlon game involving cards and an increase in PE equipment at school were added. Z scores for average BMI were (significantly) lower in the intervention group than in the control group, at the end of both the first year (adjusted difference -0.09, CI 95%, -0.18 to -0.01) and the second year (-0.26, CI 95%, -0.32 to -0.21), with some relationship to the difference in initial weight (boys in the intervention group were somewhat slimmer). Girth was also somewhat lower in the intervention group in both follow-up measurements.

A controlled, non-randomised trial conducted in Australia²⁰⁴ evaluated a multidisciplinary intervention for community empowerment to promote healthy eating and physical exercise (Be Active Eat Well) in 1,001 children aged 4-12 years. At three years, the children in the intervention group showed lower increases than those in the comparison group, and statistically significant differences (comparing different groups) in weight (mean: 0.92 kg, CI 95%, -1.74 to -0.11), girth (-3.14 cm, -5.07 to -1.22), girth/height (-0.02, -0.03 to -0.004) and BMIz (-0.11, -0.21 to 0.01).

Controlled,
non-
randomised
trial
2+

A controlled, non-randomised trial²⁰⁵ analysed a community intervention in 631 children aged 6-8 years who attended state schools in Massachusetts, and used 1,065 children from another two cities in the same state, with similar socioeconomic profiles, as controls. The percentage of individuals with BMI>P85 was high in the children in all three groups: 44%, 36% and 43%. The intervention was multidisciplinary and included various components aimed at achieving a suitable energy balance, increasing physical activity options and the availability of healthy food during the day in all environments: before, during and after school, at home, at school and in the community. It required the participation and involvement of many different people: children, families, teachers, school canteen staff, local council departments, medical staff, extracurricular programmes, restaurants and the media.

Controlled,
non-
randomised
trial
2+

The main result measured was BMIz, which at the end of the first year of the intervention showed a better result in the intervention group, with a difference of -0.1005 compared to the control groups (CI 95%, 0.1151 to -0.0859, p=0.001).

KidFIT²⁰⁶, a before-and-after study with no control group, evaluated the efficacy of a six-week intervention consisting of various different components designed to encourage physical exercise and healthy eating in 120 children aged 6-12 years. They belonged to socially disadvantaged groups in Houston and had high percentages of overweight children (54%) or children at risk of overweight (71% with BMI≥P85).

Before-&-
after study
3

At the end of the study, there was a decrease in the weight of the overweight children (0.3 ± 0.2 kg [standard error]) and in BMI (0.1 ± 0.1 kg/m²). In children of normal weight before the study, both weight (0.4 ± 0.1 kg) and BMI (0.2 ± 0.1 kg/m²) increased. Statistically significant improvements were also observed in the suppleness, stamina and muscle strength of all the children.

Evidence summary

Dietary interventions	
1-	The reduction in the consumption of sugary drinks in adolescents aged 13-18 years who were enrolled in a community programme showed slight decreases in BMI, particularly in those with the highest BMIs ¹⁹³ .
Exercise-based interventions	
1+	A multidisciplinary programme involving families and teachers and including institutional and environmental strategies led to slight changes in BMI, increased physical activity levels and a decrease in time spent watching television ¹⁹⁴ .
1-	An extracurricular football programme led to a slight decrease in BMI and was effective in increasing physical activity levels ¹⁹⁵ .
Dietary and exercise-based interventions	
1-	Programmes to promote healthy eating and physical exercise in the community have yielded inconsistent results: four RCTs in African American girls, lasting 12 weeks, were not effective in reducing BMI ¹⁹⁹⁻²⁰² , whereas a two-year RCT in Australian children showed moderate decreases in BMI ²⁰³ .

Recommendations

B	For children and adolescents, sugary drinks should be limited. Community programmes that encourage drinking fewer sugary drinks and contribute to drinking water should be promoted.
✓	The relevant authorities should take steps to restrict the range and promotion of foods containing high levels of unhealthy fats or sugars (sugary drinks, pastries, deli products, etc.).
✓	Production and availability of fruit and vegetables should be encouraged using fiscal policies or subsidies.
✓	Advertising aimed at children and adolescents for products that contain high levels of unhealthy fats or sugars should be restricted.

√	It should be made compulsory to label processed food with nutritional information and information on potential health-damaging effects.
B	Physical activity programmes outside school hours are recommended for children and adolescents. These must be suited to their ages and preferences.
B	Community programmes that aim to encourage a healthy lifestyle, healthy eating and physical exercise are recommended for children and adolescents.
√	Safe, pleasant spaces and suitable infrastructures for playing and sport for children and adolescents should be created in public areas.
√	Specific actions (free entry, benefits, etc.) should be launched to provide access to municipal sporting facilities for children, adolescents and relatives from socially disadvantaged groups.

5.4. Family-based interventions

Questions to Answer

In children and adolescents of normal weight:

- How effective are family-based interventions in preventing obesity?
- How effective are family-based interventions in improving diet, increasing physical activity levels or reducing sedentary lifestyles?

The dividing line between community and family-centred interventions is very complex, as families are generally involved in many of the interventions carried out both in the community and in schools and health-care centres. Even so, this section describes some RCTs, all conducted in the USA, which analyse various interventions aimed primarily at families. These studies are generally small, and several of them were conducted in groups with unfavourable socioeconomic conditions. They show that various interventions in these groups have positive effects in promoting healthy diet- and exercise-related behaviour in children.

A family-centred intervention consisting of taking 2,000 extra steps per day and eating cereal in 105 families with children (aged 8-12 years) who were overweight or at risk of becoming overweight was evaluated in a 13 week RCT²⁰⁷. The intervention was effective both in reducing children's BMI and body fat and in reducing their relatives' weight, BMI and body fat percentage as compared to the control group. Subgroup analysis showed that the positive effects of the intervention occurred mainly in girls and mothers.

RCT
1-

Another RCT (192 families)²⁰⁸ evaluated the effects of taking 2,000 extra steps per day and reducing food intake by 100 Kcal per day, replacing sugar consumed with a calorie-free sweetener. The control group was asked to use pedometers, but was not given any exercise or dietary targets. At six months, the children in both groups showed significant decreases in BMI for their age, but a greater percentage of the children in the group that had been set targets maintained or reduced their BMIs. There were no significant increases in BMI during the trial period in the relatives of either group.

RCT
1-

One RCT randomised 87 families into three groups: use of pedometer and educational advice, pedometer alone and a control group²⁰⁹. Those who received pedometers were encouraged to take 10,000 steps a day for 12 weeks. At the end of the trial, slight decreases were observed in the weight of children and their relatives, along with increased activity levels, which were similar in both groups given pedometers to use. However, most were unwilling to continue using the pedometers after the end of the trial.

RCT
1-

In one RCT, 43 Indian American mothers with pre-school children (aged between 9 months and 3 years) were randomised to an educational intervention or a control group (the usual childrearing programme) for 16 weeks²¹⁰. Fifty-four percent of the children were boys, and their mothers had BMI > 25. The percentage of children classified as obese (obesity defined as z score of weight for height > P95) was 3% in the intervention group and 5% in the control group.

RCT
1-

At the end of the intervention, maternal BMI and prevalence of obesity were not significantly different, but calorie intake had fallen in the intervention group and increased in the control group in mothers and their children.

Another RCT analysed an intervention aimed at obese parents whose children were not obese, in order to alter their behaviour by increasing fruit and vegetable consumption or reducing consumption of food with high levels of fats and sugars²¹¹. The results at one-year follow-up showed improvements in the consumption of healthier food and a decrease in consumption of less healthy food, both in family members and in the children themselves, and the percentage of overweight adults fell.

RCT
1-

A controlled, non-randomised pilot study²¹² evaluated a one-year intervention to promote healthy habits in the families of pre-school children. The study consisted of attending group educational sessions and visits to a nutritionist. Statistically significant positive effects (in comparison to the control group) were observed in the frequency with which children were offered water instead of sugary drinks and the number of times family members played active games with the children.

Controlled,
non-
randomised
trial
2+

Evidence summary

1-	Interventions aimed at parents and designed to improve dietary habits and increase physical activity levels show slight changes in children's BMI, and minor improvements in diet and physical activity levels in the whole family ²⁰⁷⁻²¹¹ .
----	---

Recommendations

B	It is important to involve parents in programmes which aim to improve diet and increase physical activity levels in order to prevent obesity.
√	Educational programmes that target the family so as to encourage a healthy lifestyle are needed. These must cover healthy eating, education to understand nutritional information on food labels and the promotion of active leisure activities.
√	Children should be involved in food shopping. Simple cooking techniques should be encouraged.
√	Children should eat regular meals, with their families and without distractions (television, etc.).

6. Treatment

6.1. Lifestyle interventions

For overweight children and adolescents, and for most of those who are obese, maintaining a constant weight is considered an acceptable target until BMI is below P85 (of the CDC [Centres for Disease Control and Prevention] tables), unless the child presents comorbidities or is above P99. In this case, gradual weight loss is required, not exceeding 400 g per month in children aged 2-5 and not exceeding 800 g a week in children and adolescents aged 6-18. Tracking girth, an indirect estimator of visceral fat content, should also be considered when treating childhood and juvenile obesity, although not all studies provide data on this. There are national references published in Spain²¹⁴.

Various lifestyle interventions designed to control the weight of children and adolescents have been evaluated, including advice on nutrition and exercise, behavioural treatments, reducing sedentary activities and moral or psychological support. To date, combined interventions (diet, exercise and changes to behaviour) have proved the most effective, particularly if parents are involved in treatment^{43,44,53,88}. Many studies have been conducted in specialist outpatient centres within university hospitals, and are generally of poor methodological quality.

6.1.1 Dietary interventions

Questions to Answer

In overweight or obese children and adolescents:

- How effective is nutritional intervention in weight loss or maintenance and other specified outcomes?

Various dietary proposals to promote weight loss in the paediatric population have been studied. These include low-calorie diets and other micronutrient-altering diets (protein-rich, fibre-rich, low-glycaemic index or low-fat diets). The most commonly-used diet within combined intervention programmes is the Traffic Light Diet (TLD)²¹⁵.

The TLD groups foods into three categories corresponding to the colours of traffic lights: “green” foods contain 0-1.9 g fat per portion, “amber” foods contain 2.0-4.9 g, and “red” foods contain 5 g or more. The aim is to promote the consumption of “green” foods and reduce that of “red” foods, according to the food pyramid²¹⁶⁻²¹⁸ (see Appendix 3). To date, no studies have compared this diet with any other, although combined interventions (including physical exercise and behavioural therapy) which have used this diet have shown moderate improvements in overweight five and ten years after the intervention²¹⁹⁻²²¹.

Several SRs of studies that evaluate the efficacy of nutritional intervention for paediatric overweight and obesity have been identified, although most also include other interventions. This section therefore evaluates interventions in which the main component is nutrition-related.

One SR (37 RCTs, 51 observational studies) evaluated interventions that included a dietary component in the treatment of overweight or obese children and adolescents²²². Most studies included physical exercise, behavioural therapy, cognitive behavioural therapy or reduced sedentary behaviour. The diets evaluated were low-calorie diets, the TLD, low-fat diets and slight variations on these.

Participants’ ages ranged from 3 to 18 years. Both the RCTs (2,200 patients) and the observational studies (6,000 patients) showed high levels of heterogeneity and poor methodological quality, although dietary interventions yielded a short-term relative weight loss in comparison to a control group or various treatment combinations. The authors concluded that there is insufficient information to determine the long-term efficacy of dietary interventions, or to recommend any specific diet. Although meta-analysis of eight RCTs showed a significant reduction in weight after the intervention as compared to no intervention (SMD 1.82, CI 95%, -2.4 to -1.23), these results may not be reliable, due to the poor quality of the studies examined.

Another SR included trials (randomised and non-randomised) which evaluated dietary interventions in obese children or adolescents using a comparator group⁴². Dietary interventions combined with physical exercise or behavioural therapy were included, provided that the treatment groups differed only in the dietary interventions. These were divided into four groups: low-carbohydrate diet (≤ 20 g or $\leq 10\%$ of total calories), medium-carbohydrate diet (45%–50% of calories), low-glycaemic index diet and low-calorie diet. Only nine trials were ultimately included, and these were poor-quality and short-term. Low-carbohydrate and low-glycaemic index diets were as effective as low-calorie diets in short-term weight loss, but none of the studies provided information on long-term weight control. This same conclusion was reached by another SR, which also included trials conducted in adults and only one RCT involving adolescents²²³.

SR of various types of study

1-

SR of various types of study

1-

Nutritional interventions were evaluated in a CPG⁵³, although the small number of studies, their poor quality and their methodological limitations make it difficult to draw valid conclusions on the various diets involved. This guideline therefore highlights the need to conduct long-term RCTs in obese paediatric patients, evaluating the various diets. NICE's CPG⁴³ concluded that the main requirement for a dietary approach to weight control is to reduce total calorie intake. Any recommended diet should be consistent with other healthy eating advice.

CPG
4

A link has been suggested between diets and eating disorders, although it has not proved possible to establish a direct causal relationship. This link seems common in groups with moderate or severe dietary restrictions²²⁴ or those with unhealthy dietary habits²²⁵, as reported by the guideline of the Canadian Medical Association⁵³. Some studies indicate that weight-loss interventions administered by professionals pose an insignificant risk of triggering eating disorders²²⁵⁻²²⁷.

Observational
studies
2-/3

Evidence summary

1-	Studies identified which involve nutritional interventions in overweight or obese children and adolescents are short-term and poor-quality, and do not evaluate long-term weight loss. It is therefore not known which diet is the most effective in treating paediatric overweight and obesity ^{42,222,223} .
1-	Low-carbohydrate and low-glycaemic index diets have been shown to be as effective as low-calorie diets in short-term weight loss ⁴² .

Recommendations

✓	A healthy, balanced diet according to the healthy eating pyramid is recommended for children and adolescents who are overweight or obese.
✓	Dietary intervention for children and adolescents who are overweight or obese must not be a one-off event. Instead, it must be carried out as part of a change in lifestyle, including physical exercise, behavioural therapy and family-centred actions.
✓	For children and adolescents who are overweight or obese, calorie intake must be lower than the energy they expend, and changes to their diet must be customised and consistent with healthy eating. The use of restrictive, unbalanced diets is not recommended, as these are not effective in the long term and may prove dangerous.
✓	Advice on changes to diet must be given by healthcare professionals who deal with children and adolescents regularly.

D	Professionals in charge of looking after children and adolescents who are overweight or obese must pay particular attention to any risk factors or signs of eating disorders.
---	---

6.1.2 Exercise-based interventions

Questions to Answer

- In overweight or obese children and adolescents, how effective is physical exercise or active play in weight loss or maintenance and other specified outcomes?

Physical exercise is beneficial for people who are overweight or obese because it helps them lose weight and control other cardiovascular risk factors, particularly if combined with interventions to alter their diet²²⁸.

One SR (14 RCTs, 481 participants) showed that aerobic exercise (155 180 min/week) of moderate-high intensity is effective in reducing body fat in children and adolescents (average age 12 years) who are overweight or obese (SMD of body fat percentage -0.4, CI 95%, -0.7 to -0.1), and encourages physical exercise²²⁹. However, no significant changes in body weight (weighted mean difference [WMD] -2.7 kg, CI 95%, -6.1 to 0.8) or outcomes related to central obesity (SMD -0.2, CI 95%, -0.6 to 0.1) were observed. The studies included evaluated the efficacy of physical exercise alone or in combination with other interventions.

SR of RCTs

1-

A RCT randomised 53 children aged 12 years with BMI>P95 who attended the same school to gym lessons which aimed to improve lifestyle and physical fitness (14 students in each class), or to normal gym lessons (35-40 pupils per class)²³⁰. At nine months, significant reductions in fat percentage were observed in the treatment group as compared to the beginning of the study and the control group. Although there were also improvements in cardiovascular fitness (max. VO₂) and fasting insulin levels in the treatment group, no significant changes in BMI were observed. Seventeen of these 53 children were randomised to another year's treatment and evaluated after the summer holidays²³¹. The results obtained, in comparison with those from June the previous year, showed that the benefits of the intervention during the school year were lost during the school holidays.

RCT

1-

The BMIs of 28 obese adolescents (aged 11-16 years) also failed to fall after a physical exercise programme supported by cognitive behavioural techniques. The main aim of this RCT (81 participants) was to evaluate the effect of physical exercise on psychological outcomes. A secondary aim was to evaluate its effect on BMI and other outcomes, such as increased physical exercise levels²³². The participants were randomised to a physical exercise treatment group (with moderate-intensity aerobic exercise), a placebo group with gentler physical exercise or normal treatment. At 28 weeks, there were significant differences in the mean adjusted scores on the physical self-worth scale between the exercise treatment group and the other two groups (mean difference 0.23, p=0.04), but there were no significant changes in BMI in any of the groups.

RCT
1+

Some studies show that physical exercise can improve health and obesity-associated comorbidities in young people suffering from obesity^{233,234}, e.g. by improving their insulin levels. This means that physical exercise reduces cardiovascular risk factors. To achieve satisfactory cardiovascular and aerobic fitness levels, training must be arranged in intervals of varying intensity²³⁵.

Observational
studies
2-

Evidence summary

1+	Physical exercise programmes used in children and adolescents to treat overweight or obesity have not proved more effective in reducing BMI than their usual activities ²³² . However, the studies available do show that physical exercise can temporarily reduce body fat percentage ^{229,230} and cardiovascular risk factors ^{233,234} .
----	---

Recommendations

√	For children and adolescents who are overweight or obese, spontaneous physical activity should be increased by more than one hour a day in order to encourage weight loss and cardiovascular health. Such physical activity may include outdoor play, helping with housework, walking to school, using stairs instead of lifts, etc.).
√	Physical exercise suited to age and interests is recommended for children and adolescents who are overweight or obese. It should begin slowly and gradually increase in intensity and duration.

6.1.3 Interventions to reduce sedentary lifestyles

Questions to Answer

- In overweight or obese children and adolescents, how effective is reducing sedentary lifestyles in weight loss or maintenance and other specified outcomes?

Sedentary lifestyles, particularly the amount of time spent watching television, playing video games and using computers, has been associated with obesity in children and adolescents^{236,237}. Time spent watching television encourages calorie intake for two reasons: the increase in food consumption while watching television, and exposure to advertisements which encourage this²³⁸⁻²⁴³. This section reviews the efficacy of reducing sedentary lifestyles in treating childhood and juvenile obesity, although little information has been identified for this type of intervention alone.

Observational studies
2-/2+

1+

One SR (12 studies) evaluated the efficacy of interventions which aimed to limit sedentary behaviour in children and adolescents (aged 8-12 years) in order to achieve changes in behaviour and control weight²⁴⁴. Six of the studies were conducted in a clinical environment, and six were population-based preventive studies. The duration of the interventions varied greatly, but most lasted between six weeks and two years, with follow-up ranging from four weeks to one year. The results show that these interventions reduced sedentary behaviour and improved weight slightly. As the messages aimed at reducing sedentary behaviour were combined with other interventions, it is impossible to estimate how much weight loss is due to these messages.

SR of various types of study
1+

Thirty children aged 8-12 years with BMI>P85 were randomised to an intervention consisting of monitoring their physical exercise levels and rewarding it with time spent watching television, or to a control group, which underwent monitoring of physical exercise alone²⁴⁵. At eight weeks, a significant increase in time spent on physical exercise and a reduction in sedentary behaviour were observed in the intervention group as compared to the control group. The decrease in sedentary behaviour was also associated with reductions in weight ($r=0.70$, $p<0.001$), BMI ($r=0.54$, $p<0.05$) and calories from a fatty diet ($r=0.68$, $p<0.001$).

RCT
1-

On the basis of studies conducted in the USA, NICE's guideline⁴³ concludes that dealing with sedentary behaviour is as effective as promoting physical exercise in controlling the weight of obese children aged 8-12 years, within a specialised weight control programme.

CPG
4

Evidence summary

2-	Time spent watching television and playing video games has been associated with obesity in children and adolescents ^{236,237} .
1+	Interventions aimed at reducing sedentary behaviour in children (aged 8-12 years) are effective: they slightly reduce BMI and sedentary behaviour ^{244,245} .
1-	Reducing sedentary behaviour is effective in reducing calorie intake ²⁴⁵ .

Recommendations

D	In order to reduce their sedentary lifestyles, a maximum of 1½ hours a day watching television or playing video games is recommended for children and adolescents who are overweight or obese.
B	Reducing sedentary lifestyles is recommended for children and adolescents who are overweight or obese, in order to treat childhood and adolescent overweight and obesity.
√	Televisions, video consoles and computers should be removed from the bedrooms of children and adolescents who are overweight or obese.

6.1.4 Psychological treatment

Questions to Answer

- In overweight or obese children and adolescents, how effective is psychological treatment in weight loss or maintenance and other specified outcomes?

This section describes some studies involving isolated psychological interventions. However, most studies identified that involve psychological interventions are part of combined interventions, and are therefore evaluated in the following section.

Normal dietary treatment was compared with an intervention consisting of eight appointments with a dietician trained in behavioural techniques so that the child and his/her family would make changes to their lifestyles²⁴⁶. One hundred and thirty-four children aged 5-11 years with BMI_Z≥P98 were randomised in this RCT. BMI_Z, the main outcome, showed no significant differences between the two groups from the beginning to six or twelve months later, although significant benefits were observed in physical activity levels and reduced sedentary behaviour in the intervention group. RCT 1+

The effectiveness of cognitive behavioural therapy was evaluated in a RCT in which 47 adolescents (mean age 14.5±1.6 years, BMI 30.9±4.2) were randomised to the intervention group (ten weekly sessions of cognitive behavioural therapy and five fortnightly telephone sessions) or the control group (no treatment)²⁴⁷. In comparison to the control group, in the intervention group significant changes were observed in BMI (intervention: 1.3±0.4, control 0.3±0.3), weight (1.9±1.0 kg and 3.8±0.9 respectively), body fat (-1.5±0.9 kg and 2.3±0.9) and reduced consumption of sugary drinks. RCT 1-

A group treatment programme promoting a healthy lifestyle and involving family members was compared to normal treatment (two individual consultations with nursing staff) in 70 obese children aged 7-9 years (weight-for-height ranging from 120% to 200%)²⁴⁸. The intervention consisted of fifteen 90 minute sessions for parents and children separately, in which a healthy diet and physical exercise were recommended and behavioural techniques were offered, with no specific weight control. At six months, a change in weight-for-height of -6.8 (CI 95%, -8.9 to -4.7) was observed in the group that received the group programme, as compared to the normal treatment group (-1.8, -3.9 to 0.4).

RCT
1+

One RCT²⁴⁹ evaluated the efficacy of adding “adventure therapy” to a cognitive behavioural programme for weight control in overweight adolescents. Adventure therapy aims to increase self-esteem by relying on peers to promote change to achieve greater levels of suppleness and physical coordination. 76 adolescents aged 13-16 years (with overweight 20% to 80%) were randomised. Both groups attended 16 weekly sessions and 4 monthly sessions of the same cognitive behavioural intervention, were prescribed a low-calorie diet and were encouraged to increase their physical activity levels. The control group also took part in weekly aerobic exercise sessions, and the intervention group had an “adventure therapy” session, with group activities consisting of mental and physical challenges that aimed to develop social skills and self-confidence. At ten months, 35% of the treatment group showed weight loss ≥ 4.5 kg, compared to 12% of the control group.

RCT
1+

Regarding psychological treatment, NICE’s CPG⁴³ concluded that behavioural therapy may be more effective than conventional treatment, and may yield better results in children and adolescents aged 6-16 years, if parents take responsibility for changing behaviour. NICE concluded that the information on comparisons of this type of therapy with problem-solving is contradictory. The studies of cognitive behavioural therapy evaluated by NICE also failed to show consistent results, as did other psychological techniques such as contingent reinforcement or stimulus control.

CPG
4

Evidence summary

1-	Cognitive behavioural therapy has shown moderate short-term reductions in BMI in obese adolescents ^{247,249} . In children, a group treatment programme involving behavioural techniques also moderately reduced weight at six months ²⁴⁸ , but consulting a dietician with behavioural training did not lead to any changes in BMI ²⁴⁶ .
----	--

Recommendations

B	Psychological support (behavioural or cognitive behavioural therapy) is recommended for the treatment of overweight and obesity in children and adolescents.
√	Therapy aimed at reducing stress and other psychological techniques (goal-setting, self-monitoring, etc.) are recommended for the treatment of obesity in children and adolescents.
√	Individual or group psychological treatment should be included in combined interventions for children and adolescents suffering from obesity.

6.1.5 Combined interventions

Questions to Answer

- In overweight or obese children and adolescents, how effective are combined interventions in weight loss or maintenance and other specified outcomes?

Recent studies involving multidisciplinary programmes (diet and physical exercise with or without changes to behaviour) have yielded better results in the treatment of childhood obesity than programmes consisting of only one type of intervention. Family involvement is also important, and is associated with sustained weight loss in obese children⁵³.

Three SRs evaluated the efficacy of interventions that targeted lifestyle, diet, physical exercise and/or behavioural treatment for weight loss in children and adolescents^{41,250,251}. All three SRs showed that the evidence identified had major methodological limitations, and although the interventions had significant short-term effects in comparison with no treatment, waiting lists or standard advice on diet and exercise as a control group, the long-term effects of the interventions were not evaluated.

The following section describes the studies identified in the literature search, classified according to the various environments in which they were conducted.

Healthcare setting

One RCT that compared a programme including exercise, changes to behaviour and nutrition (Bright Bodies) with a control group in 209 young people (aged 9-16 years) with BMI>P95 showed a significant reduction in weight-related outcomes at six months and at one year²⁵². The intervention was conducted in a paediatric obesity clinic, and consisted of twice-weekly sessions for six months and weekly sessions for another six months. Fifty minutes of each session were spent on exercise, and the other 40 minutes on nutritional and behavioural education. Families also attended all sessions.

SR of RCTs
1-

RCT
1-

Participants in the control group attended one appointment every six months and received advice on diet and exercise. At one year, the BMI of the treatment group showed a decrease of -1.7 (CI 95%, -2.3 to 1.1), versus an increase of +1.6 (0.8 to 2.3) in the control group. Weight increased much less in the intervention group (+0.3 kg, CI 95%, -1.4 to 2.0) than in the control group (+7.7 kg, 5.3 to 10.0), and body fat percentage fell (4.0, -5.2 to -2.8 and +2.0, 0.5 to 3.5 respectively).

Reducing BMI was the aim of a RCT conducted in 29 primary care centres in Australia²⁵³. One hundred and sixty-three children aged 5-12 years with overweight or slight obesity (defined according to the criteria of the International Obesity Task Force [IOTF]) were randomised to the intervention or the control group. The intervention consisted of four consultations over 12 weeks, attended by the child and his/her family, which covered aspects of nutrition, physical exercise and sedentary behaviour, and support material was provided for families in order to aid changes to behaviour. At 15 months, there were no differences in adjusted BMI between the intervention group and the control group. However, the intervention group did show a significant improvement in diet as compared to the control group. This improvement remained at 15 months, and was due mainly to increased skimmed milk and water consumption in the families in the intervention group.

RCT
1+

A three-month RCT evaluated a combined intervention consisting of several sessions of nutritional education, a low-calorie diet and two hours of physical exercise per week in 46 obese schoolchildren and adolescents (BMI > P95, aged 6-16 years), in comparison to a control group (one nutritional consultation and promotion of physical exercise)²⁵⁴. At three months, significant decreases in BMI were observed in the intervention group (1.7 ± 1.1 kg/m² vs -0.2 ± 1.0 kg/m² in the control group), as well as significant decreases in fat percentage ($3.3 \pm 2.6\%$ vs $1.4 \pm 4.7\%$) in the treatment group, and a significant increase in their usual activity index. One year after the intervention, these changes remained.

RCT
1-

Individual out-patient follow-up (with dietary advice and encouragement of physical exercise) was compared with a group educational programme involving families in a study with 38 obese pre-teens (aged 7-13 years). At six months, significant differences were observed in sporting activities in the educational programme group. Although these strategies led to changes in dietary and exercise habits, no changes in BMI were observed in either group²⁵⁵.

RCT
1-

A before-and-after study conducted in Spain evaluated a programme that aimed to alter dietary habits, lifestyles and emotional disorders in 81 obese children (aged 6-12 years) using 11 group sessions (for parents and children separately) lasting 90 minutes each²⁵⁶. At the end of the treatment, in 72 children (88.9%), BMI had fallen by an average (SD) of 27.8 (3.8) to 26.5 (3.6) ($p<0.001$) and 3.3 (1.4) to 2.6 (1.2) ($p<0.001$). BMI had not changed or had worsened in 9 children. There was an increase in the percentage of children who ate fruit (from 63.3% to 82.7%, $p<0.001$) and vegetables (from 45.6% to 88.2%, $p<0.001$) every day, and a decrease in the percentage of children who ate pastries (from 17.7 to 1.3%, $p<0.001$) or skipped breakfast (from 36.7% to 11.7%, $p<0.001$). Scores on anxiety and depression scales fell from a mean of 53.46 (27.69) to 47.22 (26.3) ($p=0.03$), and from 29.68 to 16.88 ($p<0.001$) respectively, as did the number of children at risk of displaying anxiety and depression (from 38.8% to 22.5%, $p<0.001$, and from 15% to 8.2%, $p=0.01$ respectively).

Before-&-
after study
2-

One before-and-after study evaluated an intervention involving diet, physical exercise and behavioural therapy conducted in 170 schoolchildren (mean age 10 years) who were obese as defined according to the criteria of the IOTF. The schoolchildren took part in an outpatient programme lasting one year²⁵⁷. At the end of the intervention there were significant reductions in BMI SD as compared to the beginning of the intervention. These reductions remained until the end of follow-up at three years.

Before-&-
after study
2-

BMI and dietary habits remained unchanged after a six-month pilot study conducted in 27 children aged 7-16 years with $BMI>P90$ ²⁵⁸. The intervention, conducted by family doctors, consisted of giving two talks on a healthy diet and exercise to both groups. The intervention group had to record the food they ate and the exercise they took every day in a diary, and they were phoned every week to improve their compliance with the treatment plan.

Controlled
non-
randomised
trial
2-

School setting

One RCT evaluated the quality of life of 80 children and adolescents (average age 12.1 years, $BMI>P85$) who underwent a school intervention consisting of lessons on nutrition, physical exercise and behavioural strategies, compared to a control group which was given a self-help book²⁵⁹. At six months, a significant reduction in the BMIz of the group that took part in the programme was observed (0.13 ± 0.14), as was a slight increase in BMIz in the control group ($+0.04\pm 0.12$). No data comparing the two groups are available. Quality of life (measured using a paediatric questionnaire) increased considerably in the group that took part in the programme, particularly regarding physical well-being.

RCT
1-

Sixty young people with BMI \geq P95 showed a drop in weight (-1.5 kg \pm 3.2 in the intervention group vs 2.3 kg \pm 4.7 in the control group), BMI (-1.1 \pm 1.3 vs 0.4 \pm 1.5) and body fat (-1.6% \pm 1.8 vs 1.2% \pm 2.6) in comparison to sixty other children in a control group, following an educational programme involving PE sessions which was conducted in a school in Taiwan. This RCT²⁶⁰, which lasted three months, aimed to evaluate the efficacy of this educational intervention in terms of body weight and risk factors for type 2 diabetes and cardiovascular disease in children aged 10-13 years.

RCT
1-

An after-school programme involving families, which consisted of nutritional education, physical exercise and behavioural therapy, showed a smaller increase in BMI in the intervention group than in the control group²⁶¹. This non-controlled clinical trial, which lasted eight months, aimed to reduce BMI and improve motor skills. Two-hundred and seventy-six overweight or obese children were invited to take part, although only 185 completed the programme.

Before-&-
after study
2-

Family setting

One SR (16 studies, 44 treatment or control groups) compared the effects of family-based behavioural interventions with those of other treatments or controls in weight loss in children aged 5-12 years²⁶². Family/behavioural treatments showed a significant mean effect size (-0.89 [SD 0.68], CI 95%, -1.06 to -0.73) in comparison to other treatments or controls, although there was a great deal of heterogeneity. Family involvement varied between studies: in some they were treated for obesity, and in others trained to promote exercise and healthy eating in their children.

SR of RCTs
1-

Another two SRs showed significant improvements in weight-related outcomes in most of the studies included, although no overall conclusions were drawn due to the poor quality of the studies^{263,264}. The studies included evaluated interventions designed to treat childhood obesity using nutrition, exercise and behavioural methods, and in which at least one parent was involved to a greater or lesser extent. However, there is significant uncertainty as to the best way to involve families in the treatment of childhood obesity.

SR of RCTs
1-

One RCT evaluated the efficacy of training families as a key strategy in the treatment of overweight children²⁶⁵. This programme is based on social learning, and aims to provide families with skills to handle their children's behaviour. One hundred and eleven overweight children (as defined by the IOTF) aged 6-9 years were randomised to a group in which families were trained and lifestyle education was provided, a group with family training only or a control group. The children themselves did not attend any of the training or educational sessions. In all three groups, BMIz decreased significantly after the beginning of the study, but there were no significant differences between the three.

RCT
1+

One RCT evaluated the efficacy of an educational programme for families with overweight children in comparison to a waiting-list group²⁶⁶. Forty-three children (average age 7 years) with BMI \geq P85 were enrolled. The intervention consisted of an initial session attended by a parent and child and four weekly group sessions attended by the parent, at which the various components were provided by a paediatrician, a dietician, a physiotherapist and a psychologist. At three months there was a decrease in the BMI of the intervention group (BMI fell from 26.4 [SD 2.1] to 24.8 [3.2] in the treatment group, and from 26.4 [2.3] to 26.5 [4.0] in the control group), although there were no differences between the groups in terms of physical exercise, reduced sedentary behaviour or family behaviour.

RCT
1-

Another family-based intervention, which compared educational sessions with families alone and sessions with both families and children, was evaluated in a RCT involving 32 families²⁶⁷. The sessions promoted healthy eating, increased physical exercise levels and reduced sedentary behaviour, and provided families with tools to improve their authority. The children's average age was 8.7 years, BMI>P85. At six months BMIz in the group with family participation had fallen from 2.0 to 1.6 (p<0.05), whereas in the group in which sessions were attended by families and children BMIz fell from 2.1 to 2.0. There were also significant differences between groups regarding the percentage of overweight children and BMIz. Physical activity levels increased and sedentary behaviour fell in both groups, and there was a significant decrease of 22% in overall obesity-linked habits in the family group (as compared to the beginning of the trial) and 15% in the group involving families and children.

RCT
1-

A family-based behavioural treatment programme showed a significant reduction in BMI at two years (2.6 [SD 1.6] vs -0.1 [1,1]) in the control group, as shown by a study conducted in China²⁶⁸. Sixty-eight schoolchildren (average age 13 years, BMI>25) from a single class were randomised to the intervention, which consisted of changes to diet and promotion of physical exercise. The intervention was conducted within families with the support and supervision of paediatricians, or to a control group.

RCT
1-

A historical cohort study²⁶⁹ examined the efficacy of an educational treatment programme for obese children and adolescents and their families, conducted by a paediatrician at three sessions offering behavioural techniques and promoting a healthy lifestyle. One session was then held every six months for the first year, followed by one a year. One hundred and ninety children were enrolled in the study. At three years' follow-up, 72.9% of the children who remained in the programme had significantly reduced their BMI, versus 42.8% of the control group, who followed normal dietary treatment.

Observational
study
2-

Other settings

One RCT enrolled 147 obese adolescent girls (aged 12-16 years, BMI>P90) and randomised them according to the church to which they belonged, either to a “high-intensity” group (with 20-26 behavioural treatment sessions, 30 minutes of physical exercise, and cooking and eating healthy food), or a “low-intensity” group (with only six sessions). At six months’ follow-up, no significant differences in BMI were observed in either group²⁷⁰.

RCT
1-

Another RCT evaluated an online behavioural/family intervention. Fifty-seven African American girls with BMI≥P85 were randomised to this interactive programme, which promoted a healthy diet and physical exercise, versus a much more limited health education programme with no feedback. In both cases, a member of the family had to have BMI>30 and be part of the intervention or the control group. At six months, significant differences were observed in the fat percentage of girls in the treatment group (-1.12±0.47% vs 0.43%±0.47% in the control group) and the weight of their parents, but these results were not maintained over the two years the intervention lasted. Use of the website fell drastically from the sixth month of the study onwards²⁷¹.

RCT
1-

A pilot study involving 30 obese children (average age 13.5 years, minimum 40% overweight) who followed a 10 month residential programme showed a significant decrease in weight and BMI, and an increase in physical activity levels²⁷². However, these outcomes returned to their initial levels three months after the children completed the programme, which consisted of diet, regular physical exercise and psychological support.

Controlled
non-
randomised
trial
2-

A pilot study with 12 obese adolescents, which compared treatment involving a cognitive behavioural programme and physical exercise with a control group²⁷³, showed significant changes in weight and BMI after 16 sessions, although the small number of participants considerably limits the possibilities of drawing conclusions from these results.

Controlled
non-
randomised
trial
2-

A recent evaluation by a medical technology agency²⁷⁴ showed that combined interventions in schools or specialist centres may achieve moderate short-term results in terms of weight. However, the evidence that these improvements may remain up to 12 months after the intervention, and that there are few adverse effects, is much more limited.

NICE’s guideline⁴³ also concludes that behavioural treatment in combination with physical exercise and/or diet in specialist obesity treatment programmes is effective in treating children and adolescents (aged 3-18 years) suffering from obesity, and that it may be more effective if parents take greater responsibility for altering behaviour.

CPG
4

Evidence summary

	Identified combined interventions show great variation in both the type of intervention and the outcome evaluated. This makes it difficult to draw conclusions from them.
1-	Most studies conducted in clinics involving combined interventions (diet, physical exercise and changes to behaviour) show moderate short-term decreases in BMI, weight and body fat percentage in children and adolescents aged 6-16 years ^{252,254} . Various studies also show increased physical activity levels and healthier diets ²⁵³⁻²⁵⁵
1-	Two RCTs and one poorer-quality study conducted in schools, involving combined interventions (diet, physical exercise and changes to behaviour), show moderate short-term decreases in BMI in children aged 10-13 years ²⁵⁹⁻²⁶¹
1-	Three SRs showed that family/behavioural interventions were more effective than controls in weight loss ²⁶²⁻²⁶⁴ . Some subsequent RCTs involving these interventions show a moderate short-term decrease in BMI in children aged 6-13 years ²⁶⁵⁻²⁶⁸ .

Recommendations

B	Combined interventions including diet, physical exercise and changes to behaviour, with family involvement, are recommended for weight loss in children and adolescents aged 6-16 who are overweight or obese.
√	The clinical and family environments are the most appropriate settings for combined interventions for weight loss in children and adolescents who are overweight or obese.

6.2. Drug-Based intervention

Questions to Answer

In overweight or obese children and adolescents,

- How effective is sibutramine treatment in weight loss or maintenance and other specified outcomes?
- How effective is orlistat treatment in weight loss or maintenance and other specified outcomes?
- How effective is rimonabant treatment in weight loss or maintenance and other specified outcomes?
- How effective is metformin treatment in weight loss or maintenance and other specified outcomes?

Most studies on drug treatment for obesity have been conducted in adults, which means that most of the available evidence is indirect. Even these studies in adults do not provide information on morbidity and mortality or long-term safety.

The information available on anti-obesity drug treatment in adolescents is very limited, and there are no data for children. In obese adolescents, drug treatment should be used as one of the last resorts. It should only be considered in exceptional circumstances such as severe comorbidities, after lifestyle interventions have failed.

One recent SR in adolescents has been identified. This shows that drug treatment combined with lifestyle interventions has a modest short-term effect in reducing body weight²⁷⁵. No information is provided on long-term effects.

SR of RCTs
1+

In this SR, meta-analysis of three RCTs of sibutramine showed a standardised mean difference of 1.01 (CI 95%, 1.28 to 0.73), consistent with a decrease in BMI of 2.4 kg/m² (CI 95%, 1.8 to 3.1 kg/m²) after six months of treatment. Meta-analysis of three RCTs of orlistat showed a small, moderate effect (0.29, CI 95%, 0.46 to 0.12) consistent with a decrease in BMI of 0.7 kg/m² (CI 95%, 0.3 to 1.2) six months into treatment. Meta-analysis of three RCTs of metformin revealed an insignificant effect on obesity-related outcomes.

The following sections evaluate the RCTs included in this SR.

6.2.1. Sibutramine

Adults

The Spanish Agency for Medicines and Healthcare Products (AEMPS) suspended the marketing authorisation for Sibutramine on 21st January 2010 as risks of its use outweigh expected benefits.*

Sibutramine is a central monoamine reuptake inhibitor, and is sold as a coadjuvant in obesity treatment for adults (>18 years old). A recent SR that evaluated the efficacy of anti-obesity drug treatments in adults²⁷⁶ included ten RCTs of sibutramine (2,623 patients). These showed a weight loss of 4.2 kg (CI 95%, 3.6 to 4.7) in the treatment group as compared to the placebo group. Sibutramine also significantly reduced BMI, girth and triglyceride concentration, and increased HDL c. Compared to a placebo, sibutramine increased systolic blood pressure by 1.7 mmHg (0.1 to 3.3), and diastolic blood pressure by 2.4 mmHg (1.5 to 3.3). It also increased heart rate by 5.6 beats/min (3.5 to 5.6). Patients who took sibutramine reported insomnia, nausea, dry mouth and constipation at a rate of 7% to 20%.

SR of RCTs
1+

Adolescents

Five randomised trials were located that evaluated the efficacy of sibutramine in adolescents, all funded by the pharmaceutical industry and all of moderate quality.

A multicentre RCT involving 498 participants (aged 12-16 years) and lasting 12 months showed a reduction in weight of $-6.7 \text{ kg} \pm 0.5$ in the sibutramine 10 mg/day treatment group versus 1.8 ± 0.9 in the placebo group ($p < 0.001$)^{277,278}. However, blood pressure and heart rate differed significantly between the two groups throughout the study. Mean differences were 1.0 mmHg (0.1 to 1.9) for systolic pressure, 1.7 mmHg (1.0 to 2.5) for diastolic pressure and 2.5 beats/min (1.6 to 3.3) for heart rate. Twenty-three participants (6.3%) of the sibutramine group left the trial because of side effects, compared to 5.4% of the placebo group (seven participants).

RCT
1-

The second RCT compared treatment with sibutramine 10 mg and placebo in a group of 46 obese adolescents (aged 14-18 years) who followed a low-calorie diet and took 30 minutes of aerobic exercise a day²⁷⁹. After six months of treatment there were no significant differences between the weights of the two groups. There were no losses due to side effects and no significant increase in blood pressure or heart rate.

RCT
1-

Two other RCTs with similar numbers of patients also showed significant decreases in weight and BMI. In a six-month RCT²⁸⁰ involving adolescents (60 participants aged 14-17 years), from which those with major comorbidities such as type 2 diabetes mellitus were excluded, there was a mean decrease of $-10.3 \text{ kg} \pm 6.6$ in the group treated with sibutramine 10 mg/day, versus a loss of $-2.4 \text{ kg} \pm 2.5$ in the placebo group ($p < 0.001$). Although the authors did not obtain a significant difference in favour of sibutramine in most biochemical parameters, its use was associated with a significant decrease in triglycerides and VLDL c. HDL c increased by 15% in the treatment group.

RCT
1-

*Source: Information note from the Spanish Agency of Medicines and Medical Devices – AEMPS, regarding Sibutramine (Reductil®) [21st January 2010]. Available at: http://www.aemps.gob.es/informa/notasInformativas/medicamentosUsoHumano/seguridad/2010/NI_2010-01_sibutramina_reductil.htm [NOTE: website in spanish]

In another RCT, which was also conducted in adolescents (aged 13-17 years) and lasted longer (12 months)²⁸¹, the mean weight loss was -7.8 kg±6.3 in the sibutramine group (15 mg/day) and -3.2 kg±6.1 in the placebo group (p=0.001). Mean blood pressure fell by 3.6 mmHg (SD 8.6 mmHg) in the third month in the placebo group, versus a significant increase in the sibutramine group: 1.8 mmHg (10.7 mmHg) (effect size 0.55, CI 95%, 0.1 to 1.0, p=0.02), but at six months the difference between the two groups was not significant. Medication was reduced or suspended in the treatment group in 19 of the 43 patients in response to increases in blood pressure, heart rate or both.

RCT
1-

Another RCT randomised 24 obese adolescents (11 boys aged 12-17 years) to a low-calorie diet, exercise and sibutramine (10 mg) or to the same diet and exercise with a placebo for 12 weeks²⁸. Follow-up, which lasted 12 weeks, consisted of the same intervention but with no medication. There were no significant differences between the groups at the end of the trial.

RCT
1-

N.B.: Sibutramine is not funded by Spanish Social Security.

6.2.2 Orlistat

Adults

Orlistat is a pancreatic and gastric lipase inhibitor approved for the treatment of obesity in adults. Because of its mechanism of action, it may lead to deficiencies of fat-soluble vitamins.

One SR (16 RCTs, 10,631 adults)²⁷⁶ showed a weight reduction of 2.9 kg (CI 95%, 2.5 kg to 3.2 kg) in the group treated with orlistat as compared to the placebo group. Orlistat was also associated with a reduced incidence of diabetes, from 9.0% to 6.2% (hazard ratio [HR] 0.63, CI 95%, 0.46 to 0.86), improved total cholesterol and LDL c, and a slight reduction in HDL concentration and improved blood pressure and glycaemic control in patients with diabetes. However, there was also an increase in gastrointestinal side effects. Steatorrhoea, tenesmus and incontinence occurred at rates of 15-30% in most trials. In addition, almost all the trials included in meta-analysis were funded by the pharmaceutical industry.

SR of RCTs
1+

Adolescents

Only two RCTs (573 participants) evaluating the efficacy of orlistat have been identified. The first of these, which lasted six months, compared treatment with orlistat 120 mg three times a day with a placebo in 40 obese adolescents (aged 14-18 years) and showed a significant change in BMI between the beginning and the end of the trial, although there were no significant differences between the treatment and placebo groups (1.3 ± 1.6 vs 0.8 ± 3.0 respectively)²⁸³. Both groups followed a low-fat diet, took physical exercise three times a week and took a vitamin supplement. Weight loss (between the beginning and the end of the study) was not significant in either group, and there was no significant difference between the groups. Side effects, mainly gastrointestinal, appeared only in the group treated with orlistat.

RCT
1+

The second RCT showed a significantly greater decrease in BMI in the treatment group²⁸⁴. At 12 months, 26.5% of the treatment group had lost $\geq 5\%$ of their initial BMI, versus 15.7% of the placebo group ($p=0.005$). In this study, orlistat 120 mg or placebo was administered three times a day, together with a diet, instructions on taking physical exercise and reducing sedentary lifestyles and advice on achieving changes in behaviour, as well as a vitamin supplement. Although the trial population was large (533 obese adolescents aged 12-16 years), this trial was funded by a pharmaceutical company involved in the design, development and analysis and interpretation of its results. Also, the loss rate (35% overall, 12% in the placebo group and 23% in the orlistat group) compromises trial validity.

RCT
1-

The most common orlistat-related side effects were related to the gastrointestinal tract. They were mainly mild or moderate, and made it necessary to suspend the trial in 2% of those receiving treatment. Orlistat's data sheet adds that there was an unexplained increase in the incidence of bone fractures (6% versus 2.8% in the orlistat and placebo groups respectively) during this RCT.

A quasi-randomised trial involving 42 adolescents (aged 10-16 years) who also took exercise and followed a diet with a 20% reduction in calories²⁸⁵ showed a significant decrease in all outcomes evaluated in the treatment group as compared to the control group. However, the groups were not similar at the beginning of treatment: BMI was significantly higher in the group treated with orlistat. A significant reduction was also observed in the outcomes analysed in two pilot studies, in children (aged 7-12 years) and adolescents (12-17 years) respectively²⁸⁶ 288, although the studies' design and execution problems limit the validity and usefulness of these results.

Controlled
quasi-
randomised
trial
2+
Before-&-
after study
2-

A recent evaluation by the US Agency for Healthcare Research and Quality²⁷⁴ concluded that both sibutramine and orlistat, in combination with behavioural interventions, can lead to weight loss (ranging from slight to moderate), with potential side effects of varying severity.

N.B.: Orlistat is not funded by Spanish Social Security.

6.2.3 Rimonabant

Adults

The Spanish Agency for Medicines and Healthcare Products (AEMPS) suspended the sale of rimonabant in Spain on 23 October 2008, due to major psychiatric side effects²⁸⁹.

Rimonabant is a CB1 cannabinoid receptor antagonist sold in several countries as an adjuvant treatment to diet and exercise in obese or overweight patients with a risk factor (e.g. diabetes or dyslipidaemia). In two recent meta-analyses^{276,290}, rimonabant demonstrated weight loss of 4.7 kg more (4.1 to 5.3) in the treatment group than in the placebo group at one year of treatment, with girth, blood pressure and triglyceride concentration falling and HDL c concentration rising. However, there was an increase in the incidence of psychiatric disorders (depression, anxiety, irritability, aggression). These occurred in 6% of participants receiving rimonabant (3% more likely in the treatment group than in the placebo group). Rimonabant caused significantly more severe side effects than the placebo (OR 1.4, CI 95%, 1.0 to 2.0, $p=0.03$); number needed to harm = 59 (27 to 830). Anxiety caused more losses in the treatment group than in the placebo group (OR 3.0, CI 95%, 1.1 to 8.4, $p=0.03$); number needed to harm = 166 (47 to 3,716).

SR of RCTs

1+

Adolescents

No trials of rimonabant in adolescents have been identified.

6.2.4 Metformin

Adults

Metformin is an oral biguanide used to treat type 2 diabetes. It has proven effective for weight loss, and in hyperinsulinaemia and hypoglycaemia in type 2 diabetes in adults²⁹¹. In women with polycystic ovary syndrome, metformin reduces hyperandrogenism and total cholesterol, as well as lessening symptoms²⁹².

RCT

1+

Adolescents

Four RCTs evaluating the efficacy of metformin in adolescents have been identified. Freemark *et al.*²⁹³ compared metformin treatment at a dose of 500 mg/12 hours with a placebo in a group of 32 obese adolescents (aged 12-19 years) with hyperinsulinaemia and a family history of type 2 diabetes. After six months of treatment, there was a decrease of 0.12 standard deviations (SD) of BMI in the group treated with metformin, versus an increase of +0.23 SD in BMI in the placebo group. Two other RCTs (52 participants), which were of poor quality, also showed reductions in weight-related outcomes in adolescents (aged 9-18 years) following metformin treatment at a dose of 1 g/12 hours²⁹⁴ or 850 mg/12 hours, as compared to a placebo.

RCT
1+

RCT
1-

One RCT²⁹⁶ evaluated treatment with metformin 850 mg/12 hours in 39 adolescents (aged 10-17 years) with a weight increase secondary to treatment with atypical antipsychotic drugs (olanzapine, risperidone, quetiapine). After 16 weeks there was a -0.13 kg (2.88) decrease in the mean weight of the treatment group, versus a 4.01 kg (6.23) increase in the placebo group.

RCT
1-

Finally, two pilot studies in adolescents (aged 10-18 years) showed significant decreases in BMI after three months of metformin treatment. One of these was conducted in a subgroup of patients with metabolic syndrome²⁹⁷, and the other in patients being treated with psychotropic drugs (olanzapine, risperidone, quetiapine, valproate)²⁹⁸.

Before-&-
after study
2-

The most commonly-reported side effects in all these studies were nausea and diarrhoea, which were resolved by reducing the dose

A new drug, tesofensine, a noradrenaline, dopamine and serotonin re-uptake inhibitor, has been evaluated in a Phase II RCT involving 203 obese adults, and has shown a moderate decrease in weight after 24 weeks of treatment, in combination with diet²⁹⁹. To date there are no Phase III RCTs, and tesofensine has not been evaluated in children or adolescents.

Recent CPGs on the treatment of obesity in children at adolescents also touch on the potential use of drugs in this group of patients. For example, the Canadian guideline⁵³ suggests that orlistat be considered as an aid to reducing and maintaining weight in adolescents, as part of an overall lifestyle intervention. For prepubescent children, the use of drugs should be considered only in the context of clinical trials.

CPG
4

NICE's guideline⁴³ maintains that in adolescents, orlistat (120 mg three times a day) in combination with a low-calorie diet and physical exercise is more effective in weight loss than the combination of diet and exercise alone after 10-11 months. Regarding sibutramine (at a dose of 10 mg/day), NICE maintains that in specialist healthcare and in combination with diet and physical exercise sibutramine may cause greater weight loss than in control groups after six months of treatment. However, NICE's guideline recommends drug treatment for obese adolescents only in exceptional circumstances (where there are severe comorbidities).

Evidence summary

Sibutramine	
1-	In obese adolescents, sibutramine has shown significant decreases in weight-related outcomes at a dose of 10 mg/day as compared to a placebo (approximate decrease 7 kg) ^{277,278,280,281} . However sibutramine is associated with side effects such as increased blood pressure, heart rate or both. No long-term data are available. Currently, marketing authorisation for Sibutramine is suspended as risks of its use outweigh expected benefits.
1+	In adults, sibutramine results in significant decreases in weight (-4.2 kg), BMI, girth and triglyceride concentration. It is also associated with increased blood pressure, tachycardia and other side effects such as nausea and dry mouth ²⁷⁶ . Currently, marketing authorisation for Sibutramine is suspended as risks of its use outweigh expected benefits
Orlistat	
1-	Orlistat has not shown consistent results in adolescents. Two RCTs have evaluated its efficacy (at a dose of 120 mg/8 hours) in adolescents ^{283,284} . Side effects, all of which were gastrointestinal, occurred in orlistat treatment groups and led to 2% of participants leaving the trials ²⁸⁴ .
Rimonabant	
1+	There are no trials of rimonabant in adolescents. Two meta-analyses in adults ^{276,290} showed significant weight loss after one year of treatment, but also an increased incidence of psychiatric disorders (depression, anxiety, irritability, aggression), which occurred in 6% of participants treated with rimonabant (3% more likely in the treatment group than in the placebo group). Sale has currently been suspended due to severe psychiatric side effects.
Metformin	

1-	Decreases in weight-related outcomes have been observed in obese adolescents treated with metformin (at various doses) as compared to a placebo ²⁹³⁻²⁹⁶ . Side effects (nausea, diarrhoea) have also been observed, and have been resolved by reducing the dose.
----	---

Recommendations

C	For adolescents (aged 12-18) suffering from obesity and severe comorbidities who have not responded to dietary and lifestyle treatment, sibutramine* treatment (10 mg/day) may be considered as part of a programme of changes to lifestyle. This must be supervised by specialists in endocrinology and nutrition, family medicine or paediatrics who have been trained to treat obesity. Currently, marketing authorisation for Sibutramine is suspended as risks of its use outweigh expected benefits.
C	For adolescents (aged 12-18) suffering from obesity and severe comorbidities who have not responded to dietary and lifestyle treatment, orlistat* treatment (120 mg with breakfast, lunch and dinner) may be considered as part of a programme of changes to lifestyle. This must be supervised by specialists in endocrinology and nutrition, family medicine or paediatrics who have been trained to treat obesity.
√	Orlistat treatment must be supplemented with a fat-soluble vitamin complex (vitamins A, D, E and K). This must be administered before bed or two hours after taking orlistat.
C	In adolescents (aged 12-18) who are obese and insulin-resistant or glucose-intolerant and who have not responded to dietary and lifestyle treatment, metformin treatment (500-850 mg/12 hours) may be considered as part of a programme of changes to lifestyle. This must be supervised by specialists in endocrinology and nutrition, family medicine or paediatrics who have been trained to treat obesity.
√	As neither orlistat or sibutramine have been approved by the Spanish Agency for Medicines and Healthcare Products (AEMPS) or the European Medicines Agency (EMA) for use in those under 18, and as metformin is not indicated for the treatment of obesity in adults or children, informed consent must be obtained from relatives, guardians and the adolescent in question if any of these drugs is prescribed. Currently, marketing authorisation for Sibutramine is suspended as risks of its use outweigh expected benefits.
D	The decision to begin drug treatment must be taken individually for each patient. Such a decision may only be taken if there are severe comorbidities and other, associated treatments are also performed.

√	Treatments and their indication must be reassessed regularly, and must not be used indefinitely.
√	Relatives or guardians should always be informed of the risks and benefits of drug treatments, as should adolescents themselves.
* Sibutramine and orlistat are not funded by Spanish Social Security.	

6.3. Surgery

Questions to Answer

- In overweight or obese children and adolescents, how effective is surgery in weight loss or maintenance and other specified outcomes?

Obesity surgery for adolescents should only be considered in exceptional circumstances, such as severe obesity with severe comorbidities and failure of all the types of treatment evaluated above³⁰⁰. In addition, the only information available comes from case series and expert consensus, and its long-term effects are unknown. It must therefore be considered very carefully before use.

6.3.1 Intra-gastric balloon

An intra-gastric balloon is a silicon ball placed in the stomach endoscopically and then filled with 600 ml of saline solution. As it partly fills the stomach, it reduces the feeling of hunger and leads to a greater feeling of fullness on eating. Fitting of the balloon must be accompanied by a specific weight-loss diet. The balloon is removed after six months³⁰¹.

Adults

A Cochrane SR (9 RCTs, 395 patients)³⁰¹ analysed the efficacy and safety of intra-gastric balloons.

SR of RCTs

1-

The authors would like to highlight that the patients covered by their review included individuals with ages ranging from 14 to 64 years, but they do not provide separate information for patients aged 14-18, and the tables summarising the trials do not make it clear which trial involved adolescents or how many of them there were.

In trials comparing intra-gastric balloons with diets, it was observed that intra-gastric balloons have few benefits in terms of weight loss or BMI, and higher rates of minor and serious complications (mainly spontaneous emptying of Garren-Edwards balloons)³⁰²⁻³⁰⁵. A tendency towards weight gain after the balloon was removed was also observed, whereas the group on a diet tended to continue losing weight.

Adolescents

No clinical trials or cohort studies have been found specifically evaluating the efficacy and safety of intragastric balloons in obese children or adolescents. A case series of five adolescents (aged 11-17 years) suffering from extreme obesity who were fitted with intragastric balloons showed a significant increase in BMI in all the adolescents at six months³⁰⁶. Adolescent patients were also included in another case series (age range 12-71 years), but the results were not broken down by age group³⁰⁷.

Case series
3

6.3.2 Bariatric surgery

Surgical procedures for obesity include biliopancreatic diversion, gastric bypass, gastroplasty and gastric bands. Most of these procedures can be performed laparoscopically. They must be accompanied by lifestyle changes to achieve the necessary weight loss.

Adults

A Cochrane SR³⁰⁸ identified two RCTs and three prospective cohort studies comparing surgery with non-surgical treatment. It also included 21 RCTs that compared various different surgical procedures.

SR of various
types of study
1-

This SR concluded that surgery led to greater weight loss than conventional treatment (21 kg weight loss at eight years, versus weight increase), with improvements in quality of life and comorbidities. There were some complications to surgery, such as wound infection.

Gastric bypasses were associated with greater weight loss, better quality of life and fewer check-ups, repeat operations or conversions than gastroplasty, but also resulted in more side effects.

Greater weight loss and fewer side effects and repeat operations were observed with adjustable gastric bands than with vertical banded gastroplasty, but laparoscopic vertical banded gastroplasty yielded more patients with excellent or good results and fewer subsequent complications than a laparoscopic adjustable silicon gastric band. Vertical banded gastroplasty was associated with greater weight loss but more vomiting than horizontal gastroplasty. There were some post-operative deaths in the studies.

Weight loss was similar in open and laparoscopic procedures. There were fewer serious complications with laparoscopic surgery, although it was sometimes necessary to switch to open surgery. Most studies showed that laparoscopic surgery took longer but resulted in less blood loss and faster recovery.

A subsequent RCT that analysed the effect of a laparoscopic gastric band in 80 adults with moderate obesity (BMI 30-35) versus non-surgical treatment showed that the surgery group lost more weight (mean 21.6% of initial weight, CI 95%, 19.3 to 23.9%) than the non-surgery group (5.5%, CI 95%, 3.2% to 7.9%)³⁰⁹.

RCT
1-

Adolescents

The direct evidence available on the efficacy and safety of bariatric surgery in children and adolescents is based mainly on case series and analyses of hospital records. There are very few cases of bariatric surgery in children under 12. The only case published is that of a child is diagnosed with Prader-Willi syndrome at the age of two, who was operated on when she was eight³¹⁰.

The information available, which comes from case series with small numbers of patients³¹¹⁻³²⁵, shows consistently that bariatric surgery is effective in achieving major weight loss (between 33% and 87% of overweight) in adolescents suffering from extreme obesity (BMI \geq 40 kg/m²). In most patients, this weight loss is maintained in the medium and long term.

Case series
3

One trial, which aimed to analyse trends in the use of bariatric surgery in adolescents in the USA³²⁶, analysed 773 cases (something under 0.7% of the total number of weight loss operations) and observed that 69.9% of patients were female; the youngest was 12 years old (96.4% were aged 15-19 years); 89.4% had no comorbidities; and 87.1% had undergone a gastric bypass. No deaths were recorded during hospitalisation among the adolescents who underwent surgery, whereas the overall death rate is 2 per 1,000 surgery patients. The surgery complication rates were similar to those of adults; the mean length of hospitalisation for adolescents was significantly shorter. Only 4.2% of patients suffered major complications, mostly respiratory (approx. 80%).

Case series
3

An SR that evaluated mortality following bariatric surgery³²⁷ carried out subgroup analysis of five studies in adolescents (132 surgery patients) and found no deaths in the first 30 days after surgery. The studies did not provide information on mortality after this period.

SR of RCTs
2+

One study showed a considerable increase in quality of life after bariatric surgery, as assessed using questionnaire SF 36 (Short Form 36) in nine young people with an average age of 19.325. The scores for the physical section of the questionnaire rose from 34.7 \pm 10 to 55.5 \pm 5, while those for the mental section rose from 40.6 \pm 13.5 to 55.2 \pm 8.6, (p<0.0001). The scores for the Adolescent Impact of Weight on Quality of Life-Lite questionnaire after surgery were similar to the averages for adults of normal weight (93% \pm 7% vs 96% \pm 7%, p=0.15).

Case series
3

Specific recommendations have been developed by the American Academy of Pediatrics and the US Endocrine Society on the requirements for adolescent bariatric surgery candidates^{58,88,328}: 1) Surgery should only be considered after more than six months of failed treatment in adolescents suffering from severe obesity (BMI \geq 40 kg/m²) and serious associated comorbidity, or extreme obesity (BMI \geq 50 kg/m²). 2) When skeletal maturity is mostly complete (generally over 13 years of age in girls and over 15 years of age in boys). 3) Potential candidates should be referred to centres with multidisciplinary teams and extensive experience. 4) Surgery should be performed in tertiary institutions with teams who can cover these patients' needs and which allow long-term data on their clinical outcomes to be gathered.

Expert
opinion
4

A recent evaluation by a medical technology agency²⁷⁴ concluded that substantial weight loss had been observed following bariatric surgery in adolescents with extreme obesity. However, as the long-term risks of surgery and the short-term risks of specific types of surgery remain unknown, candidates must be assessed carefully.

Evidence summary

	No information has been identified on the efficacy of intragastric balloons in the treatment of obese adolescents.
3	Information on bariatric surgery for obesity in adolescents from case series ^{310 325} shows that it may be effective in achieving major weight loss (between 33% and 87% of overweight), with complication rates similar to those of adults, and improvements in quality of life. However, there is no information available on the risks of surgical treatment to development, metabolism or psychological issues in childhood and adolescence.

Recommendations

C	Bariatric surgery should only be performed in adolescents suffering from severe obesity (BMI \geq 40 kg/m ²) and severe comorbidity or who are extremely obese (BMI \geq 50 kg/m ²), and only when attempts to control weight via intensive actions to alter lifestyle, with or without drug treatment, for at least six months have failed.
---	--

√	Candidates for bariatric surgery must be selected after careful assessment by a multidisciplinary team with expertise in medicine, surgery, psychiatry and nutrition for surgical treatment of obesity in adolescents. Bariatric surgery should only be performed in adolescents who are physically and psychologically mature and aware of the risks and benefits of surgery, and with their family's support.
√	Bariatric surgery must only be performed by highly-specialised surgeons. Follow-up of patients who undergo bariatric surgery must be lifelong, in order to ensure optimum weight loss and good health.
√	Patients must be examined for possible vitamin (B12, B6, B1, B2, D, folates) and mineral (iron, calcium, zinc) deficiencies after bariatric surgery. Supplements must be administered if required.

6.4. Alternative treatments

Questions to Answer

- In children and adolescents, how effective are alternative treatments in weight loss or maintenance and other specified outcomes?

Adults

One SR evaluated the efficacy of complementary therapies in reducing the weight of obese adults³²⁹. Six systematic reviews and 25 RCTs were evaluated. These revealed that there is insufficient information on the efficacy of any of the complementary therapies evaluated (acupuncture, acupressure, dietary supplements, homeopathy). SR of RCTs 1-

One SR (15 RCTs, 1,219 patients) evaluated the efficacy of chitosan, a dietary supplement, in reducing the weight of overweight or obese adults³³⁰. The authors found that chitosan leads to significantly greater weight loss than a placebo (WMD -1.7 kg, CI 95%, -2.1 to -1.3 kg). SR of RCTs 1-

However, most of the studies were of poor methodological quality, and analysis of only better-quality studies showed a smaller, statistically insignificant decrease in weight (WMD -0.58 kg, CI 95%, -1.26 to 0.10).

Another dietary supplement, conjugated linoleic acid, was evaluated in a SR (18 RCTs) and was shown to be effective. It led to a modest reduction in fat³³¹. No trials of this supplement in children or adolescents have been identified. SR of RCTs 1-

Adolescents

Only two trials evaluating alternative therapies in adolescents have been identified. There is very little information available, and it is of poor quality.

RCT

1-

The first of these is a RCT which evaluated the efficacy and safety of a product containing ephedrine and caffeine³³², involving 32 obese adolescents with a mean age of 16 years and mean weight 104 kg. They all followed a diet of 500 kcal less than the calculated daily calorie requirement for 20 weeks, and were randomised to take a mixture of caffeine (100 mg) and ephedrine (10 mg) or a placebo.

The mean weight loss was greater in the caffeine/ephedrine group, and the difference was statistically significant (14.4 vs 2.2 kg). This was also true for BMI (2.9 vs 0.5 kg/m²) and body fat (6.6 vs 0.5 kg). Side effects were minor and similar in both groups. Withdrawal symptoms when the treatment was ended were mild, transient and of similar frequency and severity in both groups.

One clinical trial was identified which had no control group and evaluated the efficacy and safety of a traditional Korean herbal remedy (based on a herb called *Taeumjowi-tang*). The trial involved hospitalised obese children with an average age of 11 years³³³. The herbal remedy was administered to them for 30 days, and no changes were made to their diet or physical exercise routines. Of the 31 original participants, nine left the trial.

Before-&-
after study

3

Results revealed a decrease in BMI of 24.34±3.10 to 23.26±3.00 kg/m², and a reduction in body fat percentage of 34.16±3.75 to 32.08±3.15%. Regarding the safety of the remedy, no changes in heart rate, blood pressure or liver or kidney function were observed.

Evidence summary

1-	There is very little information available on the efficacy of alternative treatments for obesity in children or adolescents. Ephedrine and caffeine treatment led to moderate decreases in weight and body fat in a short RCT involving a small number of participants ³³² .
2-	A pilot study with involving a herbal remedy showed slight changes in BMI and body fat ³³³ .

Recommendations

C	The use of alternative treatments for overweight and obesity in children and adolescents is not recommended.
---	--

7. Dissemination and implementation

7.1. Guideline formats, dissemination and implementation

There are various different versions of the CPG: full, summary, information for patients and a quick-consultation tool. All these versions are available in HTML and PDF format from the GuíaSalud website (www.guiasalud.es). A hard copy of the summary version containing a CD ROM of the full version is also published.

Dissemination and implementation strategies include the following:

- Official presentation of the guideline by healthcare authorities.
- Copies sent individually to professionals and potential users.
- Distribution of material for patients.
- Dissemination of the guideline in electronic format on the websites of healthcare services and scientific societies involved in the project.
- Presentation of the guideline at scientific events (conferences, meetings).
- Publication of the guideline in medical journals.

7.2. Proposed assessment indicators

With the help of colleagues and external reviewers, the authors of the CPG have designed a set of indicators, in order to provide tools to evaluate the degree of compliance with the CPG's main recommendations. These indicators are based on the recommendations backed up by the greatest amount of evidence and/or the most consensus among the guideline's authors.

7.2.1. Unit of analysis: school

Percentage of schools that implement educational programmes to improve diet

- Numerator: number of schools that implement educational programmes to improve diet.
- Denominator: total number of schools in a Spanish Autonomous Region.
- Approach: prevention.
- Type of indicator: process.
- Basis: schools should include educational programmes which aim to improve diet, increase physical activity and reduce sedentary lifestyles. These should include families and teaching staff (recommendation level C).

Percentage of schools that implement educational programmes to encourage physical exercise and reduce sedentary lifestyles

- Numerator: number of schools that implement educational programmes to encourage physical exercise and reduce sedentary lifestyles.
- Denominator: total number of schools in a Spanish Autonomous Region.
- Approach: prevention.
- Type of indicator: process.
- Basis: schools should include educational programmes which aim to improve diet, increase physical activity and reduce sedentary lifestyles. These should include families and teaching staff (recommendation level C).

Percentage of schools that implement multidisciplinary interventions to encourage children and adolescents to eat fruit and vegetables.

- Numerator: number of schools that implement multidisciplinary interventions to encourage children and adolescents to eat fruit and vegetables.
- Denominator: total number of schools in a Spanish Autonomous Region.
- Approach: prevention.
- Type of indicator: process.
- Basis: multidisciplinary interventions should be implemented in schools to encourage children and adolescents to eat fruit and vegetables (recommendation level B).

Percentage of schools that provide written information on balanced school meals

- Numerator: number of schools that provide written information on balanced school meals.
- Denominator: total number of schools in a Spanish Autonomous Region.
- Approach: prevention.
- Type of indicator: process.
- Basis: food eaten in schools must be healthy, including a range of fruit and vegetables and meals low in fats and sugars (recommendation level B).

7.2.2. Unit of analysis: healthcare centre

Percentage of healthcare professionals who give advice on diet and physical exercise and record activities at child health monitoring visits

- Numerator: number of healthcare professionals who give advice on diet and physical exercise and record activities at child health monitoring visits.
- Denominator: total number of healthcare professionals who hold child health monitoring visits at a healthcare centre.
- Approach: prevention.
- Type of indicator: process.
- Basis: Advice on nutrition and encouraging physical activity, suited to children's ages, should be included in child health monitoring visits (recommendation level B).

Percentage of babies less than one year old who are exclusively breastfed for six months

- Numerator: babies less than one year old who are exclusively breastfed for six months.
- Denominator: babies less than one year old served by a healthcare centre.
- Approach: prevention.
- Type of indicator: result.
- Basis: It is recommended that babies be exclusively breastfed for six months, due to the many benefits of breastfeeding to children's health (recommendation level A).

Percentage of overweight or obese young people aged 6-16 who have been treated with diet, exercise and behavioural changes to behaviour

- Numerator: overweight or obese young people aged 6-16 who have been treated with diet, exercise and changes to behaviour.
- Denominator: children aged 6-16 years served by a healthcare centre.
- Approach: treatment.
- Type of indicator: process.
- Basis: Combined interventions including diet, physical exercise and changes to behaviour, with family involvement, are recommended for weight loss in children and adolescents aged 6-16 who are overweight or obese (recommendation level B).

Percentage of healthcare centres that implement combined interventions involving diet, exercise and changes to behaviour for weight loss in children and adolescents aged 6-16

- Numerator: number of healthcare centres that implement combined interventions involving diet, exercise and changes to behaviour for weight loss in children and adolescents aged 6-16.
- Denominator: number of healthcare centres in a province.
- Approach: treatment.
- Type of indicator: process.
- Basis: Combined interventions including diet, physical exercise and changes to behaviour, with family involvement, are recommended for weight loss in children and adolescents aged 6-16 who are overweight or obese (recommendation level B).

Prevalence of overweight in children

- Numerator: population aged 2-10 years with BMI >P90 and <P97 (according to the semi-longitudinal study by Hernández *et al.*, 1988)⁵⁹.
- Denominator: population aged 2-10 years served by a healthcare centre.
- Type of indicator: result.

Prevalence of overweight in adolescents

- Numerator: population aged 11-21 years with BMI>25.
- Denominator: population aged 11-21 years served by a healthcare centre.
- Type of indicator: result

Prevalence of obesity in children

- Numerator: population aged 2-10 years with BMI>P97 (according to the semi-longitudinal study by Hernández *et al.*, 1988)⁵⁹.
- Denominator: population aged 2-10 years served by a healthcare centre.
- Type of indicator: result.

Prevalence of obesity in adolescents

- Numerator: population aged 11-21 years with BMI>30.
- Denominator: population aged 11-21 years served by a healthcare centre.
- Type of indicator: result.

7.2.3. Unit of analysis: community

Percentage of towns/cities with community programmes that encourage healthy eating and physical exercise

- Numerator: number of towns/cities with community programmes that encourage healthy eating and physical exercise.
- Denominator: total number of towns/cities in a province.
- Approach: prevention.
- Type of indicator: process.
- Basis: Community programmes that aim to encourage a healthy lifestyle, healthy eating and physical exercise are recommended for children and adolescents (recommendation level B).

Percentage of towns/cities with suitable, accessible, safe infrastructures (1 sports centre per 15,000 inhabitants) for playing and sport for children and adolescents

- Numerator: number of towns/cities with suitable, accessible, safe infrastructures (1 sports centre per 15,000 inhabitants) for playing and sport for children and adolescents.
- Denominator: total number of towns/cities in a province.
- Approach: prevention.
- Type of indicator: structure.
- Basis: safe, pleasant spaces and suitable infrastructures for playing and sport for children and adolescents should be created in public areas (good clinical practice recommendation).

8. Recommendations for future research

Screening

Qualitative research studies to find out the attitudes of children, parents or relatives, as well as those of healthcare professionals, towards monitoring height, weight and BMI or screening for childhood and juvenile obesity.

Studies that establish the risks and benefits associated with screening the population for childhood and juvenile obesity.

Prevention

Studies that determine the effect of physical exercise and diet on the risk of childhood and juvenile overweight and obesity and its persistence into adulthood. Longitudinal studies that carefully measure adiposity, diet and physical exercise levels are required.

Studies that analyse the possible relationship between BMI, lifestyle and cardiovascular risk factor-related parameters in children and adolescents.

Studies that determine beyond doubt the childhood and juvenile overweight and obesity risk factors that can be altered.

Studies that evaluate the long-term effects of childhood and juvenile obesity and the effects of weight change in overweight or obese children and adolescents.

Studies that determine the most effective interventions for different age groups: what type of preventive intervention, intensity, duration and environment (individual, family, community or school) is effective in preventing childhood and juvenile overweight and obesity.

Treatment

Clinical trials that determine the most effective type of dietary intervention for paediatric overweight and obesity.

Clinical trials that evaluate the efficacy of physical exercise for overweight and obesity in children and adolescents.

Clinical trials that evaluate the efficacy of short-term interventions in primary care in promoting a healthy diet, increasing physical exercise levels and reducing sedentary lifestyles.

Clinical trials that evaluate the efficacy of various types of psychological treatment.

Clinical trials that evaluate the efficacy of various types of combined treatment (diet, exercise, behavioural) in the long term for the treatment of childhood and juvenile obesity.

Clinical trials that determine the most effective community-based interventions to treat childhood and juvenile obesity.

Clinical trials that evaluate the long-term efficacy of drug treatment in children and adolescents of various ages.

Trials that evaluate the side effects and compliance with drug treatment in children and adolescents of various ages.

Prospective longitudinal studies to estimate the risks and benefits of bariatric surgery in adolescents.

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Appendices

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Appendix 1: SIGN evidence statements and grades of recommendations

Levels of evidence

1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias.
1+	Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias.
1-	Meta-analyses, systematic reviews, or RCTs with a high risk of bias.
2++	High quality systematic reviews of case control or cohort or studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+	Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion

Grades of recommendations

A	At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+
C	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++
D	Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+

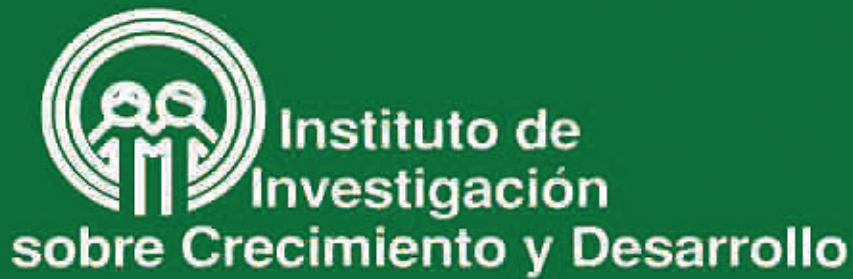
Studies classified as 1 and 2 should not be used in the process of developing recommendations due to their high possibility of bias.

Good practice points

✓*	Recommended best practice based on the clinical experience of the guideline development group
Source: Scottish Intercollegiate Guidelines Network. SIGN 50: A guideline developers' handbook (Section 6: Forming guideline recommendations), SIGN publication n° 50, 2001.	

* Sometimes the guideline development group becomes aware that there are some significant practical aspects they wish to emphasise and for which there is probably no supporting scientific evidence available. Generally, these cases are related to some aspect of the treatment, considered to be a good clinical practice and that nobody would normally question. These aspects are considered good clinical practice points. These messages are not an alternative to evidence based recommendations, but must be only considered when there is not another way to highlight the aspect mentioned above.

Appendix 2: Body Mass Index Reference Curves and Tables



Director : Prof. M. Hernández

CURVAS Y TABLAS DE CRECIMIENTO

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

FUNDACION
FAUSTINO ORBEGOZO EIZAGUIRRE

B I L B A O

GROWTH CURVES

AND TABLES

*M. Hernández, J. Castellet, J.L. Narcaíza, J.M. Rincón,
I. Ruiz, E. Sánchez, B. Sobradillo y A. Zurimendi*

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

I.S.B.N.: 84-7391-177-6
F. ORBEGOZO FOUNDATION, BILBAO

© Manuel Hernández Rodríguez, F. Orbegozo Foundation
This book may not be reproduced in whole or in part
without the explicit authorisation of the publishers.

Editorial Garsi, Londres, 17. 28028 MADRID
Tel.: (91) 255 68 00

Graphics and photo composition: ClickArt

Legal depository: M – 31927 – 1988
AZALSO Tracia, 17 Madrid

Presentation

The curves given here are based on data obtained in the longitudinal growth study by the technical team at the Growth Research Institute of the F. Orbeago Foundation.

In this second edition, we have added to those we published in 1985 by incorporating anthropometric data for ages up to 18 years. This has allowed us to cover the whole period of growth, and provides distance and growth rate curves for the various ages of childhood and adolescence. We have also added a new indicator, one which is becoming more and more widely used in nutritional anthropology: body mass index (BMI), also called Quetelet's index or the Quetelet index.

A mixed longitudinal design was used. Three groups of 600 children were selected at random and monitored for nine years. Their ages at the beginning of the study were 0, 5 and 9 years respectively, and the intervals between measurements were 6 months, except during the first year when they were taken every 3 months. Children who missed two consecutive monitoring sessions were systematically excluded.

Most children in the sample belonged to a medium-low socioeconomic group. By comparing the groups for one year we were able to confirm that there were no significant differences between them, and that the graphs can be used as pure longitudinal curves representing a single population.

To construct distance graphs, variables with a normal distribution (height, sitting height, vertex-coccyx distance and head circumference) were represented directly by calculating the mean, standard deviation, range and percentiles. For weight, arm circumference and skin folds, whose distribution is asymmetrical, logarithmic transformations were used. The theoretical percentile values were obtained using the formula $\alpha = \bar{X} \pm t\alpha \times DS$ where α is the percentile to be obtained, \bar{X} the mean and $t\alpha$ the normal distribution for the percentile.

For rate curves, to avoid distortion of the pubertal growth spurt caused by differing maturation rates, the graph was drawn by superimposing maximum growth peaks. The shape of the curve therefore represents the normal growth rate during this period.

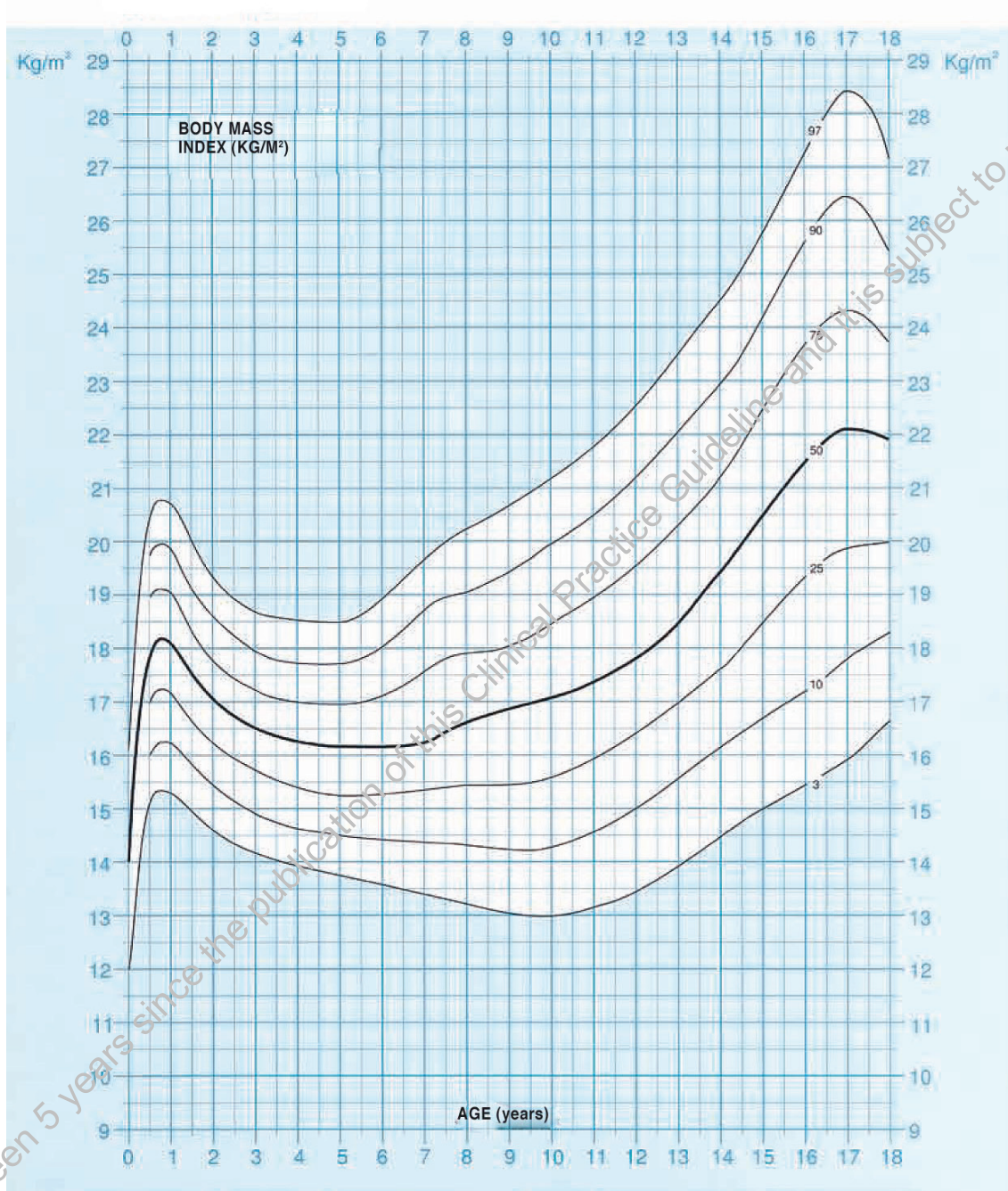
Graphs were drawn according to the model used by the US National Center for Health Statistics to draw up the NCHS Growth Charts.

These curves represent the child population of Vizcaya, particularly the Greater Bilbao area. However, we believe that the size and nature of the sample and the methods used to draw the curves make them suitable for the rest of Spain and a clear improvement on those from other countries.

*M. HERNÁNDEZ RODRÍGUEZ
Director, Growth Institute*

CHILDREN (BOYS): 0-18 years

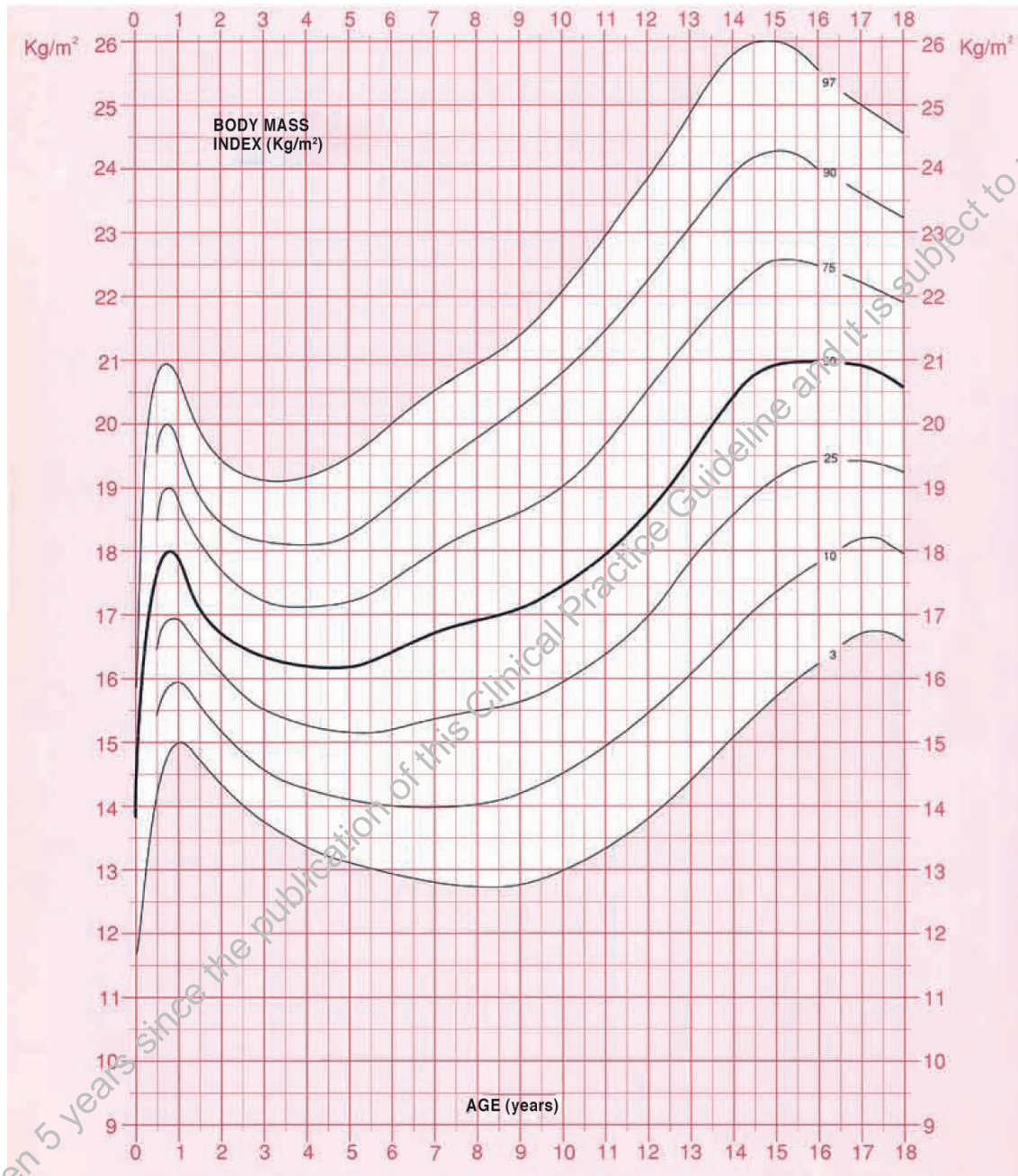
BODY MASS INDEX (kg/m²)



LONGITUDINAL GROWTH STUDY: CURVES FOR 0-18 YEARS

CHILDREN (GIRLS): 0-18 years

BODY MASS INDEX (kg/m²)



LONGITUDINAL GROWTH STUDY: CURVES FOR 0-18 YEARS

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

BOYS

AGE	Length * Height ** (cm)				Weight (kg)				Body mass index Weight/height ² (kg/m ²)				Head circumference (cm)			
	P3	P50	P97	DS	P3	P50	P97	DS	P3	P50	P97	DS	P3	P50	P97	DS
Birth	46.54	50.16	53.78	1.92	2.75	3.51	4.46	0.45	11.92	14.02	16.11	1.11	32.72	34.89	37.06	1.15
3 months	56.43	60.43	64.42	2.12	5.08	6.25	7.66	0.87	14.84	17.17	19.51	1.24	38.97	41.17	43.37	1.17
6 months	62.75	66.74	70.74	2.12	6.55	7.99	9.74	0.82	15.30	18.02	20.73	1.44	42.17	44.14	46.10	1.04
9 months	66.70	71.11	75.53	2.34	7.52	9.24	11.36	1.02	15.63	18.32	21.00	1.43	43.95	46.02	48.08	1.03
1 year	70.29	75.01	79.03	2.45	8.26	10.15	12.47	1.13	15.37	18.09	20.81	1.45	45.21	47.28	49.35	1.13
1.5 years	76.27	81.37	86.38	2.66	9.48	11.50	13.94	1.13	15.11	17.43	19.76	1.24	46.32	48.70	51.00	1.22
2 years	81.24	86.68	92.12	2.89	10.37	12.70	15.55	1.30	14.60	16.95	19.21	1.20	47.29	49.59	51.80	1.22
2.5 years	85.41	91.10	96.80	3.03	11.23	13.80	16.95	1.49	14.47	16.89	18.90	1.18	47.98	50.28	52.59	1.22
3 years	88.65	95.18	101.50	3.26	12.04	14.86	18.33	1.66	14.26	16.46	18.66	1.17	48.56	50.75	52.94	1.18
3.5 years	91.59	98.72	105.65	3.79	12.66	15.84	19.96	1.97	14.04	16.33	18.62	1.22	48.64	50.98	53.32	1.24
4 years	95.25	102.51	109.77	3.86	13.73	17.01	21.06	1.95	13.95	16.24	18.53	1.22	48.86	51.21	53.68	1.28
4.5 years	98.09	106.00	113.90	4.21	14.44	17.90	22.16	2.04	13.66	16.16	18.45	1.22	49.11	51.28	53.74	1.23
5 years	101.25	109.23	117.20	4.24	14.60	18.76	24.11	2.87	13.68	16.36	18.48	1.28	49.21	51.51	53.80	1.22
5.5 years	103.56	111.02	120.07	4.39	15.26	19.91	25.95	3.13	13.69	16.15	18.68	1.34	49.27	51.49	53.92	1.23
6 years	105.84	115.11	124.40	4.90	15.86	20.87	27.42	3.13	13.54	16.34	19.14	1.49	49.32	51.71	54.09	1.27
6.5 years	108.99	117.64	127.29	5.02	16.30	22.41	30.04	4.17	12.40	16.37	19.04	1.57	49.35	51.00	54.20	1.31
7 years	110.63	120.21	129.78	5.09	17.34	23.59	32.06	4.33	12.32	16.54	19.76	1.71	49.51	52.10	54.50	1.37
7.5 years	113.36	123.21	133.07	5.24	18.14	24.73	33.72	4.35	12.24	16.71	20.18	1.85	49.76	52.27	54.78	1.34
8 years	116.25	126.10	135.95	5.24	19.52	26.06	34.94	4.15	12.19	16.70	20.20	1.87	49.83	52.47	55.16	1.40
8.5 years	118.72	129.01	139.30	5.47	20.42	27.50	36.71	4.72	12.14	16.68	20.23	1.89	50.05	52.68	55.20	1.34
9 years	121.80	131.85	142.10	5.45	21.59	28.81	38.45	4.81	12.00	16.81	20.58	2.01	50.27	52.75	55.20	1.32
9.5 years	123.98	134.07	144.18	5.36	22.15	30.14	40.99	5.09	12.92	16.93	20.94	2.13	50.33	52.68	55.32	1.33
10 years	125.85	136.58	147.20	5.67	23.02	31.83	43.43	5.53	12.07	17.14	21.20	2.18	50.52	53.07	55.61	1.35
10.5 years	128.5	138.99	149.48	5.57	24.37	33.29	45.40	5.67	12.22	17.34	21.47	2.19	50.78	53.30	55.02	1.34
11 years	130.97	141.51	152.08	5.60	25.44	35.16	48.66	6.30	12.18	17.71	22.24	2.41	51.03	53.60	56.17	1.39
11.5 years	132.32	143.67	155.02	6.03	26.50	36.90	51.40	6.73	12.33	18.07	22.61	2.52	51.18	53.74	56.19	1.31
12 years	135.07	146.70	158.39	6.18	27.73	38.79	54.27	7.21	12.45	18.23	23.02	2.55	51.27	53.91	56.55	1.43
12.5 years	136.69	149.04	161.40	6.57	28.96	41.12	58.34	8.12	12.59	18.50	23.41	2.61	51.31	54.04	56.87	1.50
13 years	139.01	152.6	166.61	7.34	30.32	43.34	61.94	8.55	12.73	18.76	23.79	2.68	51.53	54.28	57.03	1.46
13.5 years	141.31	156.16	171.00	7.89	32.25	46.09	65.06	8.49	14.03	19.08	24.13	2.69	51.88	54.60	57.34	1.45
14 years	144.4	160.15	175.84	8.34	34.02	49.22	71.23	9.86	14.34	19.41	24.47	2.69	51.89	54.89	57.89	1.60
14.5 years	147.89	163.28	178.69	8.19	36.14	52.33	75.76	10.54	14.80	19.87	25.14	2.60	52.15	55.27	58.40	1.66
15 years	150.31	165.46	180.61	8.06	38.32	56.25	78.56	10.27	15.00	20.07	25.00	2.62	52.02	55.81	58.61	1.60
15.5 years	154.82	168.67	182.52	7.37	42.50	58.84	81.46	10.33	15.26	20.91	26.46	2.66	52.86	56.86	58.86	1.60
16 years	158.12	170.88	183.64	6.78	46.50	61.52	83.36	9.88	15.58	21.42	27.27	3.11	52.88	56.99	59.00	1.60
16.5 years	161.42	172.32	183.23	5.80	49.17	64.42	84.62	9.61	15.80	21.94	28.07	3.26	53.32	56.25	59.18	1.56
17 years	163.03	173.68	184.33	5.67	49.98	65.96	86.11	10.42	15.87	22.11	28.35	3.32	53.37	56.31	59.26	1.56
17.5 years	163.96	174.64	185.31	5.60	50.61	66.40	87.12	9.97	16.25	21.98	27.73	3.05	53.42	56.38	59.33	1.57
18 years	164.24	175.00	186.95	6.04	51.24	66.84	87.19	9.51	16.63	21.87	27.11	2.79	53.46	56.47	59.47	1.61

* Up to 2 years
** 2 years onwards

GIRLS

AGE	Length * Height ** (cm)				Weight (kg)				Body mass index Weight/height ² (kg/m ²)				Head circumference (cm)			
	P3	P50	P97	DS	P3	P50	P97	DS	P3	P50	P97	DS	P3	P50	P97	DS
Birth	45,93	49,18	52,44	1,73	2,63	3,32	4,19	0,41	11,69	13,78	15,88	1,12	31,94	34,11	36,28	1,15
3 months	55,77	59,00	62,22	1,71	4,78	5,75	6,93	0,56	14,30	16,59	18,88	1,22	38,26	40,05	41,85	0,95
6 months	61,63	65,24	68,84	1,91	6,04	7,43	9,13	0,81	14,81	17,52	20,23	1,44	40,78	42,81	44,84	1,03
9 months	65,37	69,37	73,36	2,12	6,84	8,59	10,80	1,05	14,96	17,95	20,94	1,59	42,46	44,66	46,86	1,16
1 year	68,93	73,39	77,85	2,37	7,69	9,56	11,88	1,11	15,02	17,82	20,61	1,49	43,74	45,98	48,21	1,19
1.5 years	75,02	79,87	84,73	2,58	8,75	10,90	13,59	1,26	14,49	17,16	19,83	1,42	45,06	47,32	49,58	1,20
2 years	80,11	85,39	90,68	2,81	9,74	12,12	15,10	1,39	14,15	16,69	19,24	1,36	45,97	48,25	50,53	1,21
2.5 years	84,14	89,77	95,39	2,99	10,56	13,29	16,71	1,64	13,92	16,54	19,16	1,39	46,65	48,95	51,25	1,22
3 years	87,97	94,11	100,25	3,26	11,35	14,48	18,46	1,91	13,69	16,42	19,15	1,45	47,34	49,44	51,74	1,22
3.5 years	91,17	97,84	104,51	3,54	11,93	15,53	20,22	2,24	13,42	16,29	19,16	1,53	47,32	49,63	51,93	1,22
4 years	94,33	101,54	108,75	3,83	12,82	16,71	21,78	2,46	13,44	16,29	19,14	1,52	47,41	50,01	52,27	1,29
4.5 years	97,72	105,02	112,32	3,88	13,64	17,72	23,03	2,51	13,31	16,23	19,14	1,55	47,50	50,10	52,45	1,28
5 years	99,34	107,59	115,83	4,39	14,04	18,42	24,18	2,87	13,19	16,23	19,23	1,62	47,68	50,16	52,65	1,32
5.5 years	102,81	111,01	119,21	4,35	14,94	19,66	25,88	3,00	13,10	16,37	19,63	1,74	47,91	50,35	52,80	1,29
6 years	105,60	114,00	122,41	4,47	15,27	20,69	28,02	3,58	13,01	16,50	19,99	1,86	47,95	50,52	53,08	1,36
6.5 years	107,97	117,13	126,30	4,87	16,3	21,99	29,66	3,65	12,63	16,61	20,58	2,11	48,22	50,84	53,16	1,23
7 years	110,80	120,04	129,27	4,91	16,91	23,26	32,00	4,17	12,64	16,61	20,58	2,11	48,49	51,01	53,53	1,34
7.5 years	113,55	123,08	132,61	5,07	18,27	25,00	34,22	4,32	12,79	16,75	20,71	2,11	48,93	51,35	53,76	1,28
8 years	116,12	125,96	135,80	5,23	18,89	26,33	36,70	4,83	12,77	16,89	21,01	2,10	48,98	51,65	54,12	1,42
8.5 years	119,22	128,55	137,88	4,96	20,12	27,84	38,53	4,33	12,74	17,02	21,30	2,28	49,15	51,70	54,25	1,36
9 years	121,30	131,59	141,87	5,47	21,08	29,32	40,79	5,40	12,79	17,11	21,44	2,30	49,25	51,89	54,53	1,40
9.5 years	122,82	133,96	145,10	5,92	21,66	30,71	43,55	5,99	12,83	17,20	21,57	2,33	49,53	52,20	54,87	1,42
10 years	125,49	136,65	147,80	5,93	23,06	32,47	45,72	6,23	12,89	17,56	22,23	2,48	49,70	52,27	54,94	1,36
10.5 years	127,98	139,93	151,89	6,36	24,81	34,94	49,20	6,70	13,15	17,96	22,78	2,56	50,19	52,68	55,17	1,32
11 years	130,50	142,48	154,45	6,37	25,60	36,37	51,65	7,20	13,27	18,21	23,15	2,63	50,21	52,75	55,29	1,40
11.5 years	132,40	145,70	159,00	7,07	26,87	38,72	55,79	7,88	13,38	18,45	23,52	2,70	50,36	52,95	55,54	1,37
12 years	136,55	148,43	160,30	6,31	28,96	40,68	57,15	7,50	13,64	18,67	23,70	2,67	50,45	53,13	55,80	1,42
12.5 years	138,05	151,17	164,30	6,05	30,37	42,83	60,41	7,93	13,81	19,02	24,22	2,65	50,83	53,48	56,12	1,40
13 years	141,91	153,72	165,53	6,28	32,61	45,38	63,16	8,10	13,97	19,36	24,75	2,87	51,06	53,67	56,29	1,39
13.5 years	143,77	155,88	167,98	6,43	34,50	47,67	65,87	8,30	14,60	19,91	25,22	2,82	51,13	53,86	56,57	1,45
14 years	145,44	156,80	168,17	6,05	36,64	49,64	67,25	8,28	15,02	20,41	25,79	2,83	51,24	53,94	56,65	1,44
14.5 years	145,68	157,41	169,15	6,24	38,35	50,39	67,65	7,40	15,32	20,60	25,89	2,81	51,45	54,04	56,63	1,38
15 years	147,04	158,29	169,54	5,98	39,59	51,90	68,05	7,66	15,61	20,80	25,99	2,76	51,66	54,13	56,60	1,32
15.5 years	148,40	159,16	169,92	5,72	40,32	52,52	68,41	7,58	15,88	20,81	25,74	2,62	51,70	54,24	56,77	1,35
16 years	149,23	159,91	170,57	5,68	41,06	53,14	68,77	7,53	16,15	20,82	25,49	2,48	51,70	54,24	56,77	1,35
16.5 years	150,40	160,60	170,80	5,43	42,00	53,31	68,39	6,95	16,50	20,88	25,26	2,33	51,74	54,26	56,80	1,34
17 years	150,41	160,75	171,09	5,50	42,95	53,49	68,01	6,37	16,84	20,93	25,03	2,18	51,79	54,35	56,90	1,36
17.5 years	150,42	160,90	171,37	5,57	43,20	54,00	67,00	6,44	16,73	20,66	24,58	2,09	52,05	54,48	56,90	1,27
18 years	150,50	161,26	172,01	5,72	43,60	54,48	66,80	6,29	16,65	20,60	24,55	2,10	52,32	54,61	56,90	1,22

* Up to 2 years
** 2 years onwards

HOW TO USE THE GROWTH CURVES AND TABLES

TECHNICAL SPECIFICATIONS

All measurements were taken at the same time of day, and the children were naked.

Length was measured in the supine position, using the *Holtain Harpenden Supine Measuring Table*, up to the age of 2 years. From this age onwards, the children were measured standing upright, using the *Holtain Stadiometer*.

Weight was measured using electronic scales with sensitivity 10 grams.

Skin folds were measured using the *Harpenden Skinfold Caliper*.

Sitting height was mentioned using the *Holtain Sitting Height Table*.

Data processing: This was carried out using the FOCREC program prepared for this study.

Una descripción detallada de las técnicas de medida puede encontrarse en ZURIMENDI, A., Planificación de un estudio semilongitudinal de crecimiento en la población infantil de Vizcaya. En M. Hernández, ed. **Nutrición, Crecimiento y Desarrollo**, Publicaciones del Instituto de Crecimiento y Desarrollo de la Fundación Orbegozo. Bilbao, 1981, pág.: 23-33; SOBRA DILLO, B.: Estudio longitudinal del crecimiento en los dos primeros años de vida en la población infantil de Vizcaya. **Tesis Doctoral**. Universidad del País Vasco. Bilbao, 1984; y Hernández, M., *et al.*: Valoración del crecimiento somático. En J. Peña, ed. **Crecimiento y Desarrollo**, vol. I. Monografías de Pediatría. Jarpyo Editores. Madrid, 1985, pág.: 16-23.

USE OF CURVES

Length/height, head circumference and sitting height curves: Note the child's measurement directly on the graph and check whether it is within or outside the normal variation limits, between the 3rd and 97th percentiles.

Arm circumference and skin fold curves: These are used as above. As the values do not have a normal distribution and are highly asymmetrical, these graphs have been drawn on logarithmic paper.

Weight/length curves: On the graph, note the point where the child's length and weight meet. This gives a direct estimate of whether or not the child's weight is suitable for his/her height. These graphs are only reliable during the period when the distribution of weight for height is independent of age, i.e. until puberty. After the onset of puberty this is no longer the case, and these curves should no longer be used.

Body mass index curves: On the graph, note the quotient obtained by dividing the weight in kilograms by the square of the height in metres in the place corresponding to the child's age.

Rate curves: The graphs for children under 2 have two scales. One of these indicates whether the increase over the previous three months is normal. The other is to calculate the rate of growth expressed in centimetres or kilograms per year.

The graphs for 2-18 years of age are suitable for evaluating the rate of growth, in cm/year for height and kg/year for weight. The annual increase should be noted at the midpoint of the year in which the observation was made. For example, if a child grows by 6 cm between the ages of 5 and 6 years, this figure must be noted on the graph in the place corresponding to 5.5 years.

The curve for growth rate during puberty was obtained by superimposing the subjects' maximum growth peaks, regardless of the age at which this occurs.

The percentile lines on the graphs represent the growth pattern of children whose growth peak occurs at an average age. The areas where the background has not been shaded are reserved for children who mature early or late.

USING THE TABLES

The tables contain the mean values, represented by the 50th percentile, and the limits of the range of “normal” variation most commonly used in clinical practice (P3 and P97).

Standard deviation is also included, as this is essential for evaluating which children fall outside the range between the 3rd and 97th percentiles and to compare subjects of different ages. The value used for this is the score standard deviation, z , which yields the multiple or fraction of standard deviations separating a particular individual from the mean.

The formula used for this calculation is $z = \frac{X - \bar{X}}{SD}$ where Z is the score standard deviation, X is the value of the variable to be calculated, \bar{X} is the mean of the variable and SD is the standard deviation.

DECIMAL AGE

The decimal age panel is included to make growth rate easier to calculate. It must be used as follows: if a child is seen on 10th May 1983, the corresponding figure in the calendar for this date is 83.353. If the child’s date of birth is 8th February 1982, the corresponding figure according to the table, found in the same way, will be 82.104. The difference between these two figures (83.353-82.104 = 1.249) is rounded off to 1 decimal place, giving a decimal age of 1.2 years.

The same technique can be used to obtain the fraction of a year between two measurements.

TABLE FOR CONVERTING TO TENTHS OF A YEAR

	1 JAN	2 FEB	3 MAR	4 APR	5 MAY	6 JUN	7 JUL	8 AUG	9 SEP	10 OCT	11 NOV	12 DEC
1	000	085	162	247	329	414	496	581	666	748	833	915
2	003	088	164	249	332	416	499	584	668	751	836	918
3	005	090	167	252	334	419	501	586	671	753	838	921
4	008	093	170	255	337	422	504	589	674	756	841	923
5	011	096	173	258	340	425	507	592	677	759	844	926
6	014	099	175	260	342	427	510	595	679	762	847	929
7	016	101	178	263	345	430	512	597	682	764	849	932
8	019	104	181	266	348	433	515	600	685	767	852	934
9	022	107	184	268	351	436	518	603	688	770	855	937
10	025	110	186	271	353	438	521	605	690	773	858	940
11	027	112	189	274	356	441	523	608	693	775	860	942
12	030	115	192	277	359	444	526	611	696	778	863	945
13	033	118	195	279	362	447	529	614	699	781	866	948
14	036	121	197	282	364	449	532	616	701	784	868	951
15	038	123	200	285	367	452	534	619	704	786	871	953
16	041	126	203	288	370	455	537	622	707	789	874	956
17	044	129	205	290	373	458	540	625	710	792	877	959
18	047	132	208	293	375	460	542	627	712	795	879	962
19	049	134	211	296	378	463	545	630	715	797	882	964
20	052	137	214	299	381	466	548	633	718	800	885	967
21	055	140	216	301	384	468	551	636	721	803	888	970
22	058	142	219	304	386	471	553	638	723	805	890	973
23	060	145	222	307	389	474	556	641	726	808	893	975
24	063	148	225	310	392	477	559	644	729	811	896	978
25	066	151	227	312	395	479	562	647	731	814	899	981
26	068	153	230	315	397	482	564	649	734	816	901	984
27	071	156	233	318	400	485	567	652	737	819	904	986
28	074	159	236	321	403	488	570	655	740	822	907	989
29	077		238	323	405	490	573	658	742	825	910	992
30	079		241	326	408	493	575	660	745	827	912	995
31	082		244		411		578	663		830		997
	JAN 1	FEB 2	MAR 3	APR 4	MAY 5	JUN 6	JUL 7	AUG 8	SEP 9	OCT 10	NOV 11	DEC 12

CONTENTS

	Page	
Presentation	3	
 CURVES		
	Boys	Girls
0-2 years:		
Length		
Weight	6	15
Head circumference		
Weight/Length	6	16
Weight increase		
Length increase	7	17
2-18 years:		
Height		
Weight	8	18
Weight		
Height	9	19
0-18 years:		
Body Mass Index	10	20
Weight increase		
Height increase	11	21
Head circumference		
Sitting height	12	22
Arm circumference		
Triceps skin fold	13	23
Subscapular skin fold	14	24
 TABLES		
	Boys	Girls
Height, weight, body mass index, head circumference, arm circumference, triceps skin fold, subscapular skin fold, growth rate (mean values and normal variation)	26	28

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.



FUNDACION
FAUSTINO ORBEGOZO EIZAGUIRRE
MARÍA DÍAZ DE HARO, 10 Bis
48013 BILBAO

Appendix 3: Information for patients (*in Spanish unless stated otherwise*)

Associations for obesity sufferers:

Spanish Association for the Acceptance of Obesity: <http://www.gordos.org/index.html>

Obesity, Family and Environment Association: <http://asofe.org/>

Worldwide Obesity Association: <http://www.obesos.org>

Information on healthy eating and exercise:

Website of the NAOS (Nutrition, Physical Exercise, Obesity Prevention and Health) Strategy, including information on healthy eating and exercise: <http://www.naos.aesan.msc.es/>

Feeding Your Children: Handbook of the Spanish Agency for Food Safety and Nutrition, available at: <http://www.naos.aesan.msc.es/naos/investigacion/publicaciones/>

Website of the PERSEO (Reference School Pilot Study for Health and Exercise Against Obesity) programme, with plenty of information on healthy eating, example meals, eating and exercise guidelines for the whole family and more: <http://www.perseo.aesan.msc.es/es/familia/Familia.shtml>

Traditional games to stay active, healthy birthday celebrations and much more: http://www.perseo.aesan.msc.es/es/programa/secciones/material_divulgativo.shtml

Website of the Eroski Foundation, with plenty of information on food, meals, news and more: <http://www.consumer.es/alimentacion/>

Website for childhood obesity prevention of the Eroski Foundation: <http://obesidad-infantil.consumer.es/>

Website of the Spanish Association for Primary Paediatric Care on food for children and adolescents: <http://www.aepap.org/familia/alimentacion.htm>

Interactive website on healthy eating of the Dept. of Education of the Government of Catalonia (in Catalan): <http://www.xtec.cat/escola/tastam/logos.htm>

Holistic treatment programme for childhood overweight and obesity, Children in Motion: www.nensenmoviment.net

Information on breastfeeding:

Breastfeeding Committee of the Spanish Paediatrics Association: <http://www.aeped.es/lactanciamaterna/index.htm>

Website of the Spanish Association for Primary Paediatric Care on breastfeeding: <http://www.aepap.org/familia/lactancia.htm>

Fisterra's health website on breastfeeding: <http://www.fisterra.com/Salud/1infoConse/lactanciaMaterna.asp>

World Health Organization information on breastfeeding (in English): <http://www.who.int/topics/breastfeeding/en/>

Information and support for mothers wanting to breastfeed: <http://www.laligadela-leche.es/>

Breastfeeding support groups throughout Spain: <http://www.ihan.es/index3.asp>

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

It has been 5 years since the publication of the Clinical Practice Guidelines and it is subject to updating.

La actividad física tiene efectos beneficiosos sobre:

- ✓ El crecimiento
- ✓ El corazón y los pulmones
- ✓ La función intestinal
- ✓ Las defensas
- ✓ La coordinación
- ✓ El desarrollo psicológico y la autoestima
- ✓ La salud presente y futura



¡Cualquier movimiento ES actividad física!



Consejos a los padres

- Compartir con los hijos la actividad física
- Lo importante es participar
- Dar a conocer diferentes actividades y fomentar las actividades en grupo
- Aumentar el esfuerzo poco a poco
- Respetar las normas de seguridad:

- Protección adecuada (casco, gafas, protección solar...)
- Respetar el tiempo de digestión, beber agua durante el ejercicio, ...



Actividad física en la infancia y adolescencia:



moviéndose... se crece saludablemente

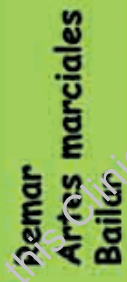


Moviéndose ... se crece saludablemente

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Menos de 1,5 horas/día

Tele, videos, ordenador video juegos



2-3 veces por semana
15 minutos o más



Montar en bicicleta
Nadar
Patinar
Correr



Jugar a la pelota
Esquiar
Deportes de equipo
Educación Física



3-5 veces por semana
45 minutos o más

Cada día
1 hora o más



Pasear
Subir las escaleras a pie
Ir andando al colegio y/o instituto

Participar en tareas domésticas
Jugar al aire libre
Pasear las mascotas



Todos queremos ... lo mejor para nuestras familias



¿Qué más puedo hacer para alimentar bien a mis hijos?

- Darles un buen desayuno con:
 - Lácteo (leche, yogur, queso)
 - Cereales (pan, galletas, otros cereales)
 - Fruta (entera o en zumo)
- La cena debería ser más ligera que la comida, evitando la repetición de alimentos
- Conviene hacer 4-5 comidas al día y no picar entre comidas



¿Cómo educar a mis hijos para que coman bien?

- Anímelos a participar en la compra y la preparación de los alimentos
- No utilice la comida como premio o castigo
- Aproveche el tiempo de las comidas para promocionar los hábitos saludables y las relaciones afectivas
- Coma en familia, sin televisor

¿Qué más puedo hacer para promover un estilo de vida saludable?

- Vaya andando al colegio, juegue con sus hijos en el parque, practique deporte con ellos, suba las escaleras a pie, ...
- Anímelos a reducir la actividad sedentaria: tiempo delante del televisor, ordenador ...



Todos queremos ...

LA ALIMENTACIÓN SALUDABLE de niños y niñas y adolescentes



Consejos para padres y madres y cuidadores

lo mejor para nuestras familias



GRUPOS DE ALIMENTOS:

Raciones recomendadas

Dulces, golosinas, embutidos, bebidas azucaradas
Consumo ocasional

Frutos secos
Ninguno: niños hasta 6 años
3-7 raciones semanales

Leche y derivados
2-4 raciones diarias

Verduras y hortalizas
2-3 raciones diarias

Aceite de oliva
3-4 raciones diarias

Carne, pescado, huevos y legumbres
2-3 raciones diarias

Fruta
2-3 raciones diarias

Feculentos: cereales, pan, pasta, arroz, patata
3-4 raciones diarias niños/4-6 adolescentes

Agua
8 vasos/día

La alimentación saludable en niños y niñas y adolescentes

- Conviene que coman de todo según la pirámide y con la mayor variedad:
 - Los féculentos son básicos
 - Potencie el consumo de frutas y verduras
 - Más pescado y legumbres y menos carnes
- Respete las raciones diarias recomendadas de los diferentes grupos
- Adapte las raciones a la edad

Appendix 4: Acronyms and abbreviations

%:	percentage
Apo-A:	apolipoprotein A
Apo-B:	apolipoprotein B
BMI:	body mass index
BMIz:	BMI score z
CI:	confidence interval
CPG:	clinical practice guideline
g:	gram
HDL-c:	high-density lipoprotein cholesterol
hr:	hour
HR:	hazard ratio
IOTF:	International Obesity Task Force
kg:	kilogram
LDL-c:	low-density lipoprotein cholesterol
mg:	milligram
min:	minute
mmol/l:	millimole per litre
NAOS (strategy):	Nutrition, Physical Exercise, Obesity Prevention and Health
NHS:	Spanish National Healthcare System
NICE:	National Institute for Clinical Excellence
NNT:	number needed to treat
OR:	odds ratio
P:	probability
P85:	85th percentile
P90:	90th percentile
P95:	95th percentile
P97:	97th percentile
PE_	physical education
RCT:	randomised clinical trial
RR:	relative risk

RRR:	relative risk reduction
SD:	standard deviation
SIGN:	Scottish Intercollegiate Guidelines Network
SMD:	standardised mean difference
SR:	systematic review
TC:	total cholesterol
TG:	triglycerides
TV:	television
UK:	United Kingdom
USA:	United States of America
VLDL-c:	very low-density lipoprotein cholesterol
WHO:	World Health Organization
WMD:	weighted mean difference

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Appendix 5: Glossary

Bariatric surgery: Surgery to reduce weight.

Before-and-after study: A study in which the same group of people is evaluated both before and after an action or treatment.

Behavioural therapy: Behavioural therapy is based on the principles of learning theory (promotion of stimuli that lead to particular behaviour). It consists of assessment (identifying problematic behaviour and the circumstances that cause it), treatment (including small, easily-measured aims that are continually reviewed) and monitoring. The processes in behavioural change include stimulus control, gradual exposure and the disappearance of the behaviour and reward.

Bias: Error appearing in the results of a study due to factors that depend on data collection, analysis, interpretation, publication or review. These factors may lead to conclusions that are systematically different from the truth or which are incorrect with regard to research aims.

Blind study: A study in which one of the parties involved does not know who is receiving a particular treatment option or placebo. Blinding is used to prevent research results being influenced by the placebo effect or by observer bias. In order to evaluate blinding effectively, we need to know who has been blinded for the study (patients, investigators, healthcare professionals, results allocators and/or statisticians).

BMI z-score: Mean BMI of the reference population for the corresponding age and sex, minus the BMI of each participant, divided by the standard deviation of the reference population for the corresponding age and sex.

Body mass index: A measurement that associates an individual's weight and height, also called Quetelet's index or the Quetelet index. It is calculated by dividing the weight in kilograms by the square of the height in metres.

Case and control study: This is an observational epidemiology study in which study subjects are selected according to whether they have (cases) or do not have (controls) a particular illness or a particular effect in general. Once the individuals in each group have been selected, it is investigated whether or not they were exposed to a certain feature, and the proportion of people exposed in the case group is compared with the proportion in the control group.

Clinical practice guideline: A set of instructions, directives, statements or recommendations developed systematically in order to help professionals and patients take decisions on the appropriate healthcare for specific clinical circumstances.

Clinical series: Also called a case series, this is a type of study that describes experience with a group of patients with similar diagnoses, with no comparator group.

Clinical trial: An experimental study to evaluate the efficacy and safety of a treatment or action.

Cochrane Library: A database on effectiveness produced by the Cochrane Collaboration. It consists of the organisation's original systematic reviews and other items.

Cochrane review: A systematic review carried out according to the methods of the Cochrane Collaboration and published in the Cochrane Library.

Cohort study: This consists of monitoring one or more cohorts of individuals with varying levels of exposure to a risk factor, in whom the onset of the illness or condition being studied is measured.

Comorbidity: The presence of several additional or associated illnesses.

Confidence interval: The interval at which the actual effect size (never known exactly) is found with a pre-established level of security, or confidence. We often speak of a “95% confidence interval” (or “95% confidence limits”). This means that the actual value would be within this interval in 95% of cases.

Confusing factor: This is an outcome that distorts measurement of the association between another two outcomes being studied. A confusing factor may lead to a non-existent effect apparently being observed or a real association being exaggerated (positive confusion); or, in contrast, it may lead to a real association being weakened or even the direction of a real association being reversed (negative confusion).

Effectiveness: The result of a diagnostic, preventive or therapeutic action when applied in normal practice, under non-experimental conditions.

Efficacy: The result of a diagnostic, preventive or therapeutic action when applied under experimental and/or controlled conditions, e.g. in a clinical trial.

Evidence: Proof. Evidence-based medicine: medicine based on scientific proof.

Gastroplasty: A surgical operation on the stomach to restrict and reduce food intake.

Incidence: The number of new cases of a disease arising in a population over a particular period of time. This tells us the probability of an individual without the disease developing it within a particular period.

Meta-analysis: A statistical technique that allows the results of several different studies (studies of diagnostic tests, clinical trials, cohort studies, etc.) to be combined in a single estimate which lends more weight to the results of larger studies.

Morbidity: Disease caused.

Motivational interview: A motivational interview is a type of patient-centred clinical interview which essentially helps the patient explore and resolve ambivalences on specific unhealthy behaviour or habits, in order to promote changes towards healthier lifestyles. It allows the patient to orient him-/herself towards a wish to change, aiming to help him/her to recognise and address his/her present and future problems and boosting his/her perception of efficacy³³⁵.

NICE: An institution within the UK's NHS. Its role is to provide doctors, patients and the general public with the best available evidence, mainly in the form of clinical guidelines.

NNT/NNH: This is a measure of the efficacy of a particular treatment. The number needed to treat (NNT) is the number of people that need to be given a specific treatment to cause or prevent an additional event. Similarly, the number needed to harm (NNH) is defined to evaluate adverse effects.

Obesity: Obesity is a condition in which the body's natural energy reserves, stored in the adipose tissue, increase to a point associated with a higher risk of suffering from various diseases and mortality. This guideline defines obesity in children and adolescents as a BMI above P97 for the child or adolescent's age and sex, according to the tables of Hernández et al. (1988)⁵⁹. In adults, the WHO defines obesity as a BMI equal to or greater than 30.

Odds ratio (OR): A measure of the efficacy of a particular treatment. An odds ratio of 1 means that the effect of the treatment is no different from the effect of the control. An OR greater (or less) than 1 means that the effect of the treatment is greater (or less) than that of the control. Note that the effect measured may be either negative (e.g. death or incapacity) or positive (e.g. giving up smoking).

Overweight: Excessive weight in relation to height. This guideline classifies children and adolescents as suffering from overweight when their BMI is between the 90th and 97th percentiles for their age and sex according to the tables of Hernández *et al.* (1988)⁵⁹. In adults, the WHO defines overweight as a BMI between 25 and 30.

Percentile: A value that divides an ordered set of statistical data so that a certain percentage of the data fall below this value. One of the 99 points that divides a distribution into 100 parts with the same frequency.

Placebo: An inactive substance or action used as a control in clinical research. It serves to rule out cures for unknown reasons which would not be attributable to the treatment being researched.

Prevalence: The proportion of individuals in a population who have a particular disease or characteristic at a particular point in time or during a particular period of time. This tells us the probability of an individual from a certain population having a disease at a particular point in time or during a particular period of time.

Randomisation: A procedure by which sample selection or allocation to a treatment option or placebo is carried out at random.

Randomised clinical trial: A type of clinical trial in which patients are allocated at random to the various treatments being compared.

Relative risk (RR): The quotient between the rate of events in a treatment group and a control group. This value is interpreted in the same way as the OR.

Risk factor: Any circumstance that increases the probability of someone contracting a particular disease.

SIGN: A multidisciplinary Scottish agency that publishes evidence-based clinical practice guidelines and methodological documents on guideline design.

Statistical power: The ability of a test to detect differences of a particular size between groups being compared as statistically significant.

Statistically significant: In a study, if the probability that the differences in effect found when two groups are compared is lower than a previously-defined significance level, the differences are said to be statistically significant. This means that the differences observed between the treatments or groups compared are highly unlikely to have occurred by chance. A significance level of 5%, generally written as $p < 0.05$, is usually used. However, it should

be borne in mind that even if the difference between treatments is statistically significant, this does not always indicate that the difference is “clinically significant” or relevant.

Systematic review (SR): A review in which the evidence on a particular subject has been systematically identified, evaluated and summarised according to a pre-established set of criteria. It may or may not include meta-analysis.

Weight for height: A method of evaluating the effect of height on a child’s total weight. This is different from BMI. It consists of extrapolating the patient’s weight to the percentiles corresponding to the age at which his/her height would be the 50th percentile, rather than directly to his/her chronological age. In other words, if a 5 year-old child is tall and his/her height corresponds to P50 for a child aged 7, his/her weight will be compared to the reference values for weight for his/her “height age” (7 years). The patient’s weight is then divided by the 50th percentile of weight for this height, and multiplied by 100 to give the percentage that represents his/her weight in relation to his/her “height age”.

Terms relating to methodological issues are based on the glossary of CASPe (Critical Appraisal Skills Programme Español), <http://www.redcaspe.org/homecasp.asp>

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Appendix 6: Disclosure of Interests

The authors', reviewers' and expert collaborators' disclosure of interests was compiled using the pre-established form included in the *Methodology Manual for Developing Clinical Practice Guidelines of the National Health Service*¹.

Authors:

Pablo Alonso Coello, Jesús Argente Oliver, Juan José Arrizabalaga, José Cristóbal Buñuel Álvarez, Alfonso Calañas Continente, Mar Calvo Terrades, Fernando Cordido Carballido, Rosario Corio Andújar, Olga Cortés Rico, Mercedes Fernández Rodríguez, María Paz González Rodríguez, Ascensión Marcos Sánchez, Ana Martínez Rubio, Gloria Orejón de Luna, Jesús Román Martínez Álvarez, Amaia Sojo Aguirre, Ivan Solà Arcau and Sera Tort Donada have declared that they have no conflicts of interest

Julia Colomer Revuelta obtained funding from Milupa and Nestlé for registration for the national conference of the Spanish Association for Primary Paediatric Care (2005-2006).

César García Vera obtained funding from Nestlé for accommodation at the Fourth Annual Conference of the Spanish Association for Primary Paediatric Care (May 2008), and from Lab. Ordesa for registration for the 33rd Annual Meeting of the Spanish Paediatric Neurology Society (September 2008). To date he has been Director of the Aragonese Association for Primary Paediatric Care for one year. He received sponsorship from the following private bodies (always in line with the commitment undertaken in the Association's Code of Ethics not to interfere in the selection of content or speakers) for the organisation of the Aragonese Annual Conference on Paediatric Primary Care and a workshop: Merck Sharp & Dohme, Lab. Ordesa, Nestlé, GlaxoSmithKline, Farma-Lepori, Phadia and Ferring. He did not receive any personal payment for any of these activities.

Isabel González González received funding from Nestlé for registration and accommodation for the conference of the Spanish Society for Parenteral and Enteral Nutrition (SENPE) (2008), and from Lilly for registration and accommodation for the conference of the Spanish Federation of Diabetes Educators' Associations (FEAED) (2008).

Gabriel Ángel Martos received funding from Lilly, Serono, Novo-Nordisk, Pfizer and Ferring for registration for the conferences of the Spanish and European Societies for Paediatric Endocrinology (2004-2007), and received fees from Serono, Novo-Nordisk and Pfizer as a speaker at the paediatric endocrinology refresher courses (2004-2007).

Reviewers and Expert:

María del Milagro Alonso Blanco, Albert Balaguer Santamaría, Ramón Cañete Estrada, José Antonio Castillo Laita, Pilar Codoñer Franch, Jaime Dalmau Serra, Lefa-Sarane Eddy Ives, Joaquín Escribano Subias, Emilio Fortea Gimeno, Javier González de Dios, María Rosa Gutiérrez Grau, María José López García, Pedro Martín Muñoz, María José Martínez Zapata, Luis Alberto Moreno Aznar, Carlos Ochoa Sangrador, Itziar Pérez Irazusta, Rafael Rotaeche García, José Ramón Rueda Martínez, Joan Carles Sevilla Moya, Carme Tort Donada and Clotilde Vázquez Martínez have declared that they do not have any conflicts of interest.

Javier Aranceta Bartrina received funding from Coca-Cola and Puleva to attend the meeting of the Governing Board of the Spanish Society for the Study of Obesity in January 2008, and from Puleva to hold a pre-conference course of the Spanish Community Nutrition Society (SENC) in Valencia in October 2008. He also received financial aid from Laboratorios Lácer for the DORICA study and the publication *Obesidad y riesgo cardiovascular en España* ('Obesity and Cardiovascular Risk in Spain').

Juan Ruiz-Canela Cáceres collaborated in the dissemination of the NAOS Strategy and was a content consultant for the compilation of *Cuentos para niños y niñas* ('Stories for Children'), funded by Puleva (April 2006, March 2007).

It has been 5 years since the publication of this Clinical Practice Guideline and it is subject to updating.

Appendix 7: Main Clinical Practice Guidelines and other useful resources

During compilation of the CPG on the prevention and treatment of childhood and juvenile obesity, some published guidelines on the subject were consulted as secondary literature sources. All these were evaluated using the AGREE method⁶⁰. Thanks to the rigour and clarity, some of these documents provided inspiration and served as examples for some sections. Below is a list and links to the full text of the main documents. Due to their high quality or recent publication date, these may constitute a major source of information for those using this guideline.

Clinical Practice Guidelines on childhood and juvenile obesity

Clinical Practice Guidelines on Tuberculosis

Title: August GP, Caprio S, Fennoy I, Freemark M, Kaufman FR, Lustig RH, et al. Prevention and Treatment of Pediatric Obesity: An Endocrine Society Clinical Practice Guideline Based on Expert Opinion. *J Clin Endocrinol Metab* 2008 Sep 9 [Epub ahead of print]. PMID: 18782869

Website: <http://www.ncbi.nlm.nih.gov/pubmed/18782869>

Title: Lau DC, Douketis JD, Morrison KM, Hramiak IM, Sharma AM, Ur E. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children. *CMAJ*. 2007; 176 (8 suppl): S1-13.

Website: <http://www.cmaj.ca/cgi/content/full/176/8/S1/DC1>

Title: US Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. 2007.

Website: <http://www.phac-aspc.gc.ca>

Title: National Institute for Health and Clinical Excellence. Obesity. Guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children. NICE clinical guideline 43. December 2006.

Website: <http://www.nice.org.uk/Guidance/CG43>

Title: Registered Nurses Association of Ontario (RNAO). Primary prevention of childhood obesity. Toronto (ON): Registered Nurses Association of Ontario (RNAO); 2005.

Website: <http://www.rnao.org/Page.asp?PageID=924&ContentID=811>

Title: U.S. Preventive Services Task Force (USPSTF). Screening and interventions for overweight in children and adolescents: recommendation statement. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2005.

Website: <http://www.ahrq.gov/clinic/uspstf/uspsobch.htm>

Title: National Guideline Clearinghouse. Guideline synthesis. Overweight and obesity in children and adolescents: assessment, prevention, and management. NGC, 2005.

Website: http://www.guideline.gov/Compare/comparison.aspx?file=OBESITY3_Child.inc

Title: National Health and Medical Research Council. Clinical Practice Guidelines for the Management of Overweight and Obesity in Children and Adolescents. Commonwealth of Australia, 2003.

Website: <http://www.health.gov.au/internet/main/publishing.nsf/Content/obesityguidelines-guidelines-children.htm>

Title: Scottish Intercollegiate Guidelines Network (SIGN). Management of obesity in children and young people. A national clinical guideline. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2003.

Website: <http://www.sign.ac.uk/guidelines/fulltext/69/index.html>

Related resources (*in Spanish unless stated otherwise*)

Title: Spanish Agency for Food Safety and Nutrition, NAOS Strategy: Strategy for Nutrition, Physical Exercise and Obesity Prevention, Spanish Ministry for Health and Consumption. Madrid; 2005.

Website: <http://www.naos.aesan.msc.es/>

Title: Reference School Pilot Study for Health and Exercise Against Obesity (PERSEO). Spanish Ministries for Health and Consumption, Education, Social Policy and Sport, in conjunction with the Regional Ministries for Health and Education of six Autonomous Regions.

Website: http://www.perseo.aesan.msc.es/es/programa/programa_perseo.shtml

Title: World Health Organization information on obesity (in English)

Website: <http://www.who.int/topics/obesity/en/>

Regional office for Europe: <http://www.euro.who.int/obesity>

Title: International Obesity Taskforce. An organisation that supports strategies to improve diet and exercise and prevent obesity and obesity-related diseases, with particular emphasis on childhood obesity.

Website: www.ionf.org

Bibliography

- 1 Grupo de trabajo sobre GPC. Elaboración de Guías de Práctica Clínica en el Sistema Nacional de Salud. Manual Metodológico. Madrid: Plan Nacional para el SNS del MSC. Instituto Aragonés de Ciencias de la Salud-I+CS; 2007. Guías de Práctica Clínica en el SNS: I+CS N° 2006/0I.
- 2 WHO. Overweight and obesity. [sitio web]. Geneva, Switzerland: World Health Organization, 2006. [citado 13 ene 2008]. Disponible en: <http://www.who.int/mediacentre/factsheets/fs311/en/index.html>
- 3 WHO. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. Technical report series 894. Geneva: WHO; 2000.
- 4 WHO. Diet, nutrition and the prevention of chronic diseases. Report of a Joint FAO/WHO Expert consultation. WHO Technical report series 916. Geneva: WHO; 2003.
- 5 Lindström M, Isacson SO, Merlo J. Increasing prevalence of overweight, obesity and physical inactivity: two population-based studies 1986 and 1994. *Eur J Public Health*. 2003;13(4): 306-12.
- 6 Gutiérrez-Fisac JL, Banegas Banegas JR, Artalejo FR, Regidor E. Increasing prevalence of overweight and obesity among Spanish adults, 1987-1997. *Int J Obes Relat Metab Disord*. 2000;24(12):1677-82.
- 7 Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obes*. 2006;1(1):11-25.
- 8 Calañas-Continente A, Arrizabalaga JJ, Caixás A, Cuatrecasas G, Díaz-Fernández MJ, García-Luna PP, et al. Guía para el manejo del sobrepeso y la obesidad en la preadolescencia y la adolescencia: Prevalencia de sobrepeso y obesidad en la adolescencia. *Endocrinol Nutr*. 2008;55(Supl 4):11-9.
- 9 Flynn MA, McNeil DA, Maloff B, Mutasingwa D, Wu M, Ford C, et al. Reducing obesity and related chronic disease risk in children and youth: a synthesis of evidence with 'best practice' recommendations. *Obes Rev*. 2006;(7 Suppl 1):7-66.
- 10 Paidós'84. Estudio epidemiológico sobre nutrición y obesidad infantil. Madrid: Gráficas Jomagar;1985.
- 11 Serra Majem L, Ribas Barba L, Aranceta Bartrina J, Pérez Rodrigo C, Saavedra Santana P, et al. Obesidad infantil y juvenil en España. Resultados del Estudio enKid (1998-2000). *Med Clin (Barc)*. 2003; 121(19):725-32.
- 12 Ríos N, Fluiters E, Pérez Méndez LF, García-Mayor EG, García-Mayor RV. Prevalence of childhood overweight in Northwestern Spain: a comparative study of two periods with a ten year interval. *Int J Obes Relat Metab Disord*. 1999; 23(10):1095-8.
- 13 Moreno LA, Sarría A, Fleta J, Rodríguez G, Bueno M. Trends in body mass index and overweight prevalence among children and adolescents in the region of Aragón (Spain) from 1985 to 1995. *Int J Obes Relat Metab Disord*. 2000; 24(7):925-31.
- 14 Larrañaga N, Amiano P, Arrizabalaga JJ, Bidaurrezaga J, Gorostiza E. Prevalence of obesity in 4-18-year-old population in the Basque Country, Spain. *Obes Rev*. 2007;8(4):281-7.
- 15 Moreno LA, Fleta J, Sarría A, Rodríguez G, Bueno M. Secular increases in body fat percentage in male children of Zaragoza, Spain, 1980-1995. *Prev Med*. 2001;33(5):357-63.
- 16 Moreno LA, Mesana MI, Fleta J, Ruiz JR, González-Gross M, Sarría A, et al. Overweight, obesity and body fat composition in Spanish adolescents. The AVENA study. *Ann Nutr Metab*. 2005;49(2):71-6.
- 17 Sociedad Española para el Estudio de la Obesidad (SEEDO). Consenso SEEDO'2007 para la evaluación del sobrepeso y la obesidad y el establecimiento de criterios de intervención

terapéutica. *Rev Esp Obes.* 2007;5(3):135-7.

- 18 Morrison JA, Sprecher DL, Barton BA, Wlaclawiw MA, Daniels SR. Overweight, fat patterning, and cardiovascular disease risk factors in black and white boys. *J Pediatr.* 1999;135(4): 458-64.
- 19 Obarzanek, E. Obesity in children, adolescents, and families. En: Fletcher GF, Grundy SM, Hayman LL, editors. *Obesity: impact on Cardiovascular Disease.* Armonk, NY: Futura Publishing Co, Inc;1999. p. 31-53.
- 20 Steinberger J, Moran A, Hong CP, Jacobs DR Jr, Sinaiko AR. Adiposity in childhood predicts obesity and insulin resistance in young adulthood. *J Pediatr.* 2001;138(4):469-73.
- 21 Guo SS, Wu W, Chumlea WC, Roche AF. Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *Am J Clin Nutr.* 2002;76(3):653-8.
- 22 Freedman DS, Khan LK, Serdula MK, Dietz WH, Srinivasan SR, Berenson GS. Interrelationships among childhood BMI, childhood height, and adult obesity: the Bogalusa Heart Study. *Int J Obes Relat Metab Disord.* 2004;28(1):10-6.
- 23 Baird J, Fisher D, Lucas P, Kkeijnen J, Roberts H, Law C. Being big or growing fast: systematic review of size and growth in infancy and later obesity. *BMJ.* 2005;331(7522):929.
- 24 Diaz JJ, Málaga I, Argüelles J, Diéguez MA, Vijande M, Málaga S. Agrupamiento de factores de riesgo cardiovascular en hijos obesos de padres con hipertensión esencial. *Anal Pediatr (Barc).* 2005;63(3):238-43.
- 25 Freedman DS, Dietz WH, Srinivasan SR, Berenson GS. The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study. *Pediatrics.* 1999;103(6):1175-82.
- 26 Baker JL, Olsen LW, Sørensen TI. Childhood body-mass index and the risk of coronary heart disease in adulthood. *N Engl J Med.* 2007;357(23):2329-37.
- 27 Bibbins-Domingo K, Coxson P, Pletcher MJ, Lightwood J, Goldman L. Adolescent overweight and future adult coronary heart disease. *N Engl J Med.* 2007;357(23):2371-9.
- 28 Must A, Jacques PF, Dallal GE, Bajema CJ, Dietz WH. Long-term morbidity and mortality of overweight adolescents. A follow-up of the Harvard Growth Study of 1922 to 1935. *N Engl J Med.* 1992;327(19):1350-5.
- 29 American Academy of Pediatrics Policy Statement. Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of All Children Committee on Nutrition. Prevention of Pediatric Overweight and Obesity. *Pediatrics.* 2003;112(2):424-30.
- 30 Richards GE, Cavallo A, Meyer WJ III, Prince MJ, Peters EJ, Stuart CA, et al. Obesity, acanthosis nigricans, insulin resistance, and hyperandrogenemia: pediatric perspective and natural history. *J Pediatr.* 1985;107(6):893-7.
- 31 Pinhas-Hamiel O, Dolan LM, Daniels SR, Standiford D, Khoury PR, Zeitler P. Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. *J Pediatr.* 1996;128(5): 608-15.
- 32 Shinha R, Fisch G, Teague B, et al. Prevalence of impaired glucose tolerance among children and adolescents with marked obesity. *N Engl J Med.* 2002;346(11):802-10.
- 33 Calañas-Contiente A, Arrizabalaga JJ, Caixás A, Cuatrecasas G, Díaz-Fernández MJ, García-Luna PP, et al. Guía para el manejo del sobrepeso y la obesidad en la preadolescencia y la adolescencia: Comorbilidades del exceso ponderal en el adolescente. *Endocrinol Nutr.* 2008;55(Supl 4):41-59.
- 34 Strauss RS. Childhood obesity and self-esteem. *Pediatrics* [serie en Internet]. 2000;105(1) [citado 13 ene 2008]. Disponible en: <http://www.pediatrics.org/cgi/content/full/105/1/e15>
- 35 Davison KK, Birch LL. Weight status, parent reaction, and self-concept in five-year-old girls. *Pediatrics.* 2001;107(1):46-53.
- 36 International Obesity Task Force [sitio web]. International Obesity Task Force, European Association for the Study of Obesity. Obesity in Europe. The Case for Action [citado 14 ene

- 2008]. Disponible en: <http://www.who.int/diabetes/euobesity.pdf>
- 37 Consejería de Salud de la Junta de Andalucía [sitio web]. Plan Integral de Obesidad Infantil de Andalucía 2007-2012 [citado 14 ene 2008]. Disponible en: <http://www.juntadeandalucia.es/salud/contenidos/planobesidadinfantil/PIOBIN%20BAJA.pdf>
 - 38 Wang G, Dietz WH. Economic burden of obesity in youths aged 6 to 17 years: 1979-1999. *Pediatrics*. 2002;109(5):e81.
 - 39 Hampl SE, Carroll CA, Stephen D, Simon SD, Sharma V. Resource Utilization and Expenditures for Overweight and Obese Children. *Arch Pediatr Adolesc Med*. 2007;161(1):11-4.
 - 40 Summerbell CD, Ashton V, Campbell KJ, Edmunds L, Kelly S, Waters E. Interventions for treating obesity in children. *Cochrane Database of Systematic Reviews* 2003, Issue 3. Art. No.: CD001872. DOI: 10.1002/14651858.CD001872.
 - 41 Wilfley DE, Tibbs TL, Van Buren DJ, Reach KP, Walker MS, Epstein LH. Lifestyle Interventions in the Treatment of Childhood Overweight: A Meta-Analytic Review of Randomized Controlled Trials. *Health Psychol*. 2007;26(5):521-32.
 - 42 Gibson LJ, Peto J, Warren JM, dos Santos Silva I. Lack of evidence on diets for obesity for children: a systematic review. *Int J Epidemiol*. 2006;35(6):1544-52.
 - 43 National Institute for Health and Clinical Excellence. Obesity. Guidance on the prevention, identification, assessment and management of overweight and obesity in adults and children. NICE clinical guideline 43. December 2006.
 - 44 Summerbell CD, Waters E, Edmunds LD, Kelly S, Brown T, Campbell KJ. Interventions for preventing obesity in children. *Cochrane Database of Systematic Reviews* 2005, Issue 3. Art. No.: CD001871. DOI: 10.1002/14651858.CD001871.pub2.
 - 45 Connelly JB, Duaso MJ, Butler G. A systematic review of controlled trials of interventions to prevent childhood obesity and overweight: a realistic synthesis of the evidence. *Public Health*. 2007;121(7):510-7.
 - 46 Serra Majem L, Aranceta Bartrina J, Ribas Barba L, Sangil Monroy M, Pérez Rodrigo C. Crecimiento y desarrollo: dimensión alimentaria y nutricional. En: Serra Majem L, Aranceta J, editores. *Crecimiento y desarrollo. Estudio enKid, Krece Plus*. Vol.4, Barcelona: Masson; 2003. p. 45-54.
 - 47 Ortega FB, Ruiz JR, Castillo MJ, Moreno LA, González-Gross M, Wärnberg J, et al. Bajo nivel de forma física en los adolescentes españoles. Importancia para la salud cardiovascular futura (estudio AVENA). *Rev Esp Cardiol*. 2005;58:898-909.
 - 48 WHO: WHO mega country health promotion network: behavioural risk factor surveillance guide. Geneva: WHO; 2002.
 - 49 Roman Viñas B, Serra Majem L, Ribas Barba L, Pérez Rodrigo C, Aranceta Bartrina J. Crecimiento y desarrollo: actividad física. Estimación del nivel de actividad física mediante el test corto Krece Plus, resultados en la población española. En: Serra Majem L, Aranceta J, editores. *Crecimiento y desarrollo. Estudio enKid, Krece Plus*. Vol.4, Barcelona: Masson; 2003. p.57-98.
 - 50 Ministerio de Sanidad y Consumo. 1ª Conferencia de prevención y promoción de la salud en la práctica clínica en España. Prevención de la obesidad infantil y juvenil. Madrid: Ministerio de Sanidad y Consumo; 2007.
 - 51 Kumanyika SK, Obarzanek E, Stettler N, Bell R, Field AE, Fortmann SP, et al. Population-based prevention of obesity: the need for comprehensive promotion of healthful eating, physical activity, and energy balance: a scientific statement from American Heart Association Council on Epidemiology and Prevention, Interdisciplinary Committee for Prevention (Formerly the Expert Panel on Population and Prevention Science). *Circulation*. 2008;118(4):428-64.
 - 52 Agencia Española de Seguridad Alimentaria y Nutrición. Estrategia NAOS. Estrategia para la Nutrición, Actividad Física y Prevención de la Obesidad. Madrid: Ministerio de Sanidad y Consumo; 2005.

- 53 Lau DC, Douketis JD, Morrison KM, Hramiak IM, Sharma AM, Ur E. 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children. *CMAJ*. 2007;176(8 Suppl):S1-13.
- 54 U.S. Preventive Services Task Force (USPSTF). Screening and interventions for overweight in children and adolescents: recommendation statement. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2005.
- 55 Registered Nurses Association of Ontario (RNAO). Primary prevention of childhood obesity. Toronto (ON): Registered Nurses Association of Ontario (RNAO); 2005.
- 56 Scottish Intercollegiate Guidelines Network (SIGN). Management of obesity in children and young people. A national clinical guideline. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2003.
- 57 National Health and Medical Research Council. Clinical Practice Guidelines for the Management of Overweight and Obesity in Children and Adolescents. Commonwealth of Australia, 2003.
- 58 Barlow SE. Expert Committee recommendations regarding the prevention, assessment and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics*. 2007;120(4 Suppl):S164-S92.
- 59 Hernández M, Castellet J, Narvaiza JL, Rincón JM, Ruiz I, Sánchez E, et al. Curvas y tablas de crecimiento. Instituto de Investigación sobre Crecimiento y Desarrollo, Fundación Faustino Orbeagozo. Madrid: Editorial Garsi; 1988
- 60 Delgado-Noguera M, Tort S, Bonfi I, Gich I, Alonso-Coello P. Quality assessment of clinical practice guidelines for the prevention and treatment of childhood overweight and obesity. *Eur J Pediatr*. 2008 Sep 25. [Epub ahead of print].
- 61 Moreno B, Monereo S, Moreno J, Desco M. Curvas de crecimiento de la Comunidad Autónoma de Madrid. En: Moreno B, editor. Retrasos del crecimiento. Madrid: Jarpio; 1988. p. 7-22.
- 62 Briones E, Perea E, Ruiz MP, Torro C, Gili M. The Andalusian Nutritional Survey: Comparison of the nutritional status of Andalusian children aged 6-60 months with that of the NCHS/CDC reference population. *Bull WHO*. 1989;67(4):409-16.
- 63 Hernández AM, Tebar FJ, Serrano S, Álvarez I, Illan F, Valdés M. Estudio antropométrico de la población escolar de la Comunidad Autónoma de Murcia. *Med Clin (Barc)*. 1992;98(17): 651-5.
- 64 Sandin M, Fraile R, Pérez M, González A, López P, García L. Curvas de crecimiento de niños de la Comunidad de Madrid. Madrid: Ediciones de la Universidad Autónoma de Madrid; 1993.
- 65 Suárez RG, Trujillo R, Díaz-Klamas MD, Toledo F, Alguacil P, Sierra A. Estudio del crecimiento de la población pediátrica de la Comunidad Canaria. Madrid: Ediciones Ergón; 1994.
- 66 De la Puente M, Canela J, Álvarez J, Salleras L, Vicens-Calvet E. Cross-sectional growth study of the child and adolescent population of Catalonia (Spain). *Ann Hum Biol*. 1997;24(5):435-52.
- 67 Sobradillo B, Aguirre A, Aresti U, Bilbao A, Fernández-Ramos C, Lizárraga A, et al. Curvas y tablas de crecimiento (Estudios Longitudinal y Transversal). Bilbao: Instituto de Investigación sobre Crecimiento y Desarrollo, Fundación Faustino Orbeagozo Eizaguirre; 2004.
- 68 Longas AF, Bager L, Labarta JI, Labena C, Mayayo E, Puga B, et al. Longitudinal study of normal Spanish children from birth to adulthood anthropometric, puberty, radiological and intellectual data. *Pediatr Endocr Rev*. 2005;2 Suppl 2:425.
- 69 Carrascosa Lezcano A, Fernández García JM, Fernández Ramos C, Ferrández Longás A, López-Siguero JP, Sánchez González E, et al y Grupo Colaborador Español. Estudio transversal español de crecimiento 2008. Parte II: valores de talla, peso e índice de masa corporal desde el nacimiento a la talla adulta. *An Pediatr (Barc)*. 2008;68(6):552-69.
- 70 Carrascosa Lezcano A, Ferrández Longás A, Yeste Fernández D, García-Dihinx Villanova

- J, Romo Montejo A, Copil Copil A, et al. Estudio transversal español de crecimiento 2008. Parte I: valores de peso y longitud en recién nacidos de 26-42 semanas de edad gestacional. *An Pediatr (Barc)*. 2008;68(6):544-51.
- 71 López-Siguero JP, Fernández García JM, De Luna Castillo JD. Estudio transversal de talla y peso de la población de Andalucía desde los 3 años a la edad adulta. *BMC Endocrine Disorders*, 2008 (en prensa).
 - 72 Prader A, Largo RH, Molinari L, Issler C. Physical growth of Swiss children from birth to 20y of age. *Helv Paediatr Acta*. 1989;52(Suppl):S1-S125.
 - 73 Rolland-Cachera MF, Cole TJ, Sempé M, Tichet J, Rossignol C, Charraud A. Body mass index variations: centiles from birth to 87 years. *Eur J Clin Nutr*. 1991;45(1):13-21.
 - 74 Cole TJ, Freeman JV, Preece MA. Body mass index reference curves for the UK, 1990. *Arch Dis Child*. 1995;73(1):25-9.
 - 75 Lindgren G, Strandell A, Cole T, Healy M, Tanner J. Swedish population reference standards for height, weight and body mass index attained at 6 to 16 years (girls) or 19 years (boys). *Acta Paediatr*. 1995;84(9):1019-28.
 - 76 Schaeffer F, Georgi M, Wühl E, Schäfer K. Body mass index and percentage fat mass in healthy German schoolchildren and adolescents. *Int J Obes (Lond)*. 1998;22(5):461-9.
 - 77 Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: International survey. *BMJ*. 2000;320(7244):1240-55.
 - 78 Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, Flegal KM, Guo SS, Wei R, et al. CDC growth charts: United States. *Adv Data*. 2000;(314):1-27.
 - 79 Kromeyer-Hauschild K, Wabitsch M, Kunze D, Geller F, Geiss HC, Hesse V, et al. Perzentile für den Body-mass-Index für das Kinder und Jugendalter unter Heranziehung verschiedener deutscher Stichproben. *Monatsschr Kinderheilkd*. 2001;149:807-18
 - 80 Cacciari E, Milani S, Balsamo A, Dammacco F, De Luca F, Chiarelli F, et al. Italian cross-sectional growth charts for height, weight and BMI (6-20 y). *Eur J Clin Nutr*. 2002;56(2):171-80.
 - 81 WHO Multicentre Growth Reference Study Group. Breastfeeding in the WHO Multicentre Reference Study. *Acta Paediatr*. 2006;Suppl 450:16-26.
 - 82 WHO Multicentre Growth Reference Study Group. Enrolment and baseline characteristics in the WHO Multicentre Reference Study. *Acta Paediatr*. 2006;Suppl 450:7-15.
 - 83 WHO Multicentre Growth Reference Study Group. Reliability in the WHO Multicentre Reference Study. *Acta Paediatr*. 2006;Suppl 450:38-46.
 - 84 WHO Child Growth Standards based on length/height, weight and age. *Acta Paediatr*. 2006;Suppl;450:76-85.
 - 85 Deshmukh PR, Dongre AR, Gupta SS, Garg BS. Newly developed WHO growth standards: implications for demographic surveys and child health programs. *Indian J Pediatr*. 2007;74(11): 987-90.
 - 86 Ogden CL, Kuczmarski RJ, Flegal KM, Mei Z, Guo S, Wei R, et al. Centers for Disease Control and Prevention 2000 Growth Charts for the United States: Improvements to the 1977 National Center for Health Statistics Version. *Pediatrics*. 2002;109(1):45-60.
 - 87 Wright CM, Booth IW, Buckler JMH, Cameron N, Cole TJ, Healy MJR, et al. Growth reference charts for use in the United Kingdom. *Arch Dis Child*. 2002;86(1):11-4.
 - 88 August GP, Caprio S, Fennoy I, Freemark M, Kaufman FR, Lustig RH, et al. Prevention and Treatment of Pediatric Obesity: An Endocrine Society Clinical Practice Guideline Based on Expert Opinion. *J Clin Endocrinol Metab*. 2008;93(12):4576-99.
 - 89 Kipping RR, Jago R, Lawlor DA. Obesity in children. Part 2: prevention and management. *BMJ*. 2008;337:a1848.
 - 90 Speiser PW, Rudolf MC, Anhalt H, Camacho-Hubner C, Chiarelli F, Eliakim A, et al. Consensus statement: Childhood obesity. *J Clin Endocrinol Metab*. 2005; 90(3):1871-87.
 - 91 Alemzadeh R, Rising R, Lifshitz F. Obesity in children. En: *Pediatric Endocrinology*. Lifshitz

- F (editor). New York, Informa Healthcare, 2007. Volume 1; p. 1-36.
- 92 Krebs NF, Himes JH, Jacobson D, Nicklas TA, Guilday P, Styne D. Assessment of child and adolescent overweight and obesity. *Pediatrics* 2007;120(Suppl 4):S193-228.
 - 93 Doak CM, Visscher TL, Renders CM, Seidell JC. The prevention of overweight and obesity in children and adolescents: a review of interventions and programmes. *Obes Rev.* 2006;7:111-36.
 - 94 Flodmark CE, Marcus C, Britton M. Interventions to prevent obesity in children and adolescents: a systematic literature review. *Int J Obes (Lond).* 2006;30(4):579-89.
 - 95 Bluford DA, Sherry B, Scanlon KS. Interventions to prevent or treat obesity in preschool children: a review of evaluated programs. *Obesity (Silver Spring).* 2007;15(6):1356-72.
 - 96 Campbell KJ, Hesketh KD. Strategies which aim to positively impact on weight, physical activity, diet and sedentary behaviours in children from zero to five years. A systematic review of the literature. *Obes Rev.* 2007;8(4):327-38.
 - 97 Katz DL, O'connell M, Njike VY, Yeh MC, Nawaz H. Strategies for the prevention and control of obesity in the school setting: systematic review and meta-analysis. *Int J Obes (Lond).* 2007. Jul 31. [Epub ahead of print]
 - 98 Sharma M. International school-based interventions for preventing obesity in children. *Obes Rev.* 2007;8:155-67.
 - 99 Brown T, Summerbell C. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute of Health and Clinical Excellence. *Obes Rev.* 2008; Jul 30.
 - 100 Kamath CC, Vickers KS, Ehrlich A, McGovern L, Johnson J, Singhal V et al. Behavioral interventions to prevent childhood obesity. A systematic review and meta-analyses of randomized trials. *J Clin Endocrinol Metab.* 2008;95(12):4606-15.
 - 101 Kropf JA, Keckley PH, Jensen GL. School-based obesity prevention programs: an evidence-based review. *Obesity (Silver Spring).* 2008;16(5):1009-18.
 - 102 Shaya FT, Flores D, Gbarayor CM, Wang J. School-based obesity interventions: a literature review. *J Sch Health.* 2008;78(4):189-96.
 - 103 Wofford LG. Systematic review of childhood obesity prevention. *J Pediatr Nurs.* 2008;23(1): 5-19.
 - 104 James J, Thomas P, Cavan D, Kerr D. Preventing childhood obesity by reducing consumption of carbonated drinks: cluster randomised controlled trial. *BMJ.* 2004;328(7450):1237.
 - 105 James J, Thomas P, Kerr D. Preventing childhood obesity: two year follow-up results from the Christchurch obesity prevention programme in schools (CHOPPS). *BMJ.* 2007;335(7623): 762-4.
 - 106 Mo-Suwan L, Pongprapai S, Junjana C, Peutpaiboon A. Effects of a controlled trial of a school-based exercise program on the obesity indexes of preschool children. *Am J Clin Nutr.* 1998;68(5):1006-11.
 - 107 Sallis JF, McKenzie TL, Alcaraz JE, Kolody B, Hovell MF, Nader PR. Project SPARK. Effects of physical education on adiposity in children. *Ann N Y Acad Sci.* 1993;699:127-36.
 - 108 Salmon J, Ball K, Hume C, Booth M, Crawford D. Outcomes of a group-randomized trial to prevent excess weight gain, reduce screen behaviours and promote physical activity in 10-year-old children: Switch-Play. *Int J Obes (Lond).* 2008;32(4):601-12.
 - 109 Robinson TN. Reducing children's television viewing to prevent obesity: A randomised controlled trial. *JAMA.* 1999;282(16):1561-7.
 - 110 Reed KE, Warburton DE, Macdonald HM, Naylor PJ, McKay HA. Action Schools! BC: A school-based physical activity intervention designed to decrease cardiovascular disease risk factors in children. *Prev Med.* 2008;46(6):525-31.
 - 111 Ahamed Y, Macdonald H, Reed K, Naylor PJ, Liu-Ambrose T, McKay H. School-based physical activity does not compromise children's academic performance. *Med Sci Sports*

- Exerc. 2007;39(2):371-6.
- 112 Naylor PJ, Macdonald HM, Warburton DE, Reed KE, McKay HA. An active school model to promote physical activity in elementary schools: action schools! BC. *Br J Sports Med.* 2008 May; 42(5):338-43.
 - 113 Naylor PJ, Macdonald HM, Zebedee JA, Reed KE, McKay HA. Lessons learned from Action Schools! BC an 'active school' model to promote physical activity in elementary schools. *J Sci Med Sport.* 2006;9(5):413-23.
 - 114 Martínez Vizcaíno V, Salcedo Aguilar F, Franquelo Gutiérrez R, Solera Martínez M, Sánchez López M, Serrano Martínez S, et al. Assessment of an after-school physical activity program to prevent obesity among 9- to 10-year-old children: a cluster randomized trial. *Int J Obes (Lond).* 2008;32(1):12-22.
 - 115 Jago R, Jonker ML, Missaghian M, Baranowski T. Effect of 4 weeks of Pilates on the body composition of young girls. *Prev Med.* 2006;42(3):177-80.
 - 116 Lazaar N, Aucouturier J, Ratel S, Rance M, Meyer M, Duche P. Effect of physical activity intervention on body composition in young children: influence of body mass index status and gender. *Acta Paediatr.* 2007;96(9):1315-20.
 - 117 Pangrazi RP, Beighle A, Vehige T, Vack C. Impact of Promoting Lifestyle Activity for Youth (PLAY) on children's physical activity. *J Sch Health.* 2003;73(8):317-21.
 - 118 Neumark-Sztainer D, Story M, Hannan PJ, Rex J. New Moves: a school-based obesity prevention program for adolescent girls. *Prev Med.* 2003;37(1):41-51.
 - 119 Flores R. Dance for Health: Improving Fitness in African American and Hispanic Adolescents. *Public Health Rep.* 1995;110(2):189-93.
 - 120 Jamner MS, Spruit-Metz D, Bassin S, Cooper DM. A controlled evaluation of a school-based intervention to promote physical activity among sedentary adolescent females: project FAB. *J Adolesc Health.* 2004;34(4):279-89.
 - 121 Pate RR, Ward DS, Saunders RP, Felton G, Dishman RK, Dowda M. Promotion of physical activity among high-school girls: a randomized controlled trial. *Am J Public Health.* 2005;95(9):1582-7.
 - 122 Fitzgibbon ML, Stolley MR, Schiffer L, Van Horn L, KauferChristoffel K, Dyer A. Two-year follow-up results for Hip-Hop to Health Jr.: a randomized controlled trial for overweight prevention in preschool minority children. *J Pediatr.* 2005;146(5):618-25.
 - 123 Fitzgibbon ML, Stolley MR, Schiffer L, Van Horn L, KauferChristoffel K, Dyer A. Hip-Hop to Health Jr. for Latino preschool children. *Obesity (Silver Spring).* 2006;14(9):1616-25.
 - 124 Caballero B, Clay T, Davis SM, Ethelbah B, Rock BH, Lohman T, et al. Pathways: a schoolbased, randomized controlled trial for the prevention of obesity in American Indian schoolchildren. *Am J Clin Nutr.* 2003;78(5):1030-8.
 - 125 Gortmaker SL, Peterson K, Wiecha J, Sobal AM, Dixit S, Fox MK, et al. Reducing obesity via a school-based interdisciplinary intervention among youth. *Arch Pediatr Adolesc Med.* 1999;153(4):409-18.
 - 126 Müller MJ, Asbeck I, Mast M, Lagnaese L, Grund A. Prevention of Obesity – more than an intention. Concept and first results of the Kiel Obesity Prevention Study (KOPS). *Int J of Obes.* 2001;25(1 Suppl):S66-S74.
 - 127 Plachta-Danielzik S, Pust S, Asbeck I, Czerwinski-Mast M, Langnäse K, Fischer C, et al. Four year follow-up of school-based intervention on overweight children: the KOPS study. *Obesity (Silver Spring).* 2007;15(12):3159-69.
 - 128 Sahota P, Rudolf MCJ, Dixey R, Hill AJ, Barth JH, Cade J. Randomised controlled trial of primary school based intervention to reduce risk factors for obesity. *BMJ.* 2001;323(7320): 1029-32.
 - 129 Warren JM, Henry CJK, Lightowler HJ, Bradshaw SM, Perwaiz S. Evaluation of a pilot school programme aimed at the prevention of obesity in children. *Health Promot Int.* 2003;18(4): 287-96.

- 130 Williamson DA, Copeland AL, Anton SD, Champagne C, Han H, Lewis L, et al. Wise Mind project: a school-based environmental approach for preventing weight gain in children. *Obesity (Silver Spring)*. 2007;15(4):906-17.
- 131 Foster GD, Sherman S, Borradaile KE, Grundy KM, Vander Veur SS, Nachmani J, et al. A policy-based school intervention to prevent overweight and obesity. *Pediatrics*. 2008;121(4):e794-802.
- 132 Donnelly JE, Jacobsen DJ, Whatley JE, Hill JO, Swift LL, Cherrington A, et al. Nutrition and physical activity program to attenuate obesity and promote physical and metabolic fitness in elementary school children. *Obes Res*. 1996;4(3):229-43.
- 133 Haerens L, Deforc Jul 31. [Epub ahead of print]he B, Maes L, Stevens V, Cardon G, De Bourdeaudhuij I. Body mass effects of a physical activity and healthy food intervention in middle schools. *Obesity (Silver Spring)*. 2006;14(5):847-54.
- 134 Haerens L, Deforche B, Vandelanotte C, Maes L, De Bourdeaudhuij I. Acceptability, feasibility and effectiveness of a computer-tailored physical activity intervention in adolescents. *Patient Educ Couns*. 2007;66(3):303-10.
- 135 Haerens L, Deforche B, Maes L, Brug J, Vandelanotte C, De Bourdeaudhuij I. A computertailored dietary fat intake intervention for adolescents: results of a randomized controlled trial. *Ann Behav Med*. 2007; 34(3):253-62.
- 136 Eliakim A, Nemet D, Balakirski Y, Epstein Y. The effects of nutritional-physical activity school-based intervention on fatness and fitness in preschool children. *J Pediatr Endocrinol Metab*. 2007;20(6):711-8.
- 137 Kain J, Uauy R, Albala, Vio F, Cerda R, Leyton B. School-based obesity prevention in Chilean primary school children: methodology and evaluation of a controlled study. *Int J Obes*. 2004;28(4):483-93.
- 138 Spiegel SA, Foulk D. Reducing overweight through a multidisciplinary school-based intervention. *Obesity (Silver Spring)*. 2006;14(1):88-96.
- 139 Amaro S, Viggiano A, Di Costanzo A, Madeo I, Viggiano A, Baccari ME, et al. Kalèdo, a new educational board-game, gives nutritional rudiments and encourages healthy eating in children: a pilot cluster randomized trial. *Eur J Pediatr*. 2006;165(9):630-5.
- 140 Singh AS, Chin A, Paw MJ, Brug J, van Mechelen W. Short-term effects of school-based weight gain prevention among adolescents. *Arch Pediatr Adolesc Med*. 2007;161(6):565-71.
- 141 Thomas J, Sutcliffe K, Harden A, Oakley A, Oliver S, Rees R, Brunton G, Kavanagh J. *Children and Healthy Eating: A systematic review of barriers and facilitators*. London: EPPI Centre, Social Science Research Unit, Institute of Education, University of London; 2003.
- 142 Shepherd J, Harden A, Rees R, Brunton G, Garcia J, Oliver S, et al. Young people and healthy eating: a systematic review of research on barriers and facilitators. *Health Educ Res*. 2006;21(2):239-57.
- 143 Vartiainen E, Puska P, Pallonen U, Poyhia P. Effects of two years' education intervention on dietary habits, serum cholesterol and blood pressure among 13 to 15 year old adolescents: the North Kareilia Youth Project. *Acta Cardiol*. 1982;37(3):199-220.
- 144 Nicklas TA, Johnson CC, Myers L, Farris RP, Cunningham A. Outcomes of a high school program to increase fruit and vegetable consumption: Gimme 5—a fresh nutrition concept for students. *J Sch Health*. 1998;68(6):248-53.
- 145 Perry CL, Klepp KI, Halper A. Promoting healthy eating and physical activity patterns among adolescents: a pilot study of 'Slice of Life'. *Health Educ Res*. 1987;2:93-103.
- 146 Klepp KI, Wilhelmsen BU. Nutrition education in junior high schools: incorporating behavior change strategies into home economics courses. *Health Educ Res*. 1993;8:547-54.
- 147 Knai C, Pomerleau J, Lock K, McKee M. Getting children to eat more fruit and vegetables: a systematic review. *Prev Med*. 2006;42(2):85-95.
- 148 Perry C, Lytle L, Feldman H, et al. Effects of the child and adolescent trial for cardiovascular

- health (CATCH) on fruit and vegetable intake. *J Nutr Educ*. 1998;30:354-60.
- 149 Lytle L, Murray D, Perry C, Story M, Birnbaum A, Kubik M, et al. School based approaches to affect adolescents' diets: results from the TEENS study. *Health Educ Behav*. 2004;31(2):270-87.
- 150 Howerton MW, Bell BS, Dodd KW, Berrigan D, Stolzenberg-Solomon R, Nebeling L. School based nutrition programs produced a moderate increase in fruit and vegetable consumption: meta and pooling analyses from 7 studies. *J Nutr Educ Behav*. 2007;39(4):186-96.
- 151 Woolfe J, Stockley L. Nutrition health promotion in schools in the UK: learning from Food Standards Agency funded schools research. *Health Educ J*. 2005;64(3):229-46.
- 152 Van der Horst K, Oenema A, Ferreira I, Wendel-Vos W, Giskes K, van Lenthe F, et al. A systematic review of environmental correlates of obesity-related dietary behaviors in youth. *Health Educ Res*. 2007;22(2):203-26.
- 153 Bere E, Veierød MB, Bjelland M, Klepp KI. Outcome and process evaluation of a Norwegian school-randomized fruit and vegetable intervention: Fruits and Vegetables Make the Marks (FVMM). *Health Educ Res*. 2006;21(2):258-67.
- 154 Haerens L, De Bourdeaudhuij I, Maes L, Vereecken C, Brug J, Deforche B. The effects of a middle-school healthy eating intervention on adolescents' fat and fruit intake and soft drinks consumption. *Public Health Nutr*. 2007;10(5):443-9.
- 155 Mangunkusumo RT, Brug J, de Koning HJ, van der Lei J, Raat H. School-based Internet-tailored fruit and vegetable education combined with brief counselling increases children's awareness of intake levels. *Public Health Nutr*. 2007;10(3):273-9.
- 156 Reinaerts E, de Nooijer J, Candel M, de Vries N. Increasing children's fruit and vegetable consumption: distribution or a multicomponent programme?. *Public Health Nutr*. 2007;10(9):939-47.
- 157 Bere E, Veierød MB, Bjelland M, Klepp KI. Free school fruit-sustained effect 1 year later. *Health Educ Res*. 2006;21(2):268-75.
- 158 Sluijs van EM, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. *BMJ*. 2007;335(7622):703.
- 159 Haerens L, De Bourdeaudhuij I, Maes L, Cardon G, Deforche B. School-based randomized controlled trial of a physical activity intervention among adolescents. *J Adolesc Health*. 2007;40(3):258-65.
- 160 Haerens L, Deforche B, Maes L, Cardon G, Stevens V, De Bourdeaudhuij I. Evaluation of a 2-year physical activity and healthy eating intervention in middle school children. *Health Educ Res*. 2006;21(6):911-21.
- 161 Da Cunha CT. *Impacto de Programa Educativo no Gasto Energetico de Escolares nas aulas de Educação Física: Ensaio randomizado controlado*. São Paulo: Federal University of São Paul, 2002.
- 162 Bonhauser M, Fernández G, Puschel K, et al. Improving physical fitness and emotional wellbeing in adolescents of low socioeconomic status in Chile: results of a school-based controlled trial. *Health Promot Int*. 2005;20(2):113-22.
- 163 Coleman KJ, Tiller CL, Sanchez J, Heath EM, Sy O, Milliken G, et al. Prevention of the epidemic increase in child risk of overweight in low-income schools: the El Paso coordinated approach to child health. *Arch Pediatr Adolesc Med*. 2005;159(3):217-24.
- 164 Dennison BA, Russo TJ, Burdick PA, Jenkins PL. An intervention to reduce television viewing by preschool children. *Arch Pediatr Adolesc Med*. 2004;158(2):170-6.
- 165 Epstein LH, Roemmich JN, Robinson JL, Paluch RA, Winiewicz DD, Fuerch JH, et al. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Arch Pediatr Adolesc Med*. 2008;162(3):239-45.
- 166 Young DR, Phillips JA, Yu T, Haythornthwaite JA. Effects of a life skills intervention for increasing

- physical activity in adolescent girls. *Arch Pediatr Adolesc Med.* 2006;160(12):1255- 61.
- 167 Harrison M, Burns CF, McGuinness M, Heslin J, Murphy NM. Influence of a health education intervention on physical activity and screen time in primary school children: 'Switch Off-Get Active'. *J Sci Med Sport.* 2006;9(5):388-94.
 - 168 Westwood M, Fayter D, Hartley S, Rithalia A, Butler G, Glasziou P, et al. Childhood obesity: should primary school children be routinely screened? A systematic review and discussion of the evidence. *Arch Dis Child.* 2007;92(5):416-22.
 - 169 Whitlock EP, Williams SB, Gold R, Smith P, Shipman S. Screening and Interventions for Childhood Overweight: A Systematic Review for the US Preventive Services Task Force: Systematic Evidence Review. Rockville, MD: Agency for Healthcare Research and Quality; 2005.
 - 170 Moyer VA, Klein JD, Ockene JK, Teutsch SM, Johnson MS, Allan JD; Childhood Obesity Working Group, US Preventive Services Task Force. Screening for overweight in children and adolescents: where is the evidence? A commentary by the childhood obesity working group of the US Preventive Services Task Force. *Pediatrics.* 2005;116(1):235-8.
 - 171 Ikeda JP, Crawford PB, Woodward-Lopez G. BMI screening in schools: helpful or harmful. *Health Educ Res.* 2006;21(6):761-9.
 - 172 Arenz S, Ruckerl R, Koletzko B, von Kries R. Breast-feeding and childhood obesity—a systematic review. *Int J Obes Relat Metab Disord.* 2004;28(10):1247-56.
 - 173 Harder T, Bergmann R, Kallschnigg G, Plagemann A. Duration of breastfeeding and risk of overweight: a meta-analysis. *Am J Epidemiol.* 2005;162(5):397-403.
 - 174 Owen CG, Martin RM, Whincup PH, Davey-Smith G, Gillman MW, Cook DG. The effect of breastfeeding on mean body mass index throughout life: a quantitative review of published and unpublished observational evidence. *Am J Clin Nutr.* 2005;82(6):1298-307.
 - 175 Horta BL, Bahl R, Martines JC, Victora CG. Evidence of the long-term effects of breastfeeding [sitio web]. Geneva: WHO, 2007 [citado 15 oct 2008]. Disponible en: http://libdoc.who.int/publications/2007/9789241595230_eng.pdf
 - 176 Kramer MS, Kakuma R. Optimal duration of exclusive breastfeeding. *Cochrane Database of Systematic Reviews* 2002, Issue 1. Art. No.: CD003517. DOI: 10.1002/14651858.CD003517.
 - 177 Dyson L, McCormick F, Renfrew MJ. Interventions for promoting the initiation of breastfeeding. *Cochrane Database of Systematic Reviews* 2005, Issue 2. Art. No.: CD001688. DOI: 10.1002/14651858.CD001688.pub2.
 - 178 Britton C, McCormick FM, Renfrew MJ, Wade A, King SE. Support for breastfeeding mothers. *Cochrane Database of Systematic Reviews* 2007, Issue 1. Art. No.: CD001141. DOI: 10.1002/14651858.CD001141.pub3.
 - 179 Abdulwadud OA, Snow ME. Interventions in the workplace to support breastfeeding for women in employment. *Cochrane Database of Systematic Reviews* 2007, Issue 3. Art. No.: CD006177. DOI: 10.1002/14651858.CD006177.pub2.
 - 180 Guise JM, Palda V, Westhoff C, Chan BK, Helfand M, Lieu TA; U.S. Preventive Services Task Force. The effectiveness of primary care-based interventions to promote breastfeeding: systematic evidence review and meta-analysis for the US Preventive Services Task Force. *Ann Fam Med.* 2003;1(2):70-8.
 - 181 Renfrew MJ, Spiby H, D'Souza L, Wallace LM, Dyson L, McCormick F. Rethinking research in breast-feeding: a critique of the evidence base identified in a systematic review of interventions to promote and support breast-feeding. *Public Health Nutr.* 2007;10(7):726-32.
 - 182 Spiby H, McCormick F, Wallace L, Renfrew MJ, D'Souza L, Dyson L. A systematic review of education and evidence-based practice interventions with health professionals and breast feeding counsellors on duration of breast feeding. *Midwifery.* 2007 Apr 4.
 - 183 Kramer MS, Matush L, Vanilovich I, Platt RW, Bogdanovich N, Sevkovskaya Z, et al; PROBIT Study Group. Effects of prolonged and exclusive breastfeeding on child height, weight, adiposity, and blood pressure at age 6.5 y: evidence from a large randomized trial. *Am J Clin*

- Nutr. 2007;86(6):1717-21.
- 184 World Health Organization. Global strategy for infant and young child feeding [sitio web]. Geneva, Switzerland: World Health Organization, 2003 [citado 15 oct 2008]. Disponible en: http://www.who.int/nutrition/publications/infantfeeding/gi_infant_feeding_eng.pdf
 - 185 Salmon J, Booth ML, Phongsavan P, Murphy N, Timperio A. Promoting Physical Activity Participation among Children and Adolescents. *Epidemiol Rev.* 2007;29(1):144-59.
 - 186 Ortega-Sanchez R, Jimenez-Mena C, Cordoba-Garcia R, Muñoz-Lopez J, Garcia-Machado ML, Vilaseca-Canals J. The effect of office-based physician's advice on adolescent exercise behavior. *Prev Med.* 2004;38(2):219-26.
 - 187 Kelleher CC, Fallon UB, McCarthy E, Dineen BD, O'Donnell M, Killian M, et al. Feasibility of a lifestyle cardiovascular health promotion programme for 8–15 year olds in Irish general practice: results of the Galway Health Project. *Health Promot Int.* 1999;14(3): 221-30.
 - 188 Ford BS, McDonald TE, Owens AS, et al. Primary care interventions to reduce television viewing in African-American children. *Am J Prev Med.* 2002;22(2):106-9.
 - 189 Patrick K, Sallis JF, Prochaska JJ, Lydston DD, Calfas KJ, Zabinski MF, et al. A multicomponent program for nutrition and physical activity change in primary care: PACE+ for adolescents. *Arch Pediatr Adolesc Med.* 2001;155(8):940-6.
 - 190 Walker Z, Townsend J, Oakley L, Donovan C, Smith H, Hurst Z, et al. Health promotion for adolescents in primary care: randomised controlled trial. *BMJ.* 2002;325(7363):524-9.
 - 191 Patrick K, Calfas KJ, Norman GJ, Zabinski MF, Sallis JF, Rupp J, et al. Randomized controlled trial of a primary care and home-based intervention for physical activity and nutrition behaviors: PACE+ for adolescents. *Arch Pediatr Adolesc Med.* 2006;160(2):128-36.
 - 192 Schwartz RP, Hamre RH, Dietz WH, Wasserman RC, Slora EJ, Myers EF, et al. Office-based motivational interviewing to prevent childhood obesity. *Arch Pediatr Adolesc Med.* 2007;161(5):495-501.
 - 193 Ebbeling CB, Feldman HA, Osganian SK, Chomitz VR, Ellenbogen SJ, Ludwig DS. Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: a randomized, controlled pilot study. *Pediatrics.* 2006;117(3):673-80.
 - 194 Simon C, Schweitzer B, Oujaa M, Wagner A, Arweiler D, Tribby E, et al. Successful overweight prevention in adolescents by increasing physical activity: a 4-year randomized controlled evaluation. *Int J Obes (Lond).* 2008;32(10):1489-98.
 - 195 Weintraub DL, Tirumalai EC, Haydel KF, Fujimoto M, Fulton JE, Robinson TN. Team sports for overweight children: the Stanford Sports to Prevent Obesity Randomized Trial (SPORT). *Arch Pediatr Adolesc Med.* 2008;162(3):232-7.
 - 196 Ignico AA, Mahon AD. The effects of a physical fitness program on low-fit children. *Res Q Exerc Sport.* 1995;66(1):85-90.
 - 197 Nader PR, Baranowski T, Vanderpool NA, Dunn K, Dworkin R, Ray L. The family health project: cardiovascular risk reduction education for children and parents. *J Dev Behav Pediatr.* 1983;4(1):3-10.
 - 198 Owens S, Gutin B, Allison J, Riggs S, Ferguson M, Litaker M, et al. Effect of physical training on total and visceral fat in obese children. *Med Sci Sports Exerc.* 1999;31(1):143-50.
 - 199 Baranowski T, Baranowski JC, Cullen KW, Thompson DI, Nicklas T, Zakeri IE, et al. The Fun, Food, and Fitness Project (FFFP): the Baylor GEMS pilot study. *Ethn Dis.* 2003;13(Suppl 1): S30-9.
 - 200 Beech BM, Klesges RC, Kumanyika SK, Murray DM, Klesges L, McClanahan B, et al. Child- and parent-targeted interventions: the Memphis GEMS pilot study. *Ethn Dis.* 2003;13(Suppl 1):S40-53.
 - 201 Robinson TN, Killen JD, Kraemer HC, Wilson DN, Matheson DM, Haskell WL, et al. Dance and reducing television viewing to prevent weight gain in African-American girls: The Stanford GEMS pilot study. *Ethn Dis.* 2003;13:S165-77.

- 202 Story M, Sherwood NE, Himes JH, Davis M, Jacobs DR, Jr., Cartwright Y. An after-school obesity prevention program for African-American girls: the Minnesota GEMS pilot study. *Ethn Dis.* 2003;13:S54-64.
- 203 Taylor RW, McAuley KA, Barbezat W, Strong A, Williams SM, Mann JI. APPLE Project: 2-year findings of a community-based obesity prevention program in primary school age children. *Am J Clin Nutr.* 2007;86(3):735-42.
- 204 Sanigorski AM, Bell AC, Kremer PJ, Cuttler R, Swinburn BA. Reducing unhealthy weight gain in children through community capacity-building: results of a quasi-experimental intervention program, Be Active Eat Well. *Int J Obes (Lond).* 2008;32(7):1060-7.
- 205 Economos CD, Hyatt RR, Goldberg JP, Must A, Naumova EN, Collins JJ, et al. A community intervention reduces BMI z-score in children: Shape Up Somerville first year results. *Obesity (Silver Spring).* 2007;15(5):1325-36.
- 206 Bush CL, Pittman S, McKay S, Ortiz T, Wong WW, Klish WJ. Park-based obesity intervention program for inner-city minority children. *J Pediatr.* 2007;151(5):513-7.
- 207 Rodearmel SJ, Wyatt HR, Barry MJ, Dong F, Pan D, Israel RG, et al. A family-based approach to preventing excessive weight gain. *Obesity (Silver Spring).* 2006;14(8):1392-401.
- 208 Rodearmel SJ, Wyatt HR, Stroebele N, Smith SM, Ogden LG, Hill JO. Small changes in dietary sugar and physical activity as an approach to preventing excessive weight gain: the America on the Move family study. *Pediatrics.* 2007;120(4):e869-79.
- 209 Rooney BL, Gritt LR, Havens SJ, Mathiason MA, Clough EA. Growing healthy families: family use of pedometers to increase physical activity and slow the rate of obesity. *WMJ.* 2005;104(5):54-60.
- 210 Harvey-Berino J, Rourke J. Obesity prevention in preschool native-american children: a pilot study using home visiting. *Obes Res.* 2003;11(5):606-11.
- 211 Epstein LH, Gordy CC, Raynor HA, Beddome M, Kilanowski CK, Paluch R. Increasing fruit and vegetable intake and decreasing fat and sugar intake in families at risk for childhood obesity. *Obes Res.* 2001;9(3):171-8.
- 212 McGarvey E, Keller A, Forrester M, Williams E, Seward D, Suttle DE. Feasibility and benefits of a parent-focused preschool child obesity intervention. *Am J Public Health.* 2004; 94(9): 1490-5.
- 213 Spear BA, Barlow SE, Erwin C, Ludwig DS, Saelens BE, Schetzina KE, et al. Recommendations for treatment of child and adolescent overweight and obesity. *Pediatrics.* 2007;120 Suppl 4: S254-88.
- 214 Moreno LA, Fleta J, Mur L, Rodríguez G, Sarría A, Bueno M. Waist circumference values in Spanish children-Gender related differences. *Eur J Clin Nutr.* 1999;53(6):429-33.
- 215 Epstein LH, Wing RR, Valoski A. Childhood obesity. *Pediatr Clin North Am.* 1985;32(2):363-79.
- 216 U.S. Department of Agriculture. The Food Guide Pyramid, Home and Garden Bulletin Number 252 U.S. Government Printing Office Washington, DC. 1992.
- 217 Britten P, Marcoe K, Yamini S, Davis C. Development of food intake patterns for the MyPyramid Food Guidance System. *J Nutr Educ Behav.* 2006;38(6 Suppl):S78-92.
- 218 Marcoe K, Juan W, Yamini S, Carlson A, Britten P. Development of food group composites and nutrient profiles for the MyPyramid Food Guidance System. *J Nutr Educ Behav.* 2006;38(6 Suppl):S93-107.
- 219 Epstein LH, McCurley J, Wing RR, Valoski A. Five-year follow-up of family-based behavioral treatments for childhood obesity. *J Consult Clin Psychol.* 1990;58(5):661-4.
- 220 Epstein LH, Valoski A, Wing RR, McCurley J. Ten-year follow-up of behavioral, family-based treatment for obese children. *JAMA.* 1990;264(19):2519-23.
- 221 Epstein LH, Valoski A, Wing RR, McCurley J. Ten-year outcomes of behavioral family-based treatment for childhood obesity. *Health Psychol.* 1994;13(5):373-83.

- 222 Collins CE, Warren J, Neve M, McCoy P, Stokes BJ. Systematic review of interventions in the management of overweight and obese children which include a dietary component. *Int J Evid Based Healthc.* 2007;5:2-53.
- 223 Thomas DE, Elliott EJ, Baur L. Low glycaemic index or low glycaemic load diets for overweight and obesity. *Cochrane Database of Systematic Reviews* 2007, Issue 3. Art. No.: CD005105. DOI: 10.1002/14651858.CD005105.pub2.
- 224 Patton GC, Selzer R, Coffey C, Carlin JB, Wolfe R. Onset of adolescent eating disorders: population based cohort study over 3 years. *BMJ.* 1999;318(7186):765-8.
- 225 Braet C, Tanghe A, Decaluwe V, Moens E, Rosseel Y. Inpatient treatment for children with obesity: weight loss, psychological well-being, and eating behavior. *J Pediatr Psychol.* 2004;29(7):519-29.
- 226 Butryn ML, Wadden TA. Treatment of overweight in children and adolescents: does dieting increase the risk of eating disorders? *Int J Eat Disord.* 2005;37(4):285-93.
- 227 Tanofsky-Kraff M, Faden D, Yanovski SZ, Wilfley DE, Yanovski JA. The perceived onset of dieting and loss of control eating behaviors in overweight children. *Int J Eat Disord.* 2005;38(2):112-22.
- 228 Grupo de trabajo de la Guía de prevención del ictus. Guía de práctica clínica sobre la prevención primaria y secundaria del ictus. Centro Cochrane Iberoamericano, coordinador. Madrid: Plan Nacional para el SNS del MSC. Agència d'Avaluació de Tecnologia i Recerca Mèdiques; 2008. Guía de práctica clínica: AATRM N.º 2006/15.
- 229 Atlantis E, Barnes EH, Fiatarone Singh MA. Efficacy of exercise for treating overweight in children and adolescents: a systematic review. *Int J Obes (Lond).* 2006;30(7):1027-40.
- 230 Carrel AL, Clark RR, Peterson S, Nemet BA, Sullivan J, Allen DB. Improvement of fitness, body composition, and insulin sensitivity in overweight children in a school-based exercise program: a randomized, controlled study. *Arch Pediatr Adolesc Med.* 2005;159(10):963-8.
- 231 Carrel AL, Clark RR, Peterson S, Eickhoff J, Allen D. School-based fitness changes are lost during the summer vacation. *Arch Pediatr Adolesc Med.* 2007;161(6):561-4.
- 232 Daley AJ, Copeland RJ, Wright NP, Roaf A, Wales JKH. Exercise therapy as a treatment for psychopathologic conditions in obese and morbidly obese adolescents: a randomized, controlled trial. *Pediatrics.* 2006;118(5):2126-34.
- 233 Allen DB, Nemeth BA, Clark RR, Peterson SE, Eickhoff J, Carrel AL. Fitness is a stronger predictor of fasting insulin levels than fatness in overweight male middle-school children. *J Pediatr.* 2007;150(4):383-7.
- 234 Eisenmann JC, Welk GJ, Wickel EE, Blair SN. Combined influence of cardiorespiratory fitness and body mass index on cardiovascular risk factors among 8-18 year old youth: The Aerobics Center Longitudinal Study. *Int J Pediatr Obes.* 2007;2(2):66-72.
- 235 Baquet G, van Praagh E, Berthoin S. Endurance training and aerobic fitness in young people. *Sports Med.* 2003;33(15):1127-43.
- 236 Dietz WH Jr, Gortmaker SL. Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. *Pediatrics.* 1985;75(5):807-12.
- 237 Gortmaker SL, Must A, Sobol AM, Peterson K, Colditz GA, Dietz WH. Television watching as a cause of increasing obesity among children in the United States, 1986-1990. *Arch Pediatr Adolesc Med.* 1996;150(4):356-62.
- 238 Galst JP. Television food commercials and pro-nutritional public service announcements as determinants of young children's snack choices. *Child Dev.* 1980;51(3):935-8.
- 239 Jeffrey DB, McLellam RW, Fox DT. The development of children's eating habits: the role of television commercials. *Health Educ Q.* 1982;9(2-3):174-89.
- 240 Taras HL, Sallis JF, Patterson PR, Nader PR, Nelson JA. Television's influence on children's diet and physical activity. *J Dev Behav Pediatr.* 1989;10(4):176-80.
- 241 Borzekowski DL, Robinson TN. The 30-second effect: an experiment revealing the impact of

- television commercials on food preferences of preschoolers. *J Am Diet Assoc.* 2001;101(1):42-6.
- 242 Taveras EM, Sandora TJ, Shih MC, Ross-Degnan D, Goldmann DA, Gillman MW. The association of television and video viewing with fast food intake by preschoolage children. *Obesity (Silver Spring).* 2006;14(11):2034-41.
- 243 Utter J, Scragg R, Schaaf D. Associations between television viewing and consumption of commonly advertised foods among New Zealand children and young adolescents. *Public Health Nutr.* 2006;9(5):606-12.
- 244 DeMattia L, Lemont L, Meurer L. Do interventions to limit sedentary behaviours change behaviour and reduce childhood obesity? A critical review of the literature. *Obes Rev.* 2007;8(1):69-81.
- 245 Goldfield GS, Mallory R, Parker T, Cunningham T, Legg C, Lumb A, et al. Effects of open feedback on physical activity and television viewing in overweight and obese children: a randomized, controlled trial. *Pediatrics.* 2006;118(1):e157-66.
- 246 Hughes AR, Stewart L, Chapple J, McColl JH, Donaldson MCD, Kelnar CJH, et al. Randomized, controlled trial of a best-practice individualized behavioral program for treatment of childhood overweight: Scottish Childhood Overweight Treatment Trial (SCOTT). *Pediatrics.* 2008;121(3):e539-46.
- 247 Tsiros MD, Sinn N, Brennan L, Coates AM, Walkley JW, Petkov J, et al. Cognitive behavioral therapy improves diet and body composition in overweight and obese adolescents. *Am J Clin Nutr.* 2008;87(5):1134-40.
- 248 Kalavainen MP, Korppi MO, Nuutinen OM. Clinical efficacy of group-based treatment for childhood obesity compared with routinely given individual counseling. *Int J Obes (Lond).* 2007;31(10):1500-8.
- 249 Jelalian E, Mehlenbeck R, Lloyd-Richardson EE, Birmaher V, Wing RR. 'Adventure therapy' combined with cognitive-behavioral treatment for overweight adolescents. *Int J Obes (Lond).* 2006;30(1):31-9.
- 250 Stuart WP, Broome ME, Smith BA, Weaver M. An integrative review of interventions for adolescent weight loss. *J Sch Nurs.* 2005;21(2):77-85.
- 251 Sneath JA, Broome ME, Cashin SE. Effective weight loss for overweight children: a metaanalysis of intervention studies. *J Pediatr Nurs.* 2006;21(1):45-56.
- 252 Savoye M, Shaw M, Dziura J, Tamborlane WV, Rose P, Guandalini C, et al. Effects of a weight management program on body composition and metabolic parameters in overweight children. *JAMA.* 2007;297(24):2697-704.
- 253 McCallum Z, Wake M, Gerner B, Baur LA, Gibbons K, Gold L, et al. Outcome data from the LEAP (Live, Eat and Play) trial: a randomized controlled trial of a primary care intervention for childhood overweight/mild obesity. *Int J Obes (Lond).* 2007;31(4):630-6.
- 254 Nemet D, Parkan S, Epstein Y, Friedland O, Kowen G, Eliakim A. Short- and long-term beneficial effects of a combined dietary-behavioral-physical activity intervention for the treatment of childhood obesity. *Pediatrics.* 2005;115(4):e443-9.
- 255 De Mello ED, Luft VC, Meyer F. Individual outpatient care versus group education programs. Which leads to greater change in dietary and physical activity habits for obese children? *J Pediatr (Rio J).* 2004;80(6):468-74.
- 256 Gussinyer S, García-Reyna NI, Carrascosa A, Gussinyer M, Yeste D, Clemente M, et al. Cambios antropométricos, dietéticos y psicológicos tras la aplicación del programa "Niñ@s en movimiento" en la obesidad infantil. *Med Clin (Barc).* 2008;131(7):245-9.
- 257 Reinehr R, Temmesfeld M, Kersting M, de Sousa G, Toschke AM. Four-year follow-up of children and adolescents participating in an obesity intervention program. *Int J Obes (Lond).* 2007;31(7):1074-7.
- 258 Gillis D, Brauner M, Granot E. A community-based behavior modification intervention for childhood obesity. *J Pediatr Endocrinol Metab.* 2007;20(2):197-203.

- 259 Fullerton G, Tyler C, Johnston CA, Vincent JP, Harris GE, Foreyt JP. Quality of life in Mexican American children following a weight management program. *Obesity*. 2007;15(11):2553-6.
- 260 Huang SH, Weng KP, Hsieh KS, Ou SF, Lin CC, Chien KJ, et al. Effects of a classroom-based weight-control intervention on cardiovascular disease in elementary-school obese children. *Acta Paediatr Taiwan*. 2007;48(4):201-6.
- 261 Graf C, Koch B, Bjarnason-Wehrens B, Sreeram N, Brockmeier K, Tokarski W, et al. Who benefits from intervention in, as opposed to screening of, overweight and obese children? *Cardiol Young*. 2006;16(5):474-80.
- 262 Young KM, Northern JJ, Lister KM, Drummond JA, O'Brien WH. A meta-analysis of family behavioral weight-loss treatments for children. *Clin Psychol Rev*. 2007;27(2):240-9.
- 263 McLean N, Griffin S, Toney K, Hardeman W. Family involvement in weight control, weight maintenance and weight-loss interventions: a systematic review of randomised trials. *Int J Obes Relat Metab Disord*. 2003;27(9):987-1005.
- 264 Berry D, Sheehan R, Heschel R, Knafl K, Melkus G, Grey M. Family-based interventions for childhood obesity: a review. *J Fam Nurs*. 2004;10(4):429-49.
- 265 Golley RK, Magarey A, Baur LA, Steinbeck KS, Daniels LA. Twelve-month effectiveness of a parent-led, family-focused weight-management program for prepubertal children: a randomized, controlled trial. *Pediatrics*. 2007;119(3):517-25.
- 266 Shelton D, LeGros K, Norton L, Stanton-Cook S, Morgan J, Masterman P. Randomised controlled trial: a parent-based group education programme for overweight children. *J Paediatr Child Health*. 2007;43(12):799-805.
- 267 Golan M, Kaufman V, Shahar DR. Childhood obesity treatment: targeting parents exclusively v parents and children. *Br J Nutr*. 2006;95(5):1008-15.
- 268 Jiang JX, Xia XL, Greiner T, Lian GL, Rosenqvist U. A two year family based behaviour treatment for obese children. *Arch Dis Child*. 2005;90(12):1235-8.
- 269 Tanas R, Marcolongo R, Pedretti S, Gilli G. A family-based education program for obesity: a three-year study. *BMC Pediatrics*. 2007;7:33.
- 270 Resnicow K, Taylor R, Baskin M, McCarty F. Results of Go Girls: a weight control program for overweight African-American adolescent females. *Obes Res*. 2005;13(10):1739-48.
- 271 Williamson DA, Walden HM, White MA, York-Crowe E, Newton RL, Alfonso A, et al. Two year internet-based randomized controlled trial for weight loss in African-American girls. *Obesity*. 2006;14(7):1231-43.
- 272 Deforche B, De Bourdeaudhuij I, Tanghe A, Hills AP, De Bode P. Changes in physical activity and psychosocial determinants of physical activity in children and adolescents treated for obesity. *Patient Educ Couns*. 2004;55(3):407-15.
- 273 Melnyk BM, Small L, Morrison-Beedy D, Strasser A, Spath L, Kreipe R, et al. The COPE Healthy Lifestyles TEEN program: feasibility, preliminary efficacy and lessons learned from an after school group intervention with overweight adolescents. *J Pediatr Health Care*. 2007;21(5):315-22.
- 274 Whitlock EP, O'Connor EA, Williams SB, Beil TL, Lutz KW. Effectiveness of Weight Management Programs in Children and Adolescents. Evidence Report/Technology Assessment No. 170 (Prepared by the Oregon Evidence-based Practice Center under Contract No. 290-02-0024). AHRQ Publication No. 08-E014. Rockville, MD: Agency for Healthcare Research and Quality. September 2008.
- 275 McGovern L, Johnson JN, Paulo R, Hettinger A, Singhal V, Kamath C, et al. Treatment of pediatric obesity. A systematic review and meta-analysis of randomized trials. *J Clin Endocrinol Metab*. 2008;93(12):4600-5.
- 276 Rucker D, Padwal R, Li SK, Curioni C, Lau DC. Long term pharmacotherapy for obesity and overweight: updated meta-analysis. *BMJ*. 2007;335(7631):1194-9.
- 277 Berkowitz RI, Fujioka K, Daniels ST, Hoppin AG, Owen S, Perry AC et al. Effects of

- sibutramine treatment in obese adolescents. *Ann Intern Med.* 2006;145(2):81-90.
- 278 Daniels SR, Long B, Crow S, Styne D, Sothorn M, Vargas-Rodriguez, et al. Cardiovascular effects of sibutramine in the treatment of obese adolescents: results of a randomized, double-blind, placebo-controlled study. *Pediatrics.* 2007;120(1):e147-57.
- 279 Garcia-Morales L, Berber A, Macias-Lara C, Lucio-Ortiz C, Del Rio-Navarro BE, Dorantes-Alvarez L. Use of sibutramine in obese mexican adolescents: a 6-month, randomized, double blind, placebo-controlled, parallel-group trial. *Clin Ther.* 2006;28(5):770-82.
- 280 Godoy-Matos A, Carraro L, Vieira A, Oliveira J, Guedes EP, Mattos L, et al. Treatment of obese adolescents with sibutramine: a randomized, double-blind, controlled study. *J Clin Endocrinol Metab.* 2005;90(3):1460-5.
- 281 Berkowitz RI, Wadden TA, Tershakovec AM, Cronquist JL. Behavior therapy and sibutramine for the treatment of adolescent obesity. *JAMA.* 2003;289(14):1805-12.
- 282 Van Mil EG, Westerterp KR, Kester AD, Delemarre-van de Waal HA, Gerver WJ, Saris WH. The effect of sibutramine on energy expenditure and body composition in obese adolescents. *J Clin Endocrinol Metab.* 2007;92(4):1409-14.
- 283 Maahs D, González de Serna D, Kolotkin RL, Ralston S, Sandate J, Qualls C, et al. Randomized, double-blind, placebo-controlled trial of orlistat for weight loss in adolescents. *Endocr Pract.* 2006;12(1):18-28.
- 284 Chanoine JP, Hampl S, Jensen C, Boldrin M, Hauptman J. Effect of orlistat on weight and body composition in obese adolescents. *JAMA.* 2005;293(23):2873-83.
- 285 Ozkan B, Bereket A, Turan S, Keskin S. Addition of orlistat to conventional treatment in adolescents with severe obesity. *Eur J Pediatr.* 2004;163(12):738-41.
- 286 McDuffi e JR, Calis KA, Uwaifo GI, Sebring NG, Fallon EM, Hubbard VS, et al. Three-month tolerability of orlistat in adolescents with obesity-related comorbid conditions. *Obes Res.* 2002;10(7):642-50.
- 287 Norgren S, Danielsson P, Jurolid K, Lötbom M, Marcus C. Orlistat treatment in obese prepubertal children: a pilot study. *Acta Paediatr.* 2003;92(6):666-70.
- 288 McDuffi e JR, Calis KA, Uwaifo GI, Sebring NG, Fallon EM, Frazer TE, et al. Efficacy of orlistat as an adjunct to behavioral treatment in overweight african american and caucasian adolescents with obesity-related co-morbid conditions. *J Pediatr Endocrinol Metab.* 2004;17(3):307-19.
- 289 Agencia Española de Medicamentos y Productos Sanitarios. Rimonabant (Acomplia®): suspensión cautelar de comercialización [sitio web]. Madrid: Ministerio de Sanidad y Consumo; 2008 [citado 3 nov 2008]. Disponible en: <http://www.agemed.es/actividad/alertas/usoHumano/seguridad/home.htm>
- 290 Christensen R, Kristensen PK, Bartels EM, Bliddal H, Astrup A. Efficacy and safety of the weight-loss drug rimonabant: a meta-analysis of randomised trials. *Lancet.* 2007;370(9600):1706-13.
- 291 United Kingdom Prospective Diabetes Study Group. United Kingdom Prospective Diabetes Study 24: a 6-year, randomized, controlled trial comparing sulfonylurea, insulin, and metformin therapy in patients with newly diagnosed type 2 diabetes that could not be controlled with diet therapy. *Ann Intern Med.* 1998;128(3):165-75.
- 292 Chou KH, von Eye CH, Capp E, Spritzer PM. Clinical, metabolic and endocrine parameters in response to metformin in obese women with polycystic ovary syndrome: a randomized, double-blind and placebo-controlled trial. *Horm Metab Res.* 2003;35(2):86-9.
- 293 Freemark M, Bursey D. The effects of metformin on body mass index and glucose tolerance in obese adolescents with fasting hyperinsulinemia and a family history of type 2 diabetes. *Pediatrics.* 2001;107(4):E55.
- 294 Srinivasan S, Ambler GR, Baur LA, Garnett SP, Tepsa M, Yap F, et al. Randomized, controlled trial of metformin for obesity and insulin resistance in children and adolescents: improvement in body composition and fasting insulin. *J Clin Endocrinol Metab.* 2006;91(6):2074-80.

- 295 Kay JP, Alemzadeh R, Langley G, D'Angelo L, Smith P, Holshouser S. Beneficial effects of metformin in normoglycemic morbidly obese adolescents. *Metabolism*. 2001;50(12):1457-61.
- 296 Klein DJ, Cottingham EM, Sorter M, Barton BA, Morrison JA. A randomized, double-blind, placebo-controlled trial of metformin treatment of weight gain associated with initiation of atypical antipsychotic therapy in children and adolescents. *Am J Psychiatry*. 2006;163(12):2072-9.
- 297 Fu J, Liang L, Zou CC, Hong F, Wang CL, Wang XM, et al. Prevalence of the metabolic syndrome in Zhejiang Chinese obese children and adolescents and the effect of metformin combined with lifestyle intervention. *Int J Obes (Lond)*. 2007;31(1):15-22.
- 298 Morrison JA, Cottingham EM, Barton BA. Metformin for weight loss in pediatric patients taking psychotropic drugs. *Am J Psychiatry*. 2002;159(4):655-7.
- 299 Astrup A, Madsbad S, Breum L, Jensen TJ, Kroustrup JP, Larsen TM. Effect of tesofensin on bodyweight loss, body composition, and quality of life in obese patients: a randomized, double-blind, placebo-controlled trial. *Lancet*. 2008;372(9653):1906-13.
- 300 Calañas-Contiente A, Arrizabalaga JJ, Caixás A, Cuatrecasas G, Díaz-Fernández MJ, García-Luna PP, et al. Guía para el manejo del sobrepeso y la obesidad en la preadolescencia y la adolescencia: Estrategia terapéutica del exceso de peso en el adolescente y en su familia. *Endocrinol Nutr*. 2008;55(Supl 4):60-77.
- 301 Fernandes M, Atallah AN, Soares BGO, Humberto S, Guimarães S, Matos D, et al. Intra-gastric balloon for obesity. *Cochrane Database of Systematic Reviews*. 2007, Issue 1. Art. No.: CD004931. DOI: 10.1002/14651858.CD004931.pub2.
- 302 Lindor KD. Intra-gastric balloon in comparison with standard therapy for obesity – A randomized, double-blind trial. *Mayo Clin Proc*. 1987;62(11):992-6.
- 303 Benjamin SB. Double-blind controlled trial of the Garren-Edwards gastric bubble: an adjunctive treatment for exogenous obesity. *Gastroenterology*. 1988;95(3):581-8.
- 304 Hogan RB. A double-blind, randomized, sham-controlled trial of the gastric bubble for obesity. *Gastrointest Endosc*. 1989;35(5):381-5.
- 305 Geliebter A. Clinical trial of silicone-rubber gastric balloon to treat obesity. *Int J Obes (Lond)*. 1991;15(4):259-66.
- 306 Vandenas Y, Bollen P, De Langhe K, Vandemaële K, De Schepper J. Intra-gastric balloons in adolescents with morbid obesity. *Eur J Gastroenterol Hepatol*. 1999;11(3):243-5.
- 307 Genco A, Bruni T, Doldi SB, Forestieri P, Marino M, Busetto L, et al. Bioenterics intra-gastric balloon: The Italian experience with 2.515 patients. *Obes Surg*. 2005;15:1161-4.
- 308 Colquitt J, Clegg A, Loveman E, Royle P, Sidhu MK. Surgery for morbid obesity. *Cochrane Database of Systematic Reviews* 2005, Issue 4. Art. No.: CD003641. DOI: 10.1002/14651858.CD003641.pub2.
- 309 O'Brien PE, Dixon JB, Laurie C, Skinner S, Proietto J, McNeil J, et al. Treatment of mild to moderate obesity with laparoscopic adjustable gastric banding or an intensive medical program: a randomized trial. *Ann Intern Med*. 2006;144(9):625-33.
- 310 Till H, Blüher S, Hirsch W, Kiess W. Efficacy of Laparoscopic Sleeve Gastrectomy (LSG) as a Stand-Alone Technique for Children with Morbid Obesity. *Obes Surg*. 2008;18(8):1047-9.
- 311 Anderson AE, Soper RT, Scott DH. Gastric bypass for morbid obesity in children and adolescents. *J Pediatr Surg*. 1980;15(6):876-81.
- 312 Rand CSW, Macgregor AMC. Adolescents having obesity surgery: A 6-year follow-up. *South Med J*. 1994;87(12):1208-13.
- 313 Strauss RS, Bradley LJ, Brolin RE. Gastric bypass surgery in adolescents with morbid obesity. *J Pediatr*. 2001;138(4):499-504.
- 314 Abu-Abeid S, Gavert N, Klausner JM, Szold A. Bariatric surgery in adolescence. *J Pediatr Surg*. 2003;38(9):1379-82.
- 315 Capella JF, Capella RF. Bariatric surgery in adolescence. Is this the best age to operate? *Obes Surg*. 2003;13(6):826-32.

- 316 Stanford A, Glascock JM, Eid GM, Kane T, Ford HR, Ikramuddin S, et al. Laparoscopic Roux-en-Y gastric bypass in morbidly obese adolescents. *J Pediatr Surg*. 2003;38(3):430-3.
- 317 Sugerman HJ, Sugerman DL, DeMaria DJ, Kellum JM, Kennedy C, Mowery Y, et al. Bariatric surgery for severely obese adolescents. *J Gastrointest Surg*. 2003;7(1):102-7.
- 318 Dolan K, Fielding G. A comparison of laparoscopic adjustable gastric banding in adolescents and adults. *Surg Endosc*. 2004;18(1):45-7.
- 319 Inge TH, Garcia V, Daniels S, Langford L, Kirk S, Roehrig H, et al. A multidisciplinary approach to the adolescent bariatric surgical patient. *J Pediatr Surg*. 2004;39(3):442-7.
- 320 Barnett SJ, Stanley C, Hanlon M, Acton R, Saltzman DA, Ikramuddin S, Buchwald H. Long-term follow-up and the role of surgery in adolescents with morbid obesity. *Surg Obes Relat Dis*. 2005;1(4):394-8.
- 321 Fatima J, Houghton SG, Iqbal CW, Thompson GB, Que FL, Kendrick ML, et al. Bariatric surgery at the extremes of age. *J Gastrointest Surg*. 2006;10(10):1392-6.
- 322 Lawson ML, Kirk S, Mitchell T, Chen MK, Loux TJ, Daniels SR, et al. Pediatric Bariatric Study Group. One-year outcomes of Roux-en-Y gastric bypass for morbidly obese adolescents: a multicenter study from the Pediatric Bariatric Study Group. *J Pediatr Surg*. 2006;41(1):137-43.
- 323 Holterman AX, Browne A, Dillard BE 3rd, Tussing L, Gorodner V, Stahl C, et al. Short-term outcome in the first 10 morbidly obese adolescent patients in the FDA-approved trial for laparoscopic adjustable gastric banding. *J Pediatr Gastroenterol Nutr*. 2007;45(4):465-73.
- 324 Papadia FS, Adami GF, Marinari GM, Camerini G, Scopinaro N. Bariatric surgery in adolescents: a long-term follow-up study. *Surg Obes Relat Dis*. 2007;3(4):465-8.
- 325 Loux TJ, Haricharan RN, Clements RH, Kolotkin RL, Bledsoe SE, Haynes B, et al. Health-related quality of life before and after bariatric surgery in adolescents. *J Pediatr Surg*. 2008;43(7):1275-9.
- 326 Tsai WS, Inge TH, Burd RS. Bariatric surgery in adolescents: recent national trends in use and in-hospital outcome. *Arch Pediatr Adolesc Med*. 2007;161(3):217-21.
- 327 Buchwald H, Estok R, Fahrenbach K, Banel D, Sledge I. Trends in mortality in bariatric surgery: a systematic review and meta-analysis. *Surgery*. 2007;142(4):621-32.
- 328 Inge TH, Krebs NF, Garcia VF, Skelton JA, Guice KS, Strauss RS, et al. Bariatric surgery for severely overweight adolescents: concerns and recommendations. *Pediatrics*. 2004;114(1):217-23.
- 329 Pittler MH, Ernst E. Complementary therapies for reducing body weight: a systematic review. *Int J Obes (Lond)*. 2005;29(9):1030-8.
- 330 Jull AB, Ni Mhurchu C, Bennett DA, Dunshea-Mooij CAE, Rodgers A. Chitosan for overweight or obesity. *Cochrane Database of Systematic Reviews* 2008, Issue 3. Art. No.: CD003892. DOI: 10.1002/14651858.CD003892.pub3.
- 331 Whigham LD, Watras AC, Schoeller DA. Efficacy of conjugated linoleic acid for reducing fat mass: a meta-analysis in humans. *Am J Clin Nutr*. 2007;85(5):1203-11.
- 332 Molnar D, Torok K, Erhardt E, Jeges S. Safety and efficacy of treatment with an ephedrine/caffeine mixture. The first double-blind placebo-controlled pilot study in adolescents. *Int J Obes Relat Metab Disord*. 2000;24(12):1573-8.
- 333 Yoo JH, Lee EJ, Kwak CK, Sohn EH, Koh BH, Song IB, et al. Clinical trial of herbal formula on weight loss in obese Korean children. *Am J Chin Med*. 2005;33(5):713-22.
- 334 Scottish Intercollegiate Guidelines Network (SIGN). SIGN 50. A guideline developer's handbook. Edinburgh (Scotland): Scottish Intercollegiate Guidelines Network (SIGN); 2008.
- 335 Bosch JM, Cebriá J, Massons J, Casals R. Estrategias para modificar actitudes en el marco de la entrevista clínica "la motivación para el cambio". Libro de ponencias del XIV Congreso Nacional de la SEMFYC. Madrid 1994. pp. 285-94.

