

WHO guideline on the integrated management of obesity in children



World Health
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Abbreviations

BMI	body mass index
CI	confidence interval
EDC	endocrine-disrupting chemicals
FAO	UN Food and Agriculture Organization
FDA	United States Food and Drug Administration
GDG	Guideline Development Group
GI	glycaemic index
GLP-1 RA	glucagon-like peptide-1 receptor agonists
GRC	WHO Guidelines Review Committee
IMCI	Integrated Management of Childhood Illness
ICD-11	International Classification of Diseases 11
ICF	WHO International Classification of Functioning, Disability and Health
MD	mean difference
mhGAP	mental health gap action programme
PedsQL	paediatric quality of life inventory
PICO	population, intervention, comparison, outcome
PUFA	polyunsaturated fatty acid
RCT	randomized controlled trial
RoB	risk of bias
RR	relative risk
SD	standard deviation
SMD	standard mean difference
WHO	World Health Organization

Glossary

Access (to health services): The ability, or perceived ability, to obtain appropriate health services when needed. Barriers to access may involve finances, geography, epidemiology, and cultural or sociological issues.

Adolescent: A person in the phase of life between childhood and adulthood, from 10 to 19 years of age.

Carers (also called caregivers, or informal carers): Individuals who provide care for a member or members of their family, friends or community. They may provide regular, occasional, or routine care, or be involved in organizing care delivered by others. Carers are in contrast with providers, who are associated with a formal service delivery system, whether paid or volunteer (formal caregiver).

Care pathway (also called clinical pathway): A structured multidisciplinary management plan that maps the route of care through the health system for individuals with specific clinical problems. A care pathway includes clinical guidelines.

Child: A person under 19 years of age. This includes *newborn* or *neonate* (the first 28 days of life); *infant* (29 days to less than 12 months of life); *toddler* (from 12 months to less than 3 years of age); *pre-school-aged* (from 3 to less than 5 years); *school-aged* (from 5 to less than 10 years); and *adolescent* (from 10 to 19 years).

Clinical guidelines: Systematically developed recommendations that support health workers and patients to make decisions about care in specific clinical circumstances. They often include recommendations for diagnosis, treatment, and management of specific diseases or conditions, and address screening methods, follow-up care, and patient education.

Continuum of care: The spectrum of personal and population health care needed throughout all stages of a condition, injury, or event throughout a lifetime. It may include health promotion, disease prevention, diagnosis, treatment, rehabilitation, and palliative care.

Disability: The experience of any condition that makes it more difficult for a person to do certain activities or have equitable access within a given society. Disabilities may be cognitive, developmental, intellectual, mental, physical, sensory, or a combination of multiple factors.

Empowerment: A process whereby individuals and communities gain greater control over the decisions and actions that affect their lives. This includes having the knowledge, skills, and freedom to make their own choices, express their needs, and influence the factors shaping their well-being.

Equity in health: The absence of systematic or remediable differences in health status, access to health care and health-enhancing environments, and treatment in one or more aspects of health across populations or population groups defined socially, economically, demographically or geographically within and across countries.

Essential medicines: Medicines that satisfy the priority health care needs of the population and are selected based on public health relevance, on evidence of efficacy and safety, and on comparative cost-effectiveness. They are selected with consideration of disease prevalence and the effectiveness of treatments. The WHO Model Lists provide a blueprint for national authorities to adapt according to local health priorities, thereby improving access to necessary medications.

First level of care: The point of entry into the health care system at the interface between services and community. When the first level of care satisfies specific quality criteria, it is called primary care. See: primary care.

Functioning: The dynamic interaction between an individual's health conditions and contextual factors (both environmental and personal). It refers to the ability to perform daily activities and engage in social roles, considering a person's body functions and structures, their activities, and participation in life situations.

Gender equality: The process of being fair to people of all genders. To ensure fairness, strategies and measures must be available to compensate for women's, girls' and gender minorities' historical and social disadvantages that prevent women, men, girls, boys and gender minorities from otherwise operating on a level playing field. Equity leads to equality.

Health: A state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity.

Health benefits package: A benefits package that defines the specific healthcare interventions, services, and programmes that will be provided to the population. It serves as a key tool for achieving universal health coverage by specifying what services are covered, who can receive them, and what proportion of the cost is covered.

Health in All Policies: An approach to public policies across all sectors, to improve population health and health equity. It systematically takes into account the implications of decisions on health and health systems, seeks collaborations and avoids harmful health impact. In addition, it emphasizes the effect of public policies on health determinants and aims to improve the accountability of policymakers for the effects on health of all levels of policy-making.

Health service: Any service aimed at contributing to improved health or to the diagnosis, treatment and rehabilitation of individuals and populations.

Health worker, health professional: People who study, advise on or provide preventive, curative, rehabilitative and promotional health services, based on an extensive body of theoretical and factual knowledge.

In all their diversity: The acknowledgement, respect, and inclusion of everyone, recognizing their unique differences and characteristics such as gender, age, race, ethnicity, sexual orientation, religion, disability and more. It is a concept used to promote inclusion and ensure that policies and actions are made with the understanding that individuals within a group are not a monolith and may have varying needs and experiences.

Integrated health services: The management and delivery of health services provided, ranging from health promotion to disease prevention, diagnosis, treatment, disease management, rehabilitation and palliative care through the different functions, activities and sites of care within the health system.

Mental health: A state of well-being in which every individual realizes their own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to contribute to their community.

Multisectoral action on health: The collaboration between the health sector and non-health sectors for policy development, implementation and other actions which address social, economic and environmental determinants of health and associated commercial factors or improve health and well-being. Examples include involving agriculture and trade ministries developing or implementing nutrition policies.

Obesity-associated disability: Impairments or health conditions associated with obesity that interact with personal and environmental factors and that result in negative consequences. Impairments may include physical limitations due to excess body weight; symptoms associated with type 2 diabetes, hypertension, and other chronic diseases; and mental health issues such as anxiety and depression. Negative consequences may include a lack of access to the environment, stigma, discrimination, and lack of access to health care.

People-centred care: An approach to care that deliberately considers the perspectives of individuals, carers, families and communities as both participants in and beneficiaries of health systems that respond to their needs in humane and holistic ways. People-centred care also requires that people have the education and support they need to make decisions and participate in their own care.

Personal health services: Health services that target the individual. These include health promotion, disease prevention, timely diagnosis and treatment, rehabilitation, palliative care, acute care and long-term care services.

Population-based approach: An approach to health services that uses information about the population to make decisions about health planning, management, and geographical location. It seeks to improve the effectiveness and equity of interventions, and to achieve improved health and distribution of health in the context of the culture, health status, and health needs of geographical, demographic, or cultural groups.

Population health services: Health services targeted at the population as a whole, with the aim of improving health and well-being on a large scale.

Primary care: A key process in the health system that supports first-contact, accessible, continued, comprehensive and coordinated patient-focused care.

Primary health care: A society-wide approach to health that aims to maximize the level and distribution of health and well-being through three components: (a) primary care and essential public health functions as the core of integrated health services, (b) multisectoral policy and action, and (c) empowered people and communities.

Primary health care-oriented health system: A health system organized and operated to guarantee the right to the highest attainable level of health as the main goal, while maximizing equity and solidarity. A primary health care-oriented health system is composed of a core set of structural and functional elements that support achieving universal coverage and access to services that are acceptable to the population and equity enhancing.

Referral: Directing an individual to the appropriate facility or specialist in a health system or network to address relevant health needs. Counter-referral may occur when an individual is directed back to primary care for follow-up after a procedure in secondary or tertiary care.

Referral form: A standardized form throughout the network of service providers that ensures that the same essential information is provided whenever a referral is initiated. It is designed to facilitate communication in both directions: the initiating facility completes the outward referral, and at the end of care, the receiving facility completes the counter-referral to the original facility.

Sex: Refers to the different biological and physiological characteristics of females, males and intersex persons. Characteristics include chromosomes, hormones and reproductive organs.

Well-being: A multidimensional construct aiming at capturing a positive life experience, frequently equated to quality of life and life satisfaction. Measures of well-being typically focus on reported outcomes covering a wide range of domains, such as happiness, positive emotions, engagement, meaning, purpose, vitality and calmness.

Executive summary

Obesity has profound effects on the physical and mental well-being of children (1, 2, 3).

The World Health Organization (WHO) defines childhood as the period of life from birth until 19 years of age. Within this group, *newborn* or *neonate* refers to the first 28 days of life; *infant* refers to age 29 days to less than 12 months; *toddler* to 12 months to less than 3 years; *pre-school-aged* to 3 to less than 5 years; *school-aged* to 5 to less than 10 years; and *adolescent* to 10 to 19 years (4, 5, 6). The WHO International Classification of Diseases 11 (ICD-11) defines obesity as “a chronic complex disease defined by excessive adiposity that can impair health. It is in most cases a multifactorial disease due to obesogenic environments, psycho-social factors and genetic variants”.

With increasing prevalence rates of childhood obesity across Member States, there is a need for practice- and science-informed measures to address this condition and its effects on overall health, the early onset of other noncommunicable diseases, educational attainment, adult obesity, and quality of life (1, 2, 7).

Scope and purpose, objectives, and target audience

The purpose of this guideline is to provide Member States and their partners with adoptable and adaptable, clear, practice- and science-informed global clinical and public health recommendations on the integrated management and care of children in all their diversity, aged 29 days to under 10 years living with obesity, for improved health, functioning and reduced obesity-associated disability, using a primary health care approach. “In all their diversity” recognizes the uniqueness of each child, promoting inclusion, policies, and actions that acknowledge varying needs and experiences.

This guideline considered primary health care-based interventions, particularly diet therapy; physical activity, sleep hygiene and sedentary behaviours; behaviour changing interventions; multimodal interventions; digital health interventions; pharmacological interventions; and weight-control related surgery, among others. The guideline development process considered the perspective of the individual, the community and the multiple sectors involved in addition to the health systems.

The primary target audiences of this guideline are decision-makers and public health policymakers in ministries of health and other related offices at the national, sub-national and local levels. In addition, the guideline is of interest to health workers and to managers of integrated health programmes and healthcare systems. Furthermore, the recommendations may be informative for non-governmental and other organizations and professional societies

involved in the planning and management of interventions for children with obesity and other health and well-being actions. Lastly, the guideline can help inform the general public, including parents and caregivers of children with obesity.

Guideline development methodology

This guideline was developed following the methodological procedures described in the WHO Handbook for guideline development (8). The Department of Nutrition and Food Safety and the WHO Obesity Steering Committee were responsible for coordinating the guideline development process. The Guideline Development Group (GDG) assessed the results of evidence synthesis and participated in drafting recommendations. The GDG members represented diverse sex, age, and geographic backgrounds with different academic and professional expertise related to childhood obesity management.

A second relevant guideline for obesity management in adolescents was completed through a separate, independent process, also following the WHO Handbook. Each guideline had its own GDG. The guideline for obesity management in adolescents can be accessed [here](#).

A preliminary set of questions and outcomes was defined by the WHO Obesity Steering Committee; these were then subject to a public notice and comment. The results of this consultation exercise allowed the GDG and the WHO Obesity Steering Committee to refine the preliminary list of questions and outcomes, which was then ratified by the GDG and the WHO Guidelines Review Committee (GRC).

WHO commissioned the retrieval, assessment and synthesis of evidence for each question. These exercises were completed in accordance with methodological guidance from WHO (8), Cochrane (9, 10), and GRADE (11). In order to identify systematic reviewers, WHO launched a call for authors. These authors conducted the reviews and presented results to the WHO Secretariat and the GDG. Findings served as the basis for making recommendations, along with factors such as views, values, and preferences of children with obesity and their families, equitable access to health care, costs, acceptability, and feasibility (12).

The GDG determined that the following outcomes were critical for decision-making: 1) body mass index (BMI)/BMI z-score reduction, stabilization and/or maintenance (kg/m^2), 2) weight reduction, stabilization and/or maintenance (kg), 3) physical well-being (functional mobility, self-care, getting along, life activities and participation, as defined by trialists), 4) mental well-being (anxiety, stress, depression, isolation, self-esteem, body image, suicidal ideation, eating disorders, as defined by trialists), 5) physical activity (type, duration, intensity, frequency, as defined by trialists), 6) overall quality of life, 7) blood pressure, 8) adiposity and fat distribution (objective measures: dual energy x-ray absorptiometry, magnetic resonance, as defined by trialists; anthropometric measures: skinfolds, waist-to-hip ratio, waist circumference, as defined by trialists), 9) adverse events associated with the interventions, 10) presence of obesity coexisting conditions (any other noncommunicable disease), and 11) obesity-associated disability.

The GDG determined that the following outcomes were important but not critical for decision-making: 1) hyperinsulinemia [$1.7 \text{ mmol}/\text{L}$ ($30 \text{ mg}/\text{dL}$)] or higher when 1 mg of glucagon is administered IM or IV (or as defined by trialists), 2) resistance to insulin (as defined by trialists), 3) glycaemia (in mg/dL , fasting), 4) alterations in lipid metabolism or in adipogenesis and fat accumulation, 5) lipid hormones (for example, leptin or adiponectin), 6) alterations in hunger or satiety (as defined by trialists), 7) reduced disability in any of the functionality domains according to the International Classification of Functioning, Disability and Health (ICF), 8) mortality, 9) prevalence of obesity in adulthood, and 10) access to health services.

The WHO Secretariat presented a comprehensive, objective synthesis of the evidence to the WHO Obesity Steering Committee and the GDG to inform the recommendations.

When discussing and deciding on recommendations, the GDG considered the results of evidence retrieval, synthesis and assessment and of evidence-to-decision frameworks, for example the balance between benefits and harms, stakeholders' values and preferences, costs, cost effectiveness, equity considerations, acceptability, and feasibility. In addition, they explicitly took into consideration factors of human rights and sociocultural adaptability, societal implications, health system considerations, implementation, monitoring and evaluation, and research gaps. Prior to their participation, all experts in WHO meetings declared any interest relevant to the meeting and potential conflicts were managed accordingly. Participants in the GDG meetings took part in their individual capacity and not as institutional representatives.

An external group of experts was tasked with providing feedback to the final draft of the manuscript, which was then reviewed and approved by the GDG and the WHO GRC.

Recommendations, justifications and remarks

Dietary interventions

Recommendation

WHO recommends a structured dietary intervention as one of the components of the integrated management of children with obesity older than 2 years of age. It should consider age, gender, health status, food preferences and meal frequencies, nutritional education, cultural context, and be delivered and supervised by health workers with knowledge on nutrition, and involve parents and/or caregivers.

Strength of the recommendation: Strong.

Quality of the evidence: Very low.

Justification

The GDG agreed on a strong recommendation because the balance between benefits and harms probably favours dietary interventions. Children with obesity and their carers positively valued the potential benefits of dietary interventions, which are likely to be acceptable and feasible, particularly when they involved the entire family unit and were personalized, age-appropriate and culturally sensitive. While benefits are small, so is the risk of adverse events. The GDG, on the other hand, acknowledged that financial constraints may hinder parents from affording healthy food or meal plans; socioeconomic status was linked to diet quality, with low-income and historically marginalized communities facing higher food insecurity and health inequities. No studies were found on cost-effectiveness.

Evidence on dietary interventions was limited in the number and quality of studies. A small effect of dietary treatments, that is, low calorie or low glycaemic index (GI) food diets compared to no dietary changes, was identified for critical outcomes of weight, BMI, waist circumference, cholesterol concentrations, and percent body fat.

Dietary modifications are usually aimed at reducing total energy intake and include, but are not limited to, restricting caloric content (normal or reduced energy intake), varying macronutrient distribution or composition (low carbohydrate, high protein, low fat, omega-3 rich, polyunsaturated

fatty acid (PUFA) rich, or ketogenic diet), restricting particular components (low in salt, low in sugar, high in fibre, no food additives, low in industrially produced foods currently known as ultra-processed foods, or low GI foods), and dietary patterns (Mediterranean, American Heart Association, whole foods, or complex carbohydrates).

Remarks

Dietary interventions require evaluation by health workers with nutrition knowledge. They should cover physical and mental health, family and personal history and environment, and an assessment of risk factors for eating disorders. Health workers should be able to communicate in an empathetic, non-stigmatizing, motivational, and culturally responsive manner, and to display competencies of interdisciplinary collaboration.

WHO supports the consumption of a healthy diet to protect against malnutrition in all its forms as well as against noncommunicable diseases. The keys to a healthy diet include breastfeeding during the first two years of age with exclusive breastfeeding for the first six months; consuming a combination of foods avoiding monotonous diets, including plenty of fruits, vegetables, and legumes daily; moderating fat consumption; and limiting salt and sugar.

Dietary interventions allow school and community involvement and coordination with caregivers and health workers to provide appropriate foods. This also helps to initiate, support and sustain dietary practices change.

According to WHO and FAO, a healthy diet needs to be adequate, balanced, moderate and diverse. The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (for example age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs. In addition, the Codex Alimentarius standards provide potentially relevant guidelines and codes of practice regarding nutrient compounds that may be used in special dietary foods for infants and young children, formula foods for weight control diets, and labelling of and claims of prepackaged foods for dietary uses.

Children and their parents or caregivers prefer interventions that are affordable and easy to apply, including a structured meal plan, hands-on activities, and fun approaches to promoting healthy eating habits. Acceptability is enhanced when dietary interventions are tailored to age and cultural patterns.

Diet plan initiation and follow-up require the involvement of the children and their parents or caregivers, services with structured guidance, and consideration of the schedule of parents or caregivers to facilitate compliance and engagement with the intervention.

Anxiety, depression, low self-esteem, emotional dysregulation, and other mental health issues may lead to unhealthy eating behaviours. Health workers should address both obesity and mental health conditions early and together, using inclusive, developmentally appropriate, and family-engaged strategies.

Dietary behaviours are influenced by complex factors, including gender, culture, socioeconomic status, and parental involvement, with early education and the environment playing crucial roles in long-term health.

Low-income communities face higher food insecurity and health disparities, underscoring the need for accessible nutrition resources and better nutritional education.

Physical activity, sedentary behaviour, and sleep

Recommendation
WHO recommends a structured physical activity plan that considers age, gender, health status, cultural context, and the child's interests, values and preferences and that includes parents and/or caregivers as one of the components of an integrated management for children with obesity.
Strength of the recommendation: Strong.
Quality of the evidence: Very low.

Justification

The GDG voted for a strong recommendation because although small, the benefits of physical activity are clear for all ages and health statuses, with trivial to small adverse events. Children with obesity and their parents value the benefits of staying active. The GDG also considered that physical activity interventions are acceptable and feasible, particularly when they include fun, informal, non-competitive activities. Physical activity may be cost-effective due to the potential benefits of preventing chronic diseases, and it can be offered at low or no cost in parks and recreation areas or as lifestyle changes. The recommendation was agreed to be strong even though structured physical activity may result in costs to families; it also requires investment from governments and communities in venues and facilities. Gains in health equity will only crystallize if access to safe, affordable, and suitable programmes and spaces for physical activity are ensured for all, particularly girls, minoritized groups, and people with disabilities.

Evidence was limited in the number and quality of studies on children with obesity. No clear effect of physical activity compared to no physical activity was identified for the critical outcomes of BMI, weight loss, body fat, adverse effects, quality of life and mental well-being.

The 2020 WHO guidelines on physical activity and sedentary behaviour for children under 5 years of age provide physical activity recommendations for children irrespective of gender, cultural background or socioeconomic status (5). The recommendations include:

- Infants (under 1 year of age) should be physically active several times a day in a variety of ways, particularly through interactive floor-based play; more is better. For those not yet mobile, this includes at least 30 waking minutes in a prone position (tummy time) spread throughout the day.
- Children 1–2 years of age should spend at least 180 minutes in a variety of physical activities at any intensity, including moderate- to vigorous-intensity physical activity, spread throughout the day; more is better.
- Children 3–4 years of age should spend at least 180 minutes in a variety of physical activities at any intensity, of which at least 60 minutes is moderate- to vigorous-intensity physical activity, spread throughout the day; more is better.
- Children 5 years of age and above should do at least an average of 60 minutes per day of moderate- to vigorous-intensity, mostly aerobic, physical activity, across the week.
- Vigorous-intensity aerobic activities, as well as those that strengthen muscle and bone, should be incorporated at least three days a week for children 5 years of age and above.

Remarks

Incorporating physical activity into a scheduled daily routine that also includes schoolwork, commuting, seeing friends, and leisure could help children to engage in physical activity. Non-competitive activities could be the preferred option for some children.

The structured physical activity plan should be discussed and agreed upon with the child and their parents or caregivers.

Health workers need to be equipped with the required services and competencies to facilitate discussion with children and parents or caregivers and promote knowledge on body weight and obesity management.

Mental health issues may contribute to physical inactivity, sleep disturbances, and social withdrawal. There is a need to address both obesity and mental health conditions in the primary health care setting through inclusive, developmentally appropriate, and family-engaged strategies.

The structured physical activity plan should be tailored to the specific needs of population groups, including girls, children exposed to exclusion/discrimination, children with disabilities, or people at risk of developing non-communicable diseases. Children with disabilities may require personalized attention regarding their underlying impairments and how they may hinder physical activity.

Effective multisectoral collaboration is needed to develop policies supporting the establishment of active environments, for example, access to parks, athletic facilities, and recreation areas at no cost.

Behaviour changing interventions

Recommendation

WHO recommends behaviour changing interventions as one of the components of the integrated management of children with obesity. The type and duration of the intervention(s) selected should take into consideration age, gender, health status, dietary behaviour, physical activity, sedentary behaviour, cultural context, the child's interests, and values and preferences as well as the support and resources of parents and/or caregivers.

Strength of the recommendation: Strong.

Quality of the evidence: Very low.

Justification

The GDG agreed on a strong recommendation because children and their families are motivated by the expectation that behaviour changing interventions will help them achieve long-term lifestyle changes. Benefits are small, but so is the possibility of adverse events. Behaviour changing interventions that are fun, enjoyable, and consider the specific needs of participants are more likely to be acceptable and feasible. When reaching this decision, the GDG took into consideration that families may incur costs depending on the components of the interventions and the logistics and health workers involved. Other population groups may also face barriers to access due to stigma, discrimination, exclusion, or lack of appropriately tailored services.

WHO has a classification system to design and evaluate behaviour changing interventions in a way that is tailored to different contexts, from individual behaviours to societal-level changes. WHO categorizes interventions by the type of action they promote as educational/informational interventions, persuasive interventions, normative/structural interventions, environmental interventions, and policy-based interventions, as detailed in the WHO Report on Social Determinants of Health (13), WHO Health Promotion and the 2013 WHO Global Action Plan (14).

A non-exhaustive list of behaviour changing interventions includes behavioural therapy, cognitive behavioural therapy, cognitive therapy, psychotherapy, integrative or holistic therapy, self-monitoring, goal setting and reinforcement, stimulus control, problem solving, motivational techniques, mindfulness-based cognitive therapy, or stress reduction.

Remarks

Children with obesity may be motivated to engage in behaviour changing interventions because of the perceived benefits of such activities, including weight loss, body image, prevention of health sequelae, self-esteem, and social acceptability.

Children with obesity and their caregivers value personalized, holistic, and practical obesity management interventions that promote benefits such as self-esteem, self-confidence, and social acceptability.

Behaviour changing interventions are more acceptable when they are tailored to the specific needs of children with obesity and when they incorporate fun and enjoyable activities that are practical and solution-based. There may be a need for referral to specialized services when there are coexisting mental health issues or when interventions do not lead to progress. Referral should include written notification to other health workers and clear and compassionate communication with the family regarding the motivation for the referral.

The cost of behaviour changing interventions may depend on many factors, including the care setting, the type of behaviour changing intervention, and the health workers involved.

Whole-of-society approaches addressing the causes of inequities in access are required to enhance participation in obesity management interventions.

The implementation of behaviour changing interventions could be facilitated by governments, schools, and community support.

Digital health interventions

Recommendation

WHO suggests a digital health intervention as one of the components of the integrated management of children over 2 years of age with obesity. It should consider the type and daily duration of the intervention, age, gender, health status, physical activity, sedentary behaviour, cultural context, the child's interests, values and preferences, and be conducted under the supervision of parents and/or caregivers.

Strength of the recommendation: Conditional.

Quality of the evidence: Very low.

Justification

The GDG agreed on a conditional recommendation because the evidence on digital interventions was limited in the number and quality of studies. The evidence highlights that digital health interventions under parent or caregiver supervision could be potentially useful for promoting and sustaining behaviour change over time. A small effect of short- or long-term digital health interventions compared to conventional care alone was identified for the critical outcomes of weight, BMI, and waist circumference.

Digital health interventions under the supervision of parents or caregivers could be potentially useful for promoting and sustaining behaviour change over time, although high-quality evidence on effectiveness is limited.

Remarks

Supervised active video games, exergames, exercise activity mobile applications, pedometers or accelerometers, and other similar interventions may have potential for increasing physical activity behaviours in children older than 2 years of age with or without accessibility issues or chronic diseases.

Health workers should be mindful of coexisting anxiety, emotional dysregulation, and other mental health issues when deciding on digital health interventions in order to avoid sleep disturbances, social withdrawal, and other symptoms associated with mental health conditions.

While active video games, exergames, or exercise activity mobile applications may be suggested for managing obesity in children older than 2 years of age, recreational time spent in front of a screen (TV, video games, computers, mobile phones) in excess of two hours a day is associated with harmful outcomes such as depression and lower quality of life. As a result, some guidance, including the Canadian Society for Exercise Physiology 24-Hour movement guidelines for the early years, point out that two hours may be used as a daily maximum for screen time.

Pharmacotherapy

Recommendation
WHO does not recommend pharmacological interventions for obesity management for children 0–9 years of age.
Strength of the recommendation: Strong.
Quality of the evidence: Low.

Justification

The GDG agreed on a strong recommendation because the WHO-commissioned Cochrane systematic review of randomized controlled trials (RCTs) assessing the effect of any form of pharmacological interventions compared to no intervention or placebo for obesity in children and adolescents did not identify any studies that included children under 6 years of age. Eight studies included children 6 years or older; seven assessed metformin and one assessed liraglutide.

This recommendation accounts for the lack of evidence on both benefits and the potential adverse events and consequences of the different medications and/or their active ingredients on normal growth, development, physiological parameters, and mental health.

Remarks

As a general approach for children with obesity, a structured and supervised multimodal lifestyle intervention including behavioural, dietary, and physical activity interventions that considers age, gender, health status, sedentary patterns and sleeping habits, cultural context, the child's interests, values and preferences, and that involves parents and/or caregivers should be considered.

Bariatric surgery and weight-loss and weight-management devices

Recommendations
WHO does not recommend bariatric surgery and weight-loss or weight-management devices for obesity management for children 0-9 years of age.
Strength of the recommendation: Strong.
Quality of the evidence: No evidence.

Justification

The GDG agreed on a strong recommendation without relevant evidence by considering the potential adverse events and consequences of bariatric surgery and weight-loss or weight-management devices on normal growth, development, physiological parameters, and mental health.

When deciding upon the strength of this recommendation, the GDG considered GRADE guidance regarding paradigmatic situations where a strong recommendation may be warranted despite low or very low confidence in the evidence. In this case, bariatric surgery at such young age, that is under 10 years, may result in significant harm (15).

Remarks

As a general approach for children with obesity, a structured and supervised multimodal lifestyle intervention including behavioural, dietary, and physical activity interventions that considers age, gender, health status, sedentary patterns and sleeping habits, cultural context, the child's interests, values and preferences, and that involves parents and/or caregivers should be considered.

Multimodal interventions

Recommendation
WHO recommends a structured multimodal intervention including a combination of diet, physical activity, and behavioural components for the integrated management of children with obesity*. It should consider age, gender, health status, food preferences, nutritional education, physical fitness, cultural context, and the child's interests, values and preferences as well as resources and support of parents and caregivers. It should be delivered and supervised by health workers with knowledge on nutrition, physical activity, and behaviour changing interventions, and involve parents and/or caregivers. * Other components of multimodal interventions include changes in sleep behaviour and in sedentary behaviour patterns, and the use of digital technologies. Multimodal interventions could involve family, friends, caregivers and schools; improve access to care; and promote awareness and educational campaigns for children, caregivers, schools and communities.
Strength of the recommendation: Strong.
Quality of the evidence: Very low.

Justification

The GDG considered this recommendation to be strong because children with obesity and their parents value the perceived benefits associated with a healthy diet and staying active, including weight loss, social acceptance, and self-esteem. Even though the benefits are small, the balance between benefits and harms still favours the intervention. Multimodal interventions are likely to be acceptable and feasible if they are appropriate for age, gender, and ethnicity; if they are personalized; and if they acknowledge parental financial situation and schedules. Relatedly, the GDG acknowledged that multimodal interventions may incur costs on families and that the effect on equity is unclear. Underserved communities, girls, and minoritized ethnic groups are less likely to have access.

The WHO-commissioned review retrieved RCTs of multimodal interventions delivered either in health care settings or in community settings, for example, schools, churches, and community centres. Interventions consisted of dietary, physical activity, and behavioural modifications compared to usual care. Results were similar in both settings, including small effects on BMI, physical well-being, and quality of life.

Remarks

The recommendations on diet, physical activity and behavioural components established during this guideline development process could form the basis of a multimodal intervention. This guideline includes recommendations on sleep behaviour, sedentary behaviour, digital technologies, and the need for involving family, friends, caregivers, schools and the community.

The nature of the intervention can be decided based on the results of a detailed initial clinical assessment that considers anthropometric measures as well as a comprehensive family and medical history, a review of psychosocial and behavioural factors (such as eating habits, physical activity, and sleep routines), and relevant laboratory tests where appropriate.

Parental involvement can enhance the effectiveness of lifestyle interventions. Parents can support the child throughout the intervention, change their own behaviours, and adapt parenting styles.

Multimodal interventions may be cost-effective due to potential benefits in weight management and the prevention of chronic diseases.

Referral from the primary health care setting to specialized care may be required, including notification of other health workers and clear, compassionate communication with the family.

The involvement of paediatric obesity experts, secondary or specialized care, and/or multidisciplinary teams in multimodal lifestyle interventions could be an option.

While there is no ideal follow-up interval for children with obesity, the frequency of visits should consider the child's overall clinical condition, coexisting conditions, medication use, and social vulnerability.

Whole-of-society approaches addressing the causes of inequities in access are required to enhance participation in obesity management interventions.

Support from governments, schools, and the community could facilitate the implementation of multimodal interventions.

Research gaps

There is a need for high-quality evidence on the long-term benefits and harms of obesity management interventions among children. This will require well-designed and well-reported RCTs and prospective cohort studies. In addition to efficacy, study designs should consider and report the duration of treatment, the continued engagement, setting, safety profile, and long-term secondary effects. These studies should incorporate, when appropriate, subgroup analyses for the severity of obesity, obesity-related complications, differently-abled people and type of intervention.

Future research should include a varied range of outcomes that go beyond anthropometric and cardiometabolic variables to include physical and mental well-being, overall quality of life, and a reduction in obesity-associated disability. Potential short- and long-term adverse events should be carefully recorded and reported. Intervention design should foresee stakeholders' values and preferences and foster the involvement of parents, schools, and peers.

Future research should also consider implementation enablers for middle- and low-income countries, as well as population characteristics such as gender, age, ethnicity, cultural background, and socio-economic status. Criteria that facilitate decision making in health care, such as the costs, acceptability, and feasibility of interventions, should be taken into account and reported.

Plans for updating

This guideline follows a living guideline methodology. Future iterations will incorporate new evidence regarding benefits and adverse events, values and preferences from stakeholders and/or users of the guideline; feasibility or cost-effectiveness of interventions; human rights, equity, and gender considerations; accessibility and public and private coverage of the interventions; definitions or cut-offs points for defining obesity and severity; digital health interventions and social media; and the needs of children with obesity-related complications, of migrant populations, and of minorities. The WHO Secretariat will monitor the development of relevant research development as well as suggestions from stakeholders regarding new evidence or additional questions or outcomes that could be incorporated. Changes will be highlighted in the updated version of the guideline, which will then be disseminated via the regular communication channels of WHO.

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Background

Children with obesity are likely to experience poor physical and mental well-being, quality of life, and educational achievement. Many communities worldwide currently face a high prevalence of childhood obesity. Effective management strategies are crucial to safeguarding the health of children and adolescents throughout these vulnerable and formative stages of life. Furthermore, childhood obesity increases the risk of developing other noncommunicable diseases early on, and contributes to obesity persisting into adulthood (1, 2).

According to the World Health Organization (WHO) definition, childhood is the life period spanning from 0 to 19 years of age. *Newborn* or *neonate* refers to the first 28 days of life; *infant* refers to 29 days to less than 12 months of age; *toddler* to 12 months to less than 3 years; *pre-school-aged* to 3 to less than 5 years; *school-aged* to 5 to less than 10 years; and *adolescent* to 10 to 19 years (3, 4, 5). WHO thresholds for childhood obesity vary according to age. In children under 5 years old, overweight is identified as weight-for-height greater than two standard deviations (SD) above the median, and obesity as weight-for-height greater than three SD above the same median (6). For children and adolescents aged 5 to 19 years, overweight is defined as a body mass index (BMI) for-age greater than one SD above the median of the WHO Child Growth Standards, while obesity is classified as a BMI-for-age exceeding two SD above that median (6).

The International Classification of Diseases 11 (ICD-11) characterizes obesity as “*a chronic complex disease defined by excessive adiposity that can impair health. It is in most cases a multifactorial disease due to obesogenic environments, psycho-social factors and genetic variants. In a subgroup of patients, single major etiological factors can be identified (medications, diseases, immobilization, iatrogenic procedures, monogenic disease/genetic syndrome). Body mass index (BMI) is a surrogate marker of adiposity calculated as weight (kg)/height² (m²). The BMI categories for defining overweight vary by age and gender in infants, children and adolescents.*” (7). Obesity is associated with a wide range of diseases and both short- and long-term health consequences. Children who experience obesity continue to struggle with the condition into adolescence and adulthood (1). Cardiovascular diseases, asthma, cancer, dementia, depression, diabetes mellitus, kidney and liver diseases, osteoarthritis, pancreatitis, birth complications, sleep apnoea, and fertility dysfunction including impotence are recognized as obesity-associated conditions (6).

Obesity is associated with underlying impairments that, in combination with personal and environmental factors, may result in disability. In and of itself, disability is a risk factor for childhood obesity due to reduced physical capability, lack of understanding on the part of carers, withdrawal, and health issues. Furthermore, underlying impairments related to obesity, such as physical limitations due to excess body weight, symptoms associated with chronic conditions,

and mental health issues such as anxiety and depression, may result in further unwanted consequences such as stigma, discrimination, and lack of access to health care, thus generating or exacerbating disability and obesity-associated disability (8, 9).

Since 1975, global rates of obesity have nearly tripled, affecting both children and adults. In 2016, over 1.9 billion people aged 18 years and older were classified as overweight, and more than 650 million adults were living with obesity (6). According to 2021 WHO data, the global prevalence of overweight or obesity among children and adolescents, 5 to 19 years of age rose from 4% to 18% (6).

Additional studies confirm increasing childhood obesity rates. A 2024 pooled analysis reported that 93.1 million children and adolescents 5 to 14 years of age and 80.6 million adolescents and young adults 15 to 24 years of age had obesity, affecting approximately 160 million children and adolescents worldwide. This number is expected to grow to more than 250 million by 2030 (10, 11). Many countries are increasingly facing a double burden of underweight and obesity, largely driven by rising obesity rates in both adult and paediatric populations. Regardless of income level, countries are also confronted with varying obesity rates within their borders. These variations are largely reflective of poverty, education, access to health care, and other determinants of health (10, 11). Furthermore, a 2024 systematic review and meta-analysis reported the global obesity prevalence among children and adolescents to be 8.5%, noting significant increases over the past two decades (13). Regional variations are notable: the highest paediatric obesity rates are observed in North America (~17%), the Caribbean (~19%), Central America (~16%), and Polynesia (~20%). Conversely, lower childhood obesity rates are seen in Central Africa (~2%), Eastern and Western Africa (~4%), Southern Africa (~6%), as well as in Western, Eastern, and Northern Europe (~5%) (13).

Although factors such as diet, physical activity, and personal behaviour have frequently been cited, there is no clear consensus on the exact causes behind the rise in obesity rates over recent decades. Multisectoral and policy efforts have for the most part failed to stem obesogenic environments, address drivers of obesity, and remove blame from people with obesity and their families (14). Commercial determinants of health, for example private sector actions around the production of industrialized products currently known as ultra-processed foods and other unhealthy food options, marketing of unhealthy commodities, and the promotion of sedentary lifestyles, have a profound impact on people's behaviour regarding food choices, physical activity, and consuming practices (15). Among other related actions, WHO advocates for marketing restrictions for foods and beverages with respect to children and for breast-milk substitutes (16).

Importantly, recent evidence syntheses suggest that while combined dietary and physical activity interventions may offer some benefits, their impact on preventing obesity in children and adolescents remains limited. The risk of serious adverse events from these interventions appears to be low, yet the overall quality of evidence supporting these findings is also low (17, 18, 19). Physical activity contributes significantly to bone and skeletal development, cardiometabolic health, and the improvement of cognitive and motor skills in children and adolescents. It also reduces the risk of obesity and chronic diseases later in life. Alarming, as of 2024, 80% of adolescents were not meeting WHO's recommended physical activity levels (20, 21). Moreover, rising screen time has contributed to increased sedentary behaviour and a surge in mental health issues in children, both of which are linked to obesity (3, 4).

In terms of diet, major economic and technological transformations have driven a global shift from subsistence and local food systems to commercially driven food production and an increase in marketing industrialized products currently known as ultra-processed foods. This transition has increased the intake of calories, sugars, processed foods, and animal-source foods, especially in low-income countries, while reducing food preparation time and decreasing the consumption of fibre-rich and fresh foods (22, 23).

Societal and environmental conditions strongly influence individual choices around food and physical activity. This perspective is essential, as obesity is often wrongly framed purely as a matter of personal responsibility. While multimodal interventions may help boost physical activity and improve dietary habits (24), addressing obesity effectively requires coordinated, multisectoral actions. Such strategies should focus on improving access to healthy foods and safe physical activity spaces, addressing poverty, and reforming food production, marketing, and pricing systems (25).

Rationale

WHO's commitment to addressing the current global trends in obesity epidemiology and to strengthening existing prevention-oriented strategies motivated the development of relevant normative guidance. The present document presents guidance for the people-centred integrated management and care of children between 29 days and under 10 years of age with obesity, using a primary health care approach. "People-centred" entails incorporating the perspectives, preferences, and values of children and those affected by the recommendations (26). It also emphasizes a commitment to compassionate care (27, 28, 29) and to empowering families and communities to adopt and sustain healthier practices (30, 31). "In all their diversity" recognizes the uniqueness of each child, promoting inclusion, policies, and actions that acknowledge varying needs and experiences (32, 33).

These considerations were fully integrated into the development of this guideline, including the formulation of population/problem, intervention, comparison, and outcome (PICO) questions, the selection of outcomes, the review of evidence, and the identification of research gaps requiring future exploration. Children and adolescents have different developmental stages and, as a result, there are specific considerations that need to be taken into account when devising and implementing obesity management interventions. These considerations include, among others, differences in the diagnosis and prognosis of obesity, the role of parents and caregivers, behavioural aspects and mental health, eligibility for interventions, and values and preferences (1, 4, 5, 8). Therefore, a separate relevant guideline for obesity management in adolescents was completed following the WHO Handbook for guideline development (34) through two independent processes. Each guideline had its own Guideline Development Group (GDG). The guideline for obesity management in adolescents can be accessed [here](#).

The present guideline considers a primary health care approach, which is built upon three pillars: 1) meeting people's health needs throughout their lives; 2) addressing the broader determinants of health through multisectoral policy and action; and 3) empowering individuals, families and communities to take charge of their own health (31). Aligned with the Integrated Management of Childhood Illness (IMCI) strategy, developed by WHO and UNICEF, this guideline seeks to enhance case management and support the healthy development of children. IMCI focuses on improving the case management skills of health workers, strengthening overall

health systems, and promoting better family and community practices (30, 35). The present guideline builds on that foundation by providing global, evidence-informed recommendations for both clinical and public health practice in the management of childhood obesity.

This guideline promotes coordinated, multidisciplinary care delivered in primary care settings and supported through referrals to secondary and tertiary services as outlined in the Operational framework for primary health care (36). This normative work also underscores a commitment to equity, emphasizing justice, fairness, impartiality, and equality in health service delivery. It acknowledges the potential of recommended actions to either reduce or exacerbate existing health disparities within and across national boundaries.

One of the central recommendations from the WHO Commission on Ending Childhood Obesity, established in 2014, (1) was the development and support of appropriate weight management services for children and adolescents who have overweight or obesity. These services should be family-based, multicomponent (incorporating nutrition, physical activity, and psychosocial support) and delivered by trained multiprofessional teams as part of Universal Health Coverage.

This guideline also draws on the foundation of existing WHO and UN recommendations, integrating prior knowledge and technical work related to the prevention and management of obesity. Key resources that shaped the scope and objectives of this guideline include the Report of the WHO Commission on Ending Childhood Obesity (1); Obesity: preventing and managing the global epidemic (37); and UNICEF's Prevention of overweight and obesity in children and adolescents (38). Previous WHO clinical guidelines have largely emphasized prevention-focused strategies for both overweight and obesity, addressing how they are assessed and managed particularly in primary health care settings.

A significant turning point in the WHO prioritization of health equity was the establishment of the Commission on Social Determinants of Health (CSDH) in 2005 (39), the Global Strategy on Equity and Universal Health Coverage in 2018 (40), and the integration of these considerations into the guideline development process through the adoption of various frameworks and tools. A one-size-fits-all approach for a guideline may be inadequate; there is a need for greater emphasis on tailoring recommendations to specific socioeconomic, cultural and geographic contexts. Guideline development should further address social determinants of health, such as poverty, education and access to health care, thus acknowledging underlying causes of obesity. It is essential to incorporate considerations related to differences based on gender, age, nationality, race, ethnicity, ability, socio-economic background, religion, political beliefs, or other identities (41).

The prioritization of questions and outcomes, as well as the processes of retrieving, synthesizing, and assessing evidence, were guided by existing WHO recommendations. Notably, they referenced the WHO guideline Assessing and managing children at primary health-care facilities to prevent overweight and obesity in the context of the double burden of malnutrition: Updates for the Integrated Management of Childhood Illness (IMCI) (35). Collectively, this body of work informed both the technical and strategic direction of the current guideline development process.

This guideline was developed in alignment with the principles outlined in the WHO Guidelines on physical activity and sedentary behaviour (3, 4). For dietary interventions, the synthesis of evidence was informed by several key sources, including the WHO Guideline on sugars intake for adults and children (42); the WHO Guideline on saturated fatty acid and trans-fatty acid intake (43); and the

UN Food and Agriculture Organization (FAO) Nutrition guidelines and standards for school meals: a report from 33 low- and middle-income countries (44). In addition, digital health recommendations were grounded in the WHO Recommendations on digital interventions for health system strengthening (45). Lastly, the guideline integrates WHO's efforts on mental well-being, specifically the Mental health gap action programme (mhGAP) guideline for mental, neurological and substance use disorders (46).

The approach taken in this guideline aligns with broader global commitments, including the 2030 Agenda for Sustainable Development, specifically target 3.4, which aims to reduce premature mortality from noncommunicable diseases (47). The work is also responsive to the six recommendations¹ issued by the Commission on Ending Childhood Obesity, which were endorsed by the World Health Assembly in 2017 along with the corresponding implementation plan (1). Furthermore, this guideline supports and complements the *Comprehensive implementation plan on maternal, infant and young child nutrition*, approved by the Sixty-fifth World Health Assembly in 2012 (48); the *Global Strategy for Women's, Children's and Adolescents' Health 2016–2030* (49); and the *United Nations Decade of Action on Nutrition 2016–2025* (50).

¹ The six recommendations are:

1. Implement comprehensive programmes that promote the intake of healthy foods and reduce the intake of unhealthy foods and sugar-sweetened beverages by children and adolescents.
2. Implement comprehensive programmes that promote physical activity and reduce sedentary behaviours in children and adolescents.
3. Integrate and strengthen guidance for noncommunicable disease prevention with current guidance for preconception and antenatal care, to reduce the risk of childhood obesity.
4. Provide guidance on, and support for, healthy diet, sleep and physical activity in early childhood to ensure children grow appropriately and develop healthy habits.
5. Implement comprehensive programmes that promote healthy school environments, health and nutrition literacy and physical activity among school-age children and adolescents.
6. Provide family-based, multicomponent, lifestyle weight management services for children and young people who have obesity.

Scope and purpose, objectives, and target audience

Scope and purpose

This guideline focuses on children aged between 29 days and less than 10 years with obesity. The outcomes examined were based on primary health care interventions which included, but were not limited to, diet therapy or therapeutic diets; physical activity; sleep hygiene and sedentary behaviours; behaviour change interventions; multimodal approaches; digital health interventions; pharmacological treatments; and weight-control surgery.

Recommendations took into account perspectives from multiple levels, including the individual child, the community, various sectors involved, and the health systems. The outcomes were also informed by evidence reflecting the views, values, and preferences of children with obesity, as well as those of family members, community members, and health workers.

Objectives

The purpose of this guideline is to provide Member States with adoptable and adaptable, clear, practice- and science-informed global clinical and public health recommendations on the integrated management and care of children aged between 29 days and less than 10 years with obesity for improved health, functioning and reduced obesity-associated disability, using a primary health care approach. Recommendations were grounded in gender equality, equity and human rights approaches to ensure that no one is left behind. The specific aims were to:

- a. Provide recommendations on individual, family, community and home-based interventions for the integrated management of children between 29 days and under 10 years of age with obesity.
- b. Outline practice and science-informed strategies for children with obesity, their caregivers and the home environment to support health, well-being, functioning, healthier weight achievement and maintenance, and reduced obesity-associated disability.
- c. Provide guidance on monitoring treatment, health and well-being outcomes, including dietary habits and healthier behaviours and lifestyles.

Target audience

Decision-makers and public health policymakers at national, subnational, and local levels, particularly within ministries of health and other related offices comprise the primary audience for this guideline. The guideline is also aimed at health workers such as primary care providers, integrated health programme managers, and health care system managers. Additionally, the recommendations are relevant to non-governmental organizations, professional societies, and other groups involved in planning and managing care for children with obesity, as well as broader health and well-being initiatives. The guideline can be used to inform the general public, including the parents and caregivers of children with obesity.

Guideline development

Interventions included in this guideline for evidence search and recommendations

Dietary interventions: An approach to creating combinations of calories, macro and/or micronutrients for obesity management. Dietary approaches and food composition depend primarily on the child's age, weight loss goal, coexisting conditions and food preferences and habits (51).

Physical activity: Any bodily movement produced by skeletal muscles that requires energy expenditure (44, 45, 46). Regular physical activity can prevent and contribute to the management of type 2 diabetes, heart disease, hypertension, some types of cancer, and other chronic diseases (52, 53, 54). The 2020 WHO guidelines on physical activity and sedentary behaviour provide physical activity recommendations for people irrespective of gender, cultural background or socioeconomic status (3, 4).

Behaviour changing interventions: Interventions designed to effect individual behaviour change (55, 56). They play a role in obesity management by addressing the energy-balance behaviours that contribute to weight gain, and that hamper obesity management efforts. While there is no consensus on a taxonomy or classification, behaviour changing interventions may include (i) interventions that invoke behavioural models or theory; (ii) interventions based on psychotherapeutic models such as behavioural therapy, cognitive behavioural therapies, mindfulness, attitude and relationship techniques, psychotherapy, psychodynamic therapies, humanistic therapies, stimulus control, goal setting, and self-monitoring; and (iii) multimodal interventions, which are composite approaches to modifying behaviour using more than one component (55, 56).

Multimodal interventions: Therapeutic approaches that incorporate a combination of different methods, strategies, or modes of treatment. Instead of relying on a single approach, multimodal interventions utilize a variety of components, for example behavioural and educational interventions, dietary management, and encouragement to increase physical activity and reduce sedentary behaviour. In this guideline, pharmacological and/or bariatric surgery interventions were not considered as components of multimodal interventions (57).

Digital health interventions: A discrete functionality of digital technology that is applied to achieve health objectives. Digital health interventions may be implemented within digital health applications, and information and communication technology systems, including

communication channels (58). They include the use of wearable or implantable devices to monitor diet and physical activity, websites, and text messages or other texting. There are also mobile applications to deliver information on diet and physical activity and monitor behaviours. Other interventions include exergaming or active video gaming to promote physical activity, as well as telemedicine to provide counselling and monitor interventions.

Pharmacological interventions: These aim to reduce energy intake and/or increase energy expenditure. They may be a suitable course of action for obesity management when lifestyle interventions have failed and there are serious coexisting conditions that affect physical and mental well-being (59). However, patients need to be closely monitored for potential adverse events (60). Currently, the United States Food and Drug Administration (FDA) and the European Medicines Agency (EMA) have approved orlistat, semaglutide, and liraglutide for the treatment of obesity in adolescents. The FDA has also approved phentermine and phentermine/topiramate. These pharmacological interventions are to be administered as an adjunct to diet, physical activity, and other lifestyle modifications (61).

Metabolic and bariatric surgery: Surgical procedures to manage obesity and obesity-related conditions. The rationale of metabolic and bariatric surgery is to restrict food intake and reduce the absorption of food. Different types of procedures are available, including Roux-en-Y gastric bypass, adjustable banding, and sleeve gastrectomy (62, 63, 64, 65).

Weight-loss or weight-management devices: Minimally invasive interventions for obesity management. They include weight-loss devices such as intragastric balloons, electrical stimulation, gastric emptying systems; and weight-maintenance devices such as removable oral palatal space-occupying devices, and ingested, transient, space-occupying devices (66, 67).

Principles and existing documents related to this new guideline

The 2016 WHO Commission on Ending Childhood Obesity highlighted the need for recommendations on multimodal interventions for obesity management, to be delivered by multiprofessional teams with appropriate training and resources, as part of Universal Health Coverage (7). In a similar vein, the 2016 WHO guideline “Assessing and managing children at primary health-care facilities to prevent overweight and obesity in the context of the double burden of malnutrition. Updates for the Integrated Management of Childhood Illness (IMCI)” (35) included recommendations on providing counselling on nutrition and physical activity to caregivers of children aged less than 5 years with overweight. There is further advice on how to perform an initial clinical assessment with reference to the WHO Child Growth Standards (6). However, the guideline does not include guidance for children over 5 years of age, or on interventions other than nutrition or physical activity counselling.

The development of this guideline relied on practice- and science-based evidence from all WHO regions, in any language. Each narrative, systematic and qualitative review documented eligibility criteria and reasons for exclusion of potentially relevant evidence. Studies on values and preferences, regardless of their methodology, were carefully searched for and included throughout the guideline development process.

Authors for the various commissioned narrative or systematic reviews were identified via a competitive Call for authors. This Call was advertised 1) via the WHO website; 2) through the nutrition and food safety mailing list in Campaign Monitor software, reaching over 13 000 subscribers; 3) through WHO social media (WHO LinkedIn account); and 4) by members of the WHO Obesity Steering Committee. The WHO Secretariat requested Declarations of interest and Confidentiality forms from all potential authors.

The development of this guideline adhered to internationally accepted methodology for evidence synthesis (34, 68, 69). In addition, the drafting of recommendations considered the following principles:

Primary health care approach: A whole-of-society approach to health that aims to maximize the level and distribution of health and well-being through three components: 1) primary care and essential public health functions as the core of integrated health services; 2) addressing the broader determinants of health through multisectoral policy and action; and 3) empowering individuals, families and communities to take charge of their own health. The function of primary health care is to coordinate the care of people and their health needs over the life course and across the continuum of care, in primary care facilities and communities, and for individuals and populations. Care needs to be comprehensive, coordinated, people-centred, continuous and accessible (31, 70).

Integrated Management of Childhood Illness (IMCI): IMCI includes three components: 1) improving case management skills of health workers, 2) improving overall health systems, and 3) improving family and community practices (30, 71). In health care facilities, IMCI entails the identification of illness in outpatient settings, and adopting a people-centred, integrated care perspective rather than focusing on a specific illness. It also entails working with caregivers, and expediting the referral of severely ill children to the appropriate facility or specialist in the health system or network of service providers to address the relevant health needs (36).

People-centred care: An approach to care that purposely adopts the perspectives of individuals, carers, families and communities as participants in and beneficiaries of trusted health systems that respond to their needs and preferences in humane and holistic ways. People-centred care also requires that people have the education and support they need to make decisions and participate in their own care (26).

Compassionate care: A principled and intentional effort to understand a person, discern their needs, and alleviate their suffering through relational understanding and action. Compassionate care in obesity management requires a competency-based approach where health workers adopt non-judgmental and non-stigmatizing language, attitudes, knowledge, and skills that cover the multiple domains of compassion, as well as assessments by or feedback from patient's families or peers (27, 28, 29).

Disability: The experience of any condition that makes it more difficult for a person to do certain activities or have equitable access within a given society. Disabilities may be cognitive, developmental, intellectual, mental, physical, sensory, or a combination of multiple factors (9, 32).

Equity: Equity refers to a condition in which society is characterized by justice, equality, impartiality and fairness, including fair and equal distribution of power, economic resources, opportunities, goods and services across the social spectrum. In an equitable society people are not excluded from the activities of society, such as education, employment, or health care and there is no bias or favouritism (32, 33).

Gender equality: Requires the equal enjoyment by women, men, girls, boys and gender minorities of socially valued goods, opportunities, resources and rewards. It means that all persons, regardless of their gender, enjoy the same status in society; have the same entitlements to all human rights; enjoy the same level of respect in the community; can take advantage of the same opportunities to make choices about their lives; and have the same amount of power to shape the outcomes of these choices (32, 33).

Diversity: Refers to the existence of differences among people with respect to age, class, ethnicity, gender, health, physical and mental ability, race, sexual orientation, religion, physical size, education level, job and function, personality traits, and other human differences (32, 33).

In all their diversity: Recognizing and accepting individual differences such as gender, nationality, race, ethnicity, ability, sexual orientation, socio-economic status, religious beliefs, political beliefs, or other ideologies (32, 33).

Multidisciplinary teams: Various health workers collaborating to provide a broad range of services in a coordinated approach. The composition of multidisciplinary teams in primary care will vary by setting but may include generalist medical practitioners (including family doctors and general practitioners), physician assistants, nurses, specialist nurses, community health workers, pharmacists, social workers, dietitians, mental health counsellors, physiotherapists, patient educators, managers, support staff, and other primary care specialists.

Technical and Guideline Development Group meetings convened for developing this guideline

Evidence synthesis and decision-making on recommendations were made during meetings of the WHO Obesity Steering Committee and the GDG. Authors of systematic reviews presented their results and answered questions.

The WHO Obesity Steering Committee and systematic review teams met regularly during the early stages of guideline development to design and implement the process of prioritizing questions and outcomes (72), to agree on common guidance for systematic review development, to discuss systematic review findings, and to prepare GDG meetings. These meetings were scheduled as needed during later stages of guideline development.

GDG meetings served to present systematic review findings; to answer questions and discuss results; and to draft and agree on the wording, strength, and remarks of recommendations. There were eight GDG meetings, held between 28 April 2021 and 4 February 2025.

List of guideline questions and outcomes

Questions

Background questions

Background questions underscored relevant considerations related to the scope of this work or foreground knowledge that needs to be considered alongside the recommendations. They were not intended to result directly in recommendations, and they were addressed either through narrative reviews or existing material from WHO and other UN agencies. All methodological and ethical considerations, including the selection of review teams when appropriate, followed WHO guidance.

There was a total of eight background questions, on genetic or familial factors (73, 74), initial clinical assessment (75), follow-up (75), referral (75), gender- or sex-specific considerations (33, 76, 77), disability-specific considerations (32, 78, 79), mental health considerations (80), and provider competencies (81). Details on these questions and answers are listed in [Annex 1. Background questions](#).

Answers to background questions were considered and discussed during GDG deliberations, to facilitate the decision process for all recommendations. Among others, initial clinical assessment, follow-up and referral information were key when picturing the health worker-patient interaction. Gender-, sex-, and disability-specific and mental health considerations informed discussions on values and preferences, equity, and acceptability.

Key population, intervention, comparison, outcome (PICO) questions

Key questions, presented in Table 1, were prioritized as key to guideline development process (72). The questions recognize the diversity and uniqueness of each child, promoting inclusion, policies, and actions that acknowledge varying needs and experiences.

Table 1: Key questions for guideline development included in this guideline

Question 1. Dietary interventions

In children with obesity (P), what is the effect of dietary intervention (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Question 2. Physical activity

In children with obesity (P), what is the effect of physical activity (I) compared to no intervention (C) for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Question 3. Sedentary behaviour

In children with obesity (P), what characteristics of sedentary behaviour (I) in different durations, frequencies, patterns, or types (I, C) are associated with improved health, functioning and reduced obesity-associated disability (O) for the integrated management of obesity.

Question 4. Sleep

Should children with obesity (P), improve sleep and/or sleep hygiene (I) in different duration, frequencies, or patterns as measured by objective and subjective methods (C) for improved health, functioning and reduced obesity-associated disability (O) for the integrated management of obesity?

Question 5. Behaviour changing interventions

In children with obesity (P), what is the effect of behaviour changing interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Question 6. Digital health interventions

In children with obesity (P), what is the effect of digital health interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Question 7. Pharmacotherapy

In children with obesity (P), what is the effect of pharmacotherapy interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Question 8. Alternatives for medications known to cause weight gain

Should children with obesity (P), change to alternatives for medications known to cause weight gain (I) in comparison to no change (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Question 9. Bariatric surgery

In children with obesity (P), what is the effect of gastric bypass and other bariatric surgery options (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Question 10. Weight-loss and weight-management devices

In children with obesity (P), what is the effect of weight-loss or weight-management devices (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Question 11. Multimodal interventions

In children with obesity (P), what is the effect of multimodal interventions delivered by a multidisciplinary team (I) compared to standard care (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Additional questions

Future iterations of this guideline may include questions that were prioritized but not covered in this development process, along with any emerging questions on this topic. These questions may also focus on obesity diagnosis and reference standards; breastfeeding and complementary feeding; gut microbiota interventions/modulation, dysbiosis procedures, and other microbial-based therapies; reducing exposure to food additives, industrialized ingredients and food processing as well as to products containing endocrine-altering chemicals; obesity management-related messaging aimed at changing behaviour; the effect of including interventions for managing obesity in the list of essential health services and in public and/or private health insurance packages; and obesity surveillance and screening.

Outcomes

The following outcomes were proposed to serve as guidance for retrieving, synthesizing, and assessing evidence to inform the recommendations for treating children with obesity.

Critical (primary) outcomes

1. BMI/BMI z-score reduction, stabilization and/or maintenance (kg/m^2);
2. Weight reduction, stabilization and/or maintenance (kg);
3. Physical well-being (functional mobility, self-care, getting along, life activities and participation, as defined by trialists)*;
4. Mental well-being (anxiety, stress, depression, isolation, self-esteem, body image, suicidal ideation, eating disorders, as defined by trialists);
5. Physical activity (type, duration, intensity, frequency, as defined by trialists);
6. Overall quality of life;
7. Blood pressure;
8. Adiposity and fat distribution (objective measures: dual energy x-ray absorptiometry, magnetic resonance, as defined by trialists; anthropometric measures: skinfolds, waist-to-hip ratio, waist circumference, as defined by trialists);
9. Adverse events associated with the interventions;
10. Presence of obesity coexisting conditions (any other noncommunicable disease);
11. Obesity-associated disability.

* *Functional mobility– moving and getting around (as defined by trialists);
Functioning self-care– hygiene, dressing, eating and staying alone (as defined by trialists);
Functioning getting along– interacting with other people (as defined by trialists);
Functioning life activities– domestic responsibilities, leisure, work and school (as defined by trialists);
Functioning participation– joining in community activities (as defined by trialists).*

Important (secondary) outcomes

1. Hyperinsulinemia [1.7 mmol/L (30 mg/dL)] or higher when 1 mg of glucagon is administered IM or IV (or as defined by trialists);
2. Resistance to insulin (as defined by trialists);
3. Glycaemia (in mg/dL, fasting);
4. Alterations in lipid metabolism or in adipogenesis and fat accumulation;
5. Lipid hormones (for example, leptin or adiponectin);
6. Alterations in hunger or satiety (as defined by trialists);
7. Reduced disability in any of the functionality domains, according to the ICF;
8. Mortality;
9. Prevalence of obesity in adulthood;
10. Access to health services.

Recommendations

The GDG acknowledged that the strong recommendations below were based on low- or very low-quality evidence, thus resulting in discord between the quality of evidence and the corresponding recommendation strength. The GDG reached consensus and voted for strong recommendations based on factors included in the evidence-to-decision frameworks that reach beyond the evidence on effects. This was because obesity is a multifactorial disease that requires a multimodal approach to address all possible converging factors, since one or more of them can impact individuals at different times or simultaneously. The GDG considered the practicality and universality of adopting interventions such as diet, physical activity, and behavioural approaches as single or as multimodal interventions, as they are pillars for an adequate approach to obesity management.

According to the WHO Handbook for guideline development, a strong recommendation is based on the confidence that the desirable effects associated with a recommendation outweigh the undesirable effects. Most people would want the recommended intervention, and only a small proportion would not. Furthermore, the recommendation can be adopted as policy and as a quality or performance indicator.

For a conditional recommendation, there is less certainty on the balance between the desirable and undesirable effects. While many people would want the recommended intervention, many others would not. Health workers should be aware that different courses of action will be appropriate for individual patients, who will need support for decision-making that is consistent with their values and preferences. As such, developing policy will require debate and input from different stakeholders.

Dietary interventions

Summary of evidence

WHO commissioned a Cochrane systematic review on dietary interventions for children and adolescents with obesity (82). Effects on critical and important outcomes varied depending on the types of dietary intervention, as listed below. The quality of evidence ranged from very low to moderate ([Annex 2. Dietary interventions](#)).

Comparison 1: Calorie reduction compared to no calorie reduction

The effect of dietary interventions with calorie reduction is uncertain. Low-quality evidence showed that dietary interventions with calorie reduction may slightly decrease BMI z-scores and waist circumference. There was little to no impact on systolic blood pressure ([Annex 2. Summary of findings table 1.1](#)).

Comparison 2: Low carbohydrate intake alone compared to no modification or high carbohydrate intake

The effect of dietary interventions with low-carbohydrate intake alone is uncertain. Very low-quality evidence showed that dietary interventions with low carbohydrate intake alone may slightly decrease BMI z-scores and waist circumference ([Annex 2. Summary of findings table 1.2](#)).

Comparison 3: Low glycaemic index (GI) foods compared to no modification or high GI foods

The effect of dietary interventions with low GI food intake alone is uncertain. Very low-quality evidence showed that dietary intervention with low GI foods intake alone may slightly decrease BMI and waist circumference, and increase systolic blood pressure ([Annex 2. Summary of findings table 1.3](#)).

Comparison 4: High protein intake alone compared to no modification or low protein intake

The effect of dietary interventions with high protein intake is uncertain. Very low-quality evidence showed that dietary interventions with high protein intake may slightly increase body weight, BMI, waist circumference and systolic blood pressure (two randomized controlled trials (RCTs), 145 participants aged 0 to nine years of age as well as some adolescents) ([Annex 2. Summary of findings table 1.4](#)).

Comparison 5: Low fat and high carbohydrate diet compared to high fat and low carbohydrate diet

The effect of interventions with a diet of low fat and high carbohydrate is uncertain. Very low-quality evidence (one RCT, 98 participants) showed that dietary interventions with low fat and high carbohydrate may increase BMI compared to a high fat and low carbohydrate diet ([Annex 2. Summary of findings table 1.5](#)).

Comparison 6: Ketogenic diet compared to calorie reduction

The effect of a ketogenic diet is uncertain. Very low-quality evidence showed that a ketogenic diet may have an effect on serum or plasma triglycerides.

Other systematic reviews also found that dietary interventions may improve weight loss in the short term in children with obesity. However, there are limited data on long-term effects ([83, 84, 85](#)).

Southcombe et al. conducted a systematic review including 125 studies with participants 2 to 18 years of age. This review found a gradient effect according to the energy target of different dietary types. It reported that very low-energy diets were associated with a reduction of 4.40 kg/m² in BMI (n = 3; 95% confidence interval (CI) -7.01 to -1.79), while in contrast, dietary interventions with no specified energy target were associated with a BMI gain of 0.17 kg/m² (n = 22; 95% CI 0.05 to 0.40) ([83](#)).

Naude et al. conducted a Cochrane review on the effect of low fat intake on weight and body fatness in children 24 months to 18 years of age. The review found three trials and low- to very low-certainty evidence that lower total fat intake (30% or less energy) compared to usual or modified fat intake may lead to a small decrease in BMI, and in total- and LDL-cholesterol ([84](#)).

Gow et al. 2014 found a greater reduction in BMI immediately post-intervention associated with a low-carbohydrate diet in children with overweight or obesity 6 to 14 years of age. However, the quality of the studies was limited and cardiometabolic benefits were inconsistent (85). Six trials compared high protein diets (19–30% energy) to isocaloric standard-protein diets (15–20% energy), and one compared a high fat diet (40% energy) to an isocaloric standard-fat diet (27% energy). There were no differences in BMI in these studies. Results suggested that improved weight status can be achieved in children with overweight or obesity irrespective of the macronutrient distribution of a reduced-energy diet (85).

Current evidence, some very recent, suggests that dietary interventions integrated into multimodal lifestyle programmes generally produce modest weight reductions over short- to long-term periods (86). There is increasing interest in exploring novel strategies for obesity management, including but not limited to gut microbiome and personalized nutrition interventions. Obesity risk assessments based on anthropometric measures and/or in combination with child, parental, and community characteristics, all of which can be readily available in health care and community settings, have low accuracy for broad-scale screening on the risk of childhood obesity, thus hampering potential societal-level individual preventive measures (87).

Gut microbiome interventions may influence obesity by altering the diversity and abundance of intestinal bacteria. This effect could be mediated through compounds ingested that affect small intestine function, changes in substrate availability affecting colonic microbial composition, and microbial metabolites influencing metabolism (88). A 2025 Cochrane systematic review analysed 17 RCTs involving 838 participants across various countries. These trials assessed interventions such as prebiotics, probiotics, synbiotics, short-chain fatty acids, and faecal microbiota transplantation. Overall, authors found that these interventions resulted in little to no effect in obesity-related outcomes (89).

Personalized nutrition interventions tailor dietary approaches based on characteristics related to individual biology and environment rather than relying on uniform “one-size-fits-all” strategies. These personalized approaches consider factors such as genetic differences, social environments, circadian rhythms, and psychosocial characteristics to optimize nutrition and potentially improve obesity management (90). The effects of these interventions in children and adolescents with obesity remain uncertain. A 2025 Cochrane systematic review identified three relevant studies involving 105 participants; authors reported that the effect of personalized nutrition on body weight or BMI in children and adolescents was uncertain (91).

Recommendation

WHO recommends a structured dietary intervention as one of the components of the integrated management of children with obesity older than 2 years of age. It should consider age, gender, health status, food preferences and meal frequencies, nutritional education, cultural context, be delivered and supervised by health workers with knowledge on nutrition, and involve parents and/or caregivers.

Strength of the recommendation: Strong.

Quality of the evidence: Very low.

Justification

The GDG agreed on a strong recommendation because the balance between benefits and harms probably favours dietary interventions ([Annex 3. Evidence-to-decision considerations for dietary interventions](#)). Children with obesity and their carers positively valued the potential benefits of dietary interventions, which are likely to be acceptable and feasible, particularly when they involved the entire family unit and were personalized, age-appropriate and culturally sensitive. While benefits are small, so is the risk of adverse events. The GDG, on the other hand, acknowledged that financial constraints may hinder parents from affording healthy food or meal plans; socioeconomic status was linked to diet quality, with low-income and historically marginalized communities facing higher food insecurity and health inequities ([92](#)). No studies were found on cost-effectiveness ([Annex 3. Evidence-to-decision considerations for dietary interventions](#)).

Evidence on dietary interventions was limited in the number and quality of studies. A small effect of dietary treatments, that is, low calorie or low GI food diets compared to no dietary changes, was identified for critical outcomes of weight, BMI, waist circumference, cholesterol concentrations, and percent body fat ([82](#)).

Dietary modifications are usually aimed at reducing total energy intake and include, but are not limited to, restricting caloric content (normal or reduced energy intake), varying macronutrient distribution or composition (low carbohydrate, high protein, low fat, omega-3 rich, polyunsaturated fatty acid (PUFA) rich, or ketogenic diet), restricting particular components (low in salt, low in sugar, high in fibre, no food additives, low in industrially produced foods currently known as ultra-processed foods, or low GI foods), and dietary patterns (Mediterranean, American Heart Association, whole foods, or complex carbohydrates).

Remarks

Dietary interventions require evaluation by health workers with nutrition knowledge. They should cover physical and mental health, family and personal history and environment, and an assessment of risk factors for eating disorders. Health workers should be able to communicate in an empathetic, non-stigmatizing, motivational, and culturally responsive manner, and to display competencies of interdisciplinary collaboration ([81](#)).

WHO supports the consumption of a healthy diet to protect against malnutrition in all its forms as well as against noncommunicable diseases. The keys to a healthy diet include breastfeeding during the first two years of age with exclusive breastfeeding for the first six months; consuming a combination of foods avoiding monotonous diets, including plenty of fruits, vegetables, and legumes daily; moderating fat consumption; and limiting salt and sugar.

According to WHO and FAO, a healthy diet needs to be adequate, balanced, moderate and diverse. The exact make-up of a diversified, balanced and healthy diet will vary depending on individual characteristics (for example age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs ([93](#), [94](#)). In addition, the Codex Alimentarius standards provide potentially relevant guidelines and codes of practice regarding nutrient compounds that may be used in special dietary foods for infants and young children, formula foods for weight control diets, and labelling of and claims of prepackaged foods for dietary uses ([95](#)).

Dietary interventions allow school and community involvement and coordination with caregivers and health workers to provide appropriate foods. This also helps to initiate, support and sustain dietary practices change ([92](#), [96](#)).

Children and their parents or caregivers prefer interventions that are affordable and easy to apply, including a structured meal plan, hands-on activities, and fun approaches to promoting healthy eating habits. Acceptability is enhanced when dietary interventions are tailored to age and cultural patterns.

Diet plan initiation and follow-up require the involvement of the children and their parents or caregivers, services with structured guidance, and consideration of the schedule of parents or caregivers to facilitate compliance and engagement with the intervention.

Anxiety, depression, low self-esteem, emotional dysregulation, and other mental health issues may lead to unhealthy eating behaviours. Health workers should address both obesity and mental health conditions early and together, using inclusive, developmentally appropriate, and family-engaged strategies (80).

Dietary behaviours are influenced by complex factors, including gender, culture, socioeconomic status, and parental involvement, with early education and the environment playing crucial roles in long-term health.

Low-income communities face higher food insecurity and health disparities, underscoring the need for accessible nutrition resources and better nutritional education.

Research gaps

Studies to determine the risk of serious adverse events for certain restrictive diets (for example, very low-calorie diets, ketogenic, time-restricted eating), and the long-term effect of those restrictive dietary treatments in children older than 2 years of age.

Studies on the effect of restrictive diets, diets modifying a particular macronutrient, or monotonous diets on growth, physical and mental well-being, lipid metabolism, and risk of cardiovascular diseases.

Research on dietary interventions in eligible populations that prioritize well-designed and well-reported RCTs and prospective controlled cohort studies reporting efficacy, effectiveness, safety profile, long-term secondary effects, weight regain, and cost.

Summary of judgements

The GDG determined that the benefits of dietary interventions outweigh the potential adverse events. They agreed that while both the desirable and undesirable effects were small, and the certainty of evidence was very low, the recommendation should be strong. The GDG highlighted that there is probably no important uncertainty or variability in values and preferences and that dietary interventions are probably acceptable (92). Children and parents favoured structured meal plans with palatable foods, fun and hands-on activities, and enjoyable experiences that foster healthy eating habits (92, 96).

Children and their family place a high value on the benefits of weight loss, prevention of health sequelae, being socially accepted, and building self-confidence and self-esteem (96). The GDG underscored that dietary interventions result in moderate costs to families (92, 97, 98). Feasibility will vary depending on the affordability of healthy foods, competing priorities, limited time to discuss healthy diets with children, and logistic constraints to adhere to the intervention (92, 97, 98). No studies were found on cost-effectiveness.

Impact on health equity varies. Cultural, socioeconomic, and environmental factors, including the school environment, intertwine to influence dietary behaviour, affecting both immediate choices

and long-term health outcomes (99, 100). Economic constraints, particularly prevalent among low-income and historically marginalized populations, contribute to disparities in dietary quality and obesity rates (101, 107). The GDG concluded that socioeconomic status was linked to diet quality, with low-income and historically marginalized communities facing higher food insecurity and health inequities (Annex 3. Evidence-to-decision considerations for dietary interventions).

Physical activity, sedentary behaviour, and sleep

Summary of evidence

The WHO-commissioned systematic review (108) included four parallel RCTs with 517 participants, 46% of whom were female. The mean age range was between 8.9 and 9.9 years. Three studies compared physical activity against no intervention, while the fourth compared physical activity against a behaviour changing intervention (Annex 2. Physical activity, sedentary behaviour, and sleep). Authors reported evidence of small effects for the following outcomes, mostly from meta-analyses of very few studies with a limited number of participants (Annex 2. Summary of findings table 2.1):

- Very-low certainty evidence from two RCTs (n = 118) on the effect of physical activity on BMI reported an effect estimated as a mean difference (MD) of -1.52 kg/m² (95% CI -2.74 to -0.29)
- Very-low certainty evidence from two RCTs (n = 118) on the effect of physical activity on body weight reported an effect estimated as a MD of -0.86 kg (95% CI -3.17 to 1.46)
- There is very-low certainty evidence of a small potential benefit of physical activity on health, quality of life, mental well-being, and body fat.

Combined training at higher dosage seems to result in small benefits in body fat percentage and body glucose, without an increase in adverse events (Annex 2. Summary of findings table 2.2). Similarly, aquatic combined training was more beneficial for body weight than active video games (Annex 2. Summary of findings table 2.3). In both cases, the quality of the evidence was very low.

Systematic reviews of low methodological quality have reported benefits of physical activity similar to those reported above. Physical activity has a positive association with brain structure, cognitive function, and academic performance in children (109). A systematic review of reviews with meta-analysis suggested that exercise has the potential to reduce percent body fat in children with overweight and obesity (110). Another systematic review with meta-analysis found that exercise has a positive impact on reducing BMI z-scores (equivalent to 3%; mean: -0:06; 95% CI: -0:09 to -0:03; Q = 24:9; p = 0:01; I² = 59:8%) in children with overweight and obesity (111). Furthermore, both aerobic exercise and combined aerobic and strength training are linked to improvements in adiposity outcomes in children with overweight and obesity (112).

No reported evidence on the relationships between sedentary behaviour and sleep with health indicators in children and adolescents with obesity was identified from RCTs or prospective cohort studies. Secondary analysis of an excluded study of preschoolers and adolescents found that earlier bedtimes (either 15 minutes earlier or before 21:00) were associated with lower BMI z-scores.

Recommendation
WHO recommends a structured physical activity plan that considers age, gender, health status, cultural context, and the child's interests, values and preferences and that includes parents and/or caregivers as one of the components of an integrated management for children with obesity.
Strength of the recommendation: Strong.
Quality of the evidence: Very low.

Justification

The GDG voted for a strong recommendation because although small, the benefits of physical activity are clear for all ages and health statuses, with trivial to small adverse events ([Annex 3. Evidence-to-decision considerations for physical activity, sedentary behaviour, and sleep](#)). Children with obesity and their parents value the benefits of staying active. The GDG also considered that physical activity interventions are acceptable and feasible, particularly when they include fun, informal, non-competitive activities. Physical activity may be cost-effective due to the potential benefits of preventing chronic diseases, and it can be offered at low or no cost in parks and recreation areas or as lifestyle changes. The recommendation was agreed to be strong even though structured physical activity may result in costs to families; it also requires investment from governments and communities in venues and facilities. Gains in health equity will only crystallize if access to safe, affordable, and suitable programmes and spaces for physical activity are ensured for all, particularly girls, minoritized groups, and people with disabilities ([Annex 3. Evidence-to-decision considerations for physical activity, sedentary behaviour, and sleep](#)).

Evidence was limited in the number and quality of studies on children with obesity. No clear effect of physical activity compared to no physical activity was identified for the critical outcomes of body mass index (BMI), weight loss, body fat, adverse effects, quality of life and mental well-being ([108](#)).

The 2020 WHO guidelines on physical activity and sedentary behaviour for children under 5 years of age ([4](#)) provide physical activity recommendations for children irrespective of gender, cultural background or socioeconomic status. The recommendations include:

- Infants (under 1 year of age) should be physically active several times a day in a variety of ways, particularly through interactive floor-based play; more is better. For those not yet mobile, this includes at least 30 waking minutes in a prone position (tummy time) spread throughout the day.
- Children 1–2 years of age should spend at least 180 minutes in a variety of physical activities at any intensity, including moderate- to vigorous-intensity physical activity, spread throughout the day; more is better.
- Children 3–4 years of age should spend at least 180 minutes in a variety of physical activities at any intensity, of which at least 60 minutes is moderate- to vigorous-intensity physical activity, spread throughout the day; more is better.
- Children 5 years of age and above should do at least an average of 60 minutes per day of moderate- to vigorous-intensity, mostly aerobic, physical activity, across the week.
- Vigorous-intensity aerobic activities, as well as those that strengthen muscle and bone, should be incorporated at least three days a week for children 5 years of age and above.

Remarks

Incorporating physical activity into a scheduled daily routine that also includes schoolwork, commuting, seeing friends, and leisure could help children to engage in physical activity. Non-competitive activities could be the preferred option for some children.

The structured physical activity plan should be discussed and agreed upon with the child and their parents or caregivers.

Health workers need to be equipped with the required services and competencies to facilitate discussion with children and parents or caregivers and promote knowledge on body weight and obesity management (81).

Mental health issues may contribute to physical inactivity, sleep disturbances, and social withdrawal. There is a need to address both obesity and mental health conditions in the primary health care setting through inclusive, developmentally appropriate, and family-engaged strategies (80).

The structured physical activity plan should be tailored to the specific needs of population groups, including girls, children exposed to exclusion/discrimination, children with disabilities, or people at risk of developing non-communicable diseases (33, 76, 77). Children with disabilities may require personalized attention regarding their underlying impairments and how they may hinder physical activity (32, 79).

Effective multisectoral collaboration is needed to develop policies supporting the establishment of active environments, for example, access to parks, athletic facilities, and recreation areas at no cost.

Research gaps

Well-designed and well-reported RCTs and prospective cohort studies on physical activity in children with obesity, including the efficacy and potential adverse events of different exercise types, intensities and durations, reporting: 1) subgroup analyses for severity of obesity, coexisting conditions, and type of intervention, and 2) implementation considerations for low- and middle-income countries, including population characteristics such as gender, age, ethnicity, and socio-economic status.

Well-designed and well-reported RCTs and prospective cohort studies on sedentary behaviour and/or sleep patterns in children with obesity, reporting: 1) subgroup analyses for severity of obesity, coexisting conditions, and type of intervention, and 2) implementation considerations for low- and middle-income countries, including population characteristics such as gender, age, ethnicity, and socio-economic status.

Studies on the initiation and continued engagement with physical activity and weight management programmes, and determinants that influence adherence. Consideration should be given to the involvement of parents and caregivers, as well as to the child's motivation, preferences and own time planning/distribution.

Disability considerations need to be addressed in physical activity interventions, both individually and from the viewpoint of health policy.

Summary of judgements

GDG members voted that this recommendation should be strong. Benefits are moderate to small, and potential adverse events are small to trivial. Members highlighted that scant evidence on adverse events suggests the need for considering age and physical and health status when

determining the type, intensity and duration of physical activity. The overall certainty of evidence was very low.

There is probably no important variability or uncertainty in how children value the main outcomes. Physical activity interventions are likely acceptable and feasible (92, 113). Enablers include the involvement of school, peers, family, and community members; the provision of safe spaces, equipment, and facilities at different settings; and the availability of low- or no-cost physical activity programmes (92).

The GDG agreed that while costs vary, physical activity interventions are likely to be cost effective due to the potential benefits in preventing chronic diseases. Decisions were based on economic analyses reporting that physical activity programmes are cost-effective. This was largely due to the high costs of physical inactivity (114) and the potential benefits of physical activity in managing obesity and preventing chronic diseases (115-121).

Access to parks and recreation areas may be free; however, structured programmes or those led by health workers may result in costs for families. Worldwide, women, minoritized ethnic groups, disadvantaged communities, and individuals living with disabilities or chronic diseases are more prone to inactivity (122). Equity can be increased if access to opportunities to engage in physical activity are ensured for girls and for children in low-income settings, those with disabilities, or who are from underserved populations (Annex 3. Evidence-to-decision considerations for physical activity, sedentary behaviour, and sleep).

Behaviour changing interventions

Summary of evidence

WHO commissioned a systematic review on the effects of behaviour changing interventions in children with obesity or overweight (123) (Annex 2, Behaviour changing interventions). This review included trials in children under 18 years of age and compared cognitive behavioural interventions such as cognitive restructuring, mindfulness, goal setting, preplanning, self-monitoring, behavioural incentives, stimulus control, social support, and motivational interviewing, as well as combinations of these components. The comparator was a minimal control intervention (for example, usual care, no intervention, feedback only and active control treatment). Authors conducted frequentist random-effects component network meta-analyses (Annex 2. Behaviour changing interventions).

The evidence mainly relied on studies on adolescents, rather than children 0 to 9 years of age. Authors identified 125 eligible trials with 16 513 children and adolescents. Participants were mostly girls (56.8%) with a mean age of 11.12. The mean BMI baseline was 27.68 kg/m² and the mean z-score was 2.32. Studies were completed in 29 countries, with the United States being the most common (58 trials, 48%). Low- or middle-income countries were represented in 14 trials (11.4%) from Brazil, China, Indonesia, Iran, Malaysia, Mexico, and Turkey.

There was variability in the effectiveness of cognitive behavioural interventions on BMI z-scores, body fat, and waist circumference. While some components may lead to small benefits, the certainty of the evidence was mostly very low to low. According to subgroup analyses, there were no differences according to age, that is, between children and adolescents.

For conceptual-level components compared to minimal education, behavioural therapy probably reduces BMI z-scores (MD, -0.08%; 95% CI, -0.10 to -0.05; low certainty), body fat percentage (MD, -1.16%; 95% CI, -1.68 to -0.64; moderate certainty), and waist circumference (MD, -1.70 cm; 95% CI, -2.74 cm to -0.67 cm; moderate certainty) (Annex 2. Summary of findings table 5.1).

Behavioural therapy also appears to improve quality of life (SMD, 0.16; 95% CI, 0.03 to 0.30; moderate certainty) and mental health (MD, 1.00%; 95% CI, -4.07 to 6.07; moderate certainty). Data on the effects of other conceptual-level components, for example, cognitive behavioural therapy, cognitive therapy, and psychoeducation, can be found in the WHO-commissioned systematic review (123) ([Annex 2. Summary of findings table 5.1](#)).

With respect to the effect of technical-level components on BMI z-scores, parental involvement (mean difference (MD), -0.09; 95% CI, -0.16 to -0.03; moderate certainty) and stimulus control (MD, -0.07; 95% CI, -0.12 to -0.01; moderate certainty) probably result in small benefits ([Annex 2. Summary of findings table 5.2](#)). Preplanning (MD, -3.05%; 95% CI, -5.82% to -0.28%; moderate certainty) and feedback (MD, -2.73%; 95% CI, -5.31% to -0.14%; moderate certainty) have a beneficial effect on body fat percentage ([Annex 2. Summary of findings table 5.2](#)). Conversely, device-monitoring, problem solving, rule-setting and relaxation training may result in increases in body fat percentage. Information on the effects of several other technical-level components, including but not limited to cognitive restructuring, goal-setting, reinforcement, role-playing, and self-monitoring, is available in the WHO-commissioned systematic review (123).

Previous reviews have found similar results, although data on long-term effects are scant. A review on the effectiveness of various psychological treatments found that comprehensive interventions that incorporate dietary changes, increased physical activity, and behavioural strategies, combined with the involvement of family members, provide benefits in managing obesity in children and adolescents (124). Furthermore, a scoping review including two systematic reviews on motivational interviewing reported small to medium benefits in BMI, waist circumference, and body fat percentage among children and adolescents with obesity (125).

A systematic review on mindfulness interventions in children and adolescents with obesity retrieved seven RCTs with 335 participants 8-19 years of age. Authors reported that mindful eating and mindfulness-based stress reduction had potential benefits on BMI, BMI z-scores, fat mass, stress, anxiety, and depression. However, most eligible RCTs had a high risk of bias (RoB) (126).

A systematic review and meta-analysis of weight loss treatments in young people (under 21 years of age) with obesity retrieved eight studies on behavioural interventions (127). Authors estimated that behavioural interventions decreased mean BMI by 0.18 kg/m² (95%CI: - 0.52 to 0.15). One of the studies recruited children aged 4 to 8 years with overweight or obesity over a 24-month period; monthly counselling sessions combined with motivational interviews resulted in a statistically significant average BMI reduction of 0.34 kg/m² (127).

A review on the effectiveness of behavioural weight management interventions considered 18 trials with 1794 children and adolescents with overweight or obesity. Most trials reported positive short-term weight outcomes, though long-term maintenance of weight loss was less frequently reported (128).

Zolotarjova et al. reviewed evidence on multidisciplinary interventions for children and adolescents with morbid obesity. This review found that behavioural interventions may improve weight loss and health-related outcomes (129).

Recommendation
WHO recommends behaviour changing interventions as one of the components of the integrated management of children with obesity. The type and duration of the intervention(s) selected should take into consideration age, gender, health status, dietary behaviour, physical activity, sedentary behaviour, cultural context, the child's interests, and values and preferences as well as the support and resources of parents and/or caregivers.
Strength of the recommendation: Strong.
Quality of the evidence: Very low.

Justification

The GDG agreed on a strong recommendation because children and their families are motivated by the expectation that behaviour changing interventions will help them achieve long-term lifestyle changes ([Annex 3. Evidence-to-decision considerations for behaviour changing interventions](#)). Benefits are small, but so is the possibility of adverse events. Behaviour changing interventions that are fun, enjoyable, and consider the specific needs of participants are more likely to be acceptable and feasible. When reaching this decision, the GDG took into consideration that families may incur costs depending on the components of the interventions and the logistics and health workers involved. Other population groups may also face barriers to access due to stigma, discrimination, exclusion, or lack of appropriately tailored services ([Annex 3. Evidence-to-decision considerations for behaviour changing interventions](#)).

WHO has a classification system to design and evaluate behaviour changing interventions in a way that is tailored to different contexts, from individual behaviours to societal-level changes. WHO categorizes interventions by the type of action they promote as educational/informational interventions, persuasive interventions, normative/structural interventions, environmental interventions, and policy-based interventions, as detailed in the WHO Report on Social Determinants of Health (39), WHO Health Promotion and the 2013 WHO Global Action Plan (70).

A non-exhaustive list of behaviour changing interventions includes behavioural therapy, cognitive behavioural therapy, cognitive therapy, psychotherapy, integrative or holistic therapy, self-monitoring, goal setting and reinforcement, stimulus control, problem solving, motivational techniques, mindfulness-based cognitive therapy, or stress reduction.

Remarks

Children with obesity may be motivated to engage in behaviour changing interventions because of the perceived benefits of such activities, including weight loss, body image, prevention of health sequelae, self-esteem, and social acceptability.

Children with obesity and their caregivers value personalized, holistic, and practical obesity management interventions that promote benefits such as self-esteem, self-confidence, and social acceptability.

Behaviour changing interventions are more acceptable when they are tailored to the specific needs of children with obesity and when they incorporate fun and enjoyable activities that are practical and solution-based. There may be a need for referral to specialized services when there are coexisting mental health issues (80) or when interventions do not lead to progress. Referral should include written notification to other health workers and clear and compassionate communication with the family regarding the motivation for the referral (75).

The cost of behaviour changing interventions may depend on many factors, including the care setting, the type of behaviour changing intervention, and the health workers involved.

Whole-of-society approaches addressing the causes of inequities in access are required to enhance participation in obesity management interventions.

The implementation of behaviour changing interventions could be facilitated by governments, schools, and community support.

Research gaps

A common taxonomy is required to define and classify behaviour changing interventions.

Research on behaviour changing interventions in children should prioritize well-designed and well-reported studies with different combinations of treatment components, reporting efficacy, effectiveness, safety profile, long-term secondary effects, weight regain, and cost.

Behaviour changing interventions need to consider the specific barriers that children and their parents face in order to prevent inequities in obesity health outcomes.

Studies on cost-effectiveness analysis of behaviour changing interventions for children with obesity.

Studies on the cost or resources use of behaviour changing interventions in children with obesity.

Summary of judgements

The GDG voted that the balance of desirable and undesirable effects favours behaviour changing interventions, with both small benefits and undesirable effects, and very low-quality evidence.

There is probably no important uncertainty or variability on values and preferences. Children and their families are motivated by the expectation that behaviour changing interventions will help them achieve long-term lifestyle changes (55). Family involvement, as well as supportive communication and interactions, are important for the success of the intervention (55). Behaviour changing interventions are likely to be acceptable and feasible; parents and children value obesity interventions that incorporate personalized, holistic, and practical approaches (55, 113). Specific components of the intervention could also influence acceptability and feasibility (55).

The GDG concluded that costs vary depending on factors such as the type of behaviour changing intervention and the health workers involved. No studies were found on cost-effectiveness. The GDG considered that the effect of behaviour changing interventions on equity varies; as with other obesity interventions, girls and vulnerable groups, such as those with low socio-economic status, marginalized communities, minoritized ethnic groups, and individuals with disabilities are less likely to have access to and benefit from psychological interventions (122, 130, 131) (**Annex 3. Evidence-to-decision considerations for behaviour changing interventions**).

Digital health interventions

Summary of evidence

WHO commissioned a systematic review on digital health interventions for the management of obesity in children 0-9 years of age (132). This review included 15 studies involving 911 participants. Five studies were conducted in the USA, three in Sweden, and one each in Canada, China, Ireland, Italy, South Korea, Switzerland and Thailand. All studies involved participants aged 10 to 19 years old; 10 studies focused exclusively on this age group. Five of the studies also included children 0 to 9 years old. Eight studies included both diet and physical activity components, four studies included only a physical activity component, and three included only a diet component. Studies were grouped into two comparisons: (1) digital health technology plus conventional care compared to conventional care alone (eight studies); and (2) digital technology alone compared to conventional care alone (seven studies) (Annex 2. Digital health interventions).

Dietary and/or physical activity components were included in all interventions. However, eight included both components, four included only a physical activity component, and three included only a dietary component. Regarding the duration of the intervention, nine trials were short-term (less than six months), and six were long-term (six or more months). This systematic review found very-low to low-certainty evidence that digital interventions combined with dietary and/or physical activity components may lead to weight reduction in adolescents. Considering that the trials included either only adolescents or a mix of adolescents and children, the evidence was downgraded, in part due to indirectness.

Digital interventions combined with conventional care led to a slightly lower, but clinically meaningful, fat mass at the end of the study (mean difference -2.63%, 95% confidence interval -4.47 to -0.78; 3 studies, 203 participants; moderate-certainty evidence). Data from three studies with 203 participants indicated that digital interventions resulted in a reduction of waist circumference of 1.16 cm (95% CI -3.91 to 1.60) (Annex 2. Summary of findings table 6.1).

The effect of digital interventions alone compared to conventional care alone was unclear. One of the seven trials analysed BMI, with a total of 26 participants. Low-certainty evidence indicated that, at the end of the study, the digital intervention group compared to the control group (conventional care alone) showed a mean difference in BMI of -3.90 kg/m² (95% CI -11.06, 7.85). Digital interventions resulted in a reduction in waist circumference of 4.30 cm (95% CI -16.45 to 7.85) (Annex 2. Summary of findings table 6.2). No studies reported adverse event data.

Other systematic reviews have addressed the effects of digital interventions on children or adolescents with obesity or overweight. These reviews generally provided indirect evidence for children with obesity and overweight, because they either included a mixed population of children and adolescents, or only included adolescents. Five reviews assessed digital interventions in general (133-137). Other reviews studied gamed-based interventions (138-143) and smartphone apps (144-147).

Furthermore, there were two reviews on web-based programmes (148, 149), two on mobile health in general (which included a short message service, mobile apps, and wearable devices) (150, 151), and one each on web-based self-monitoring programmes (152), technology-based counselling (153), Internet of things-enabled technologies (154), and Internet or mobile-based information and communication technology (155). These reviews reported similar findings to the commissioned review, suggesting a small effect in obesity related outcomes.

Recommendation
WHO suggests a digital health intervention as one of the components of the integrated management of children over 2 years of age with obesity. It should consider the type and daily duration of the intervention, age, gender, health status, physical activity, sedentary behaviour, cultural context, the child's interests, values and preferences, and be conducted under the supervision of parents and/or caregivers.
Strength of the recommendation: Conditional.
Quality of the evidence: Very low.

Justification

The GDG agreed on a conditional recommendation because the evidence on digital interventions was limited in the number and quality of studies. The evidence highlights that digital health interventions under parent or caregiver supervision could be potentially useful for promoting and sustaining behaviour change over time. A small effect of short- or long-term digital health interventions compared to conventional care alone was identified for the critical outcomes of weight, BMI, and waist circumference (132).

Digital health interventions under the supervision of parents or caregivers could be potentially useful for promoting and sustaining behaviour change over time, although high-quality evidence on effectiveness is limited.

Remarks

Supervised active video games, exergames, exercise activity mobile applications, pedometers or accelerometers, and other similar interventions may have potential for increasing physical activity behaviours in children older than 2 years of age with or without accessibility issues or chronic diseases.

Health workers should be mindful of coexisting anxiety, emotional dysregulation, and other mental health issues when deciding on digital health interventions in order to avoid sleep disturbances, social withdrawal, and other symptoms associated with mental health conditions (80).

While active video games, exergames, or exercise activity mobile applications may be suggested for managing obesity in children older than 2 years of age, recreational time spent in front of a screen (TV, video games, computers, mobile phones) in excess of two hours a day is associated with harmful outcomes such as depression and lower quality of life. As a result, some guidance, including the Canadian Society for Exercise Physiology 24-Hour movement guidelines for the early years, point out that two hours may be used as a daily maximum for screen time (156-159).

Research gaps

Guidance on how to implement digital health interventions while limiting sedentary screen time (for example, watching television, searching the Internet, or playing video games).

Studies on adverse events, maximum daily screen time, use or misuse of telemedicine, electronic health, mobile health, smartphone applications and other remote contact approaches, active video games, exergames, exercise activity applications, and other similar interventions for obesity management.

Summary of judgements

The GDG agreed that the desirable effects are small. Data on adverse events are scarce, therefore, the GDG concluded adverse events are unknown. The balance of benefits and harms probably favours the intervention, with very low-quality evidence.

The GDG voted that there is likely to be important variability in how stakeholders value the main outcomes. Indirect evidence found that users of digital health interventions place a high value on their overall effectiveness, although data security is a concern for parents. (160-162). Users also used digital interventions for their effect on empowerment and self-management (163). Digital health interventions are likely to be acceptable and feasible. There were high levels of acceptability across digital platforms from parents of young children (164, 165).

Costs vary based on the specific intervention and delivery characteristics. No studies were found on cost-effectiveness. The GDG pointed out that the impact on health equity is unknown. As with other interventions, girls, children with disabilities, and those from poorer or minoritized groups may face barriers to accessing digital health interventions (122, 130, 131). Barriers include limited resources, poor internet connectivity and low digital literacy. Despite the rapid increase in internet usage, equitable access to health information still remains a challenge (166) (Annex 3. Evidence-to-decision considerations for digital health interventions).

Pharmacotherapy

Summary of evidence

WHO commissioned a systematic review on pharmacological interventions for children and adolescents with obesity (167). The systematic review identified 37 eligible randomized trials with 4218 participants. Of these, 25 included only adolescents. Eight studies recruited children between 6 and 9 years of age (168-175); seven assessed metformin and one assessed liraglutide.

Notably, there is no direct evidence on children between 0 and 6 years of age, and no direct evidence on medications other than metformin on children between 0 and 9 years of age (167).

Seventeen of the 37 studies were completed in high-income countries, six in middle-income countries and three in low-income countries. The remaining were multicentre trials completed in different countries (167).

The length of treatment ranged from three to 16 months, and the length of follow-up ranged from six to 31 months, with a median of 11 months. Pharmacotherapy was part of multimodal strategies of care, added to baseline treatments administered to both the intervention and control groups (Annex 2. Pharmacotherapy).

Out of the 37 studies, 31 compared pharmacological interventions to placebo.

Pharmacological interventions (glucagon-like peptide-1 receptor agonists (GLP-1 RA), metformin, orlistat, sibutramine, topiramate, phentermine and topiramate) found a mean difference (MD) BMI change in favour of pharmacological interventions of -1.80 kg/m^2 (95% CI -2.36 to -1.24) (25 studies; 3091 participants; low-certainty evidence) and a MD weight change from baseline in favour of pharmacological interventions of -5.47 kg (95% CI -7.45 to -3.5) (20 trials; 2380 participants; low-certainty evidence) (Annex 2, Summary of findings table 7.1).

The remaining six studies compared pharmacological interventions, specifically metformin, to no treatment. These had a very limited number of participants and reported results similar to those for pharmacological interventions compared to placebo (Annex 2. Summary of findings table 7.2).

Previous systematic reviews focused primarily on three interventions: metformin, sibutramine, and orlistat. Overall, the findings of these reviews for BMI and weight change were similar to the findings of this review (127, 176-184).

Cochrane had published a systematic review on pharmacological interventions for obesity management in children and adolescents (176). Instead of updating this review, WHO commissioned the new Cochrane systematic review reported above, including new outcomes and subgroup analyses as advised during consultations with the general public and with the Guideline Development Group. Besides these modifications, the WHO-commissioned Cochrane systematic review included new pharmacological interventions, notably GLP-1 RA.

A recent RCT included in the WHO-commissioned systematic review provides further evidence of anti-obesity medications among children. A 2025 phase 3a study evaluated once-daily subcutaneous liraglutide at a dose of 3.0 mg (or the highest tolerated dose) compared to placebo, combined with lifestyle interventions in children aged 6 to under 12 years with obesity. After 56 weeks, the liraglutide group showed a mean BMI reduction of 5.8% from the baseline, compared to a 1.6% increase in the placebo group. Adverse events occurred in 89% of participants in both groups (50 out of 56 in the liraglutide arm and 23 out of 26 in the placebo arm) most of which were mild or moderate in severity (171).

Three recently published evidence syntheses provide further insight into the effect of anti-obesity medications among children and adolescents. A 2025 systematic review and network meta-analysis (185) and a 2024 systematic review (186) reported that anti-obesity medications led to improvements in anthropometric and cardiometabolic health outcomes. These reviews also reported that long-term effects and potential adverse events remain unclear. Relatedly, a 2023 assessment of undesired effects of GLP-1 RAs on children and adolescents revealed that GLP-1 RAs may lead to inappropriate reductions in energy intake. Additional concerns include potential misuse among patients with eating disorders or athletes (187). A 2024 research letter assessed the dispensing of GLP-1 RA medications to adolescents and young adults aged 12 to 25 years between 2020 to 2023; this was based on data from a private database that captured prescriptions from over 93% of US retail pharmacies. GLP-1 RA dispensing surged by nearly 600% in this age group compared to an approximate 3% reduction of other medications (188).

An additional consideration related to pharmacotherapy is the risk of weight gain associated with some medications prescribed for treating conditions other than obesity. A 2024 literature review examined the physiology and mechanisms behind weight gain and metabolic dysregulation associated with medications prescribed for both obesity-related and unrelated conditions. Health workers should remain aware of the possible side effects of antipsychotics, glucocorticoids, beta-adrenergic blockers, tricyclic antidepressants, antihistamines, insulin, neuropathic agents, sleep aids, and steroids, which were identified as pharmacological contributors to weight gain (189). Lastly, health workers should be aware of potential genetic, hereditary, and familial factors (73, 74).

Recommendation
WHO does not recommend pharmacological interventions for obesity management for children 0–9 years of age.
Strength of the recommendation: Strong.
Quality of the evidence: Low.

Justification

The GDG agreed on a strong recommendation because the WHO-commissioned Cochrane systematic review of RCTs assessing the effect of any form of pharmacological interventions compared to no intervention or placebo for obesity in children and adolescents did not identify any studies that included children under 6 years of age. Eight studies included children 6 years or older; seven assessed metformin and one assessed liraglutide (167).

This recommendation accounts for the lack of evidence on both benefits and the potential adverse events and consequences of the different medications and/or their active ingredients on normal growth, development, physiological parameters, and mental health.

Remarks

As a general approach for children with obesity, a structured and supervised multimodal lifestyle intervention including behavioural, dietary, and physical activity interventions that considers age, gender, health status, sedentary patterns and sleeping habits, cultural context, the child's interests, values and preferences, and that involves parents and/or caregivers should be considered.

Research gaps

There is a need for high-quality evidence on the long-term benefits and harms of the different drugs, different doses, and/or their active ingredients for obesity management in eligible populations.

Research on pharmacological interventions for obesity management in eligible populations should prioritize well-designed and well-reported randomized controlled trials and prospective cohort studies reporting 1) efficacy, effectiveness, duration of treatment, continued engagement, route of drug administration, safety profile, long-term secondary effects, access, and cost; 2) subgroup analyses for severity of obesity, coexisting conditions, and type of intervention; and 3) implementation considerations for low- and middle-income countries, including population characteristics such as gender, age, ethnicity, cultural background, and socio-economic status.

Summary of judgements

The GDG concluded that while benefits are likely to be small to moderate and adverse events are likely to be small, there is uncertainty about the balance of benefits and harms. The quality of evidence was low.

The GDG agreed that there is no clarity on values and preferences, acceptability or feasibility, since evidence is mostly restricted to adolescents.

The GDG considered that while costs vary, they are likely to be moderate to high. No information was found on cost-effectiveness for children. The GDG found that the effect on health equity varies; the treatment of paediatric obesity is hindered by social and structural inadequacies within and beyond health care systems worldwide, among others (190) (Annex 3. Evidence-to-decision considerations for pharmacotherapy).

Bariatric surgery and weight-loss and weight-management devices

Summary of evidence

WHO commissioned a systematic review on metabolic and bariatric surgery for children 0 to 9 years old with obesity (191). This review did not identify any direct evidence for this population.

The search included: 1) metabolic bariatric surgery (adjustable gastric banding, laparoscopic sleeve gastrectomy, Roux-en-Y gastric bypass, one anastomosis gastric bypass, biliopancreatic diversion and variants, endoscopic sleeve gastroplasty); 2) weight-loss devices (intra-gastric balloons, electrical stimulation, gastric emptying system); and 3) weight-maintenance devices (oral removable palatal space-occupying devices, and ingested, transient, space-occupying devices).

Indirect evidence from studies on adolescents can be informative. The commissioned review found two RCTs and three non-RCTs comparing metabolic and bariatric surgery to lifestyle interventions in adolescents. Low-certainty evidence found that metabolic and bariatric surgery was more effective than lifestyle interventions in reducing BMI (-11.67 kg/m² (95% CI: -13.22 to -10.11, two RCTs, 100 participants) and reducing weight (-20.87 kg (95% CI: -23.64 to -18.09, three RCTs, 152 participants). In the same review, evidence based on nonrandomized studies showed similar results on BMI and weight reduction as in the RCTs. Low-quality evidence found that metabolic and bariatric surgery may lead to improvement in other obesity-related outcomes.

There are additional systematic reviews addressing the effects of metabolic and bariatric surgery for underage populations with obesity, predominantly adolescents (61, 127, 128, 129, 192). Indirect evidence from this group showed that metabolic and bariatric surgery may lead to BMI reduction. However, data are lacking on long-term effectiveness.

Recommendation

WHO does not recommend bariatric surgery and weight-loss or weight-management devices for obesity management for children 0-9 years of age.

Strength of recommendation: Strong.

Quality of the evidence: No evidence.

Justification

The GDG agreed on a strong recommendation without relevant evidence by considering the potential adverse events and consequences of bariatric surgery and weight-loss or weight-management devices on normal growth, development, physiological parameters, and mental health.

When deciding upon the strength of this recommendation, the GDG considered GRADE guidance regarding paradigmatic situations where a strong recommendation may be warranted despite low or very low confidence in the evidence. In this case, bariatric surgery at such young age, that is under 10 years, may result in significant harm (193).

Remarks

As a general approach for children with obesity, a structured and supervised multimodal lifestyle intervention including behavioural, dietary, and physical activity interventions that

considers age, gender, health status, existing disability, sedentary patterns and sleeping habits, cultural context, the child's interests, values and preferences, and that involves parents and/or caregivers should be considered.

Research gaps

No research on bariatric surgery and weight-loss or weight-management devices is suggested for this age group.

Summary of judgements

The GDG concluded that benefits, harms, the balance between benefits and harms, and the quality of evidence are unclear due to the lack of evidence.

The GDG highlighted that values and preferences are uncertain since there is no relevant evidence. Similarly, costs, cost-effectiveness, the effect on equity, acceptability, and feasibility are unknown ([Annex 3. Evidence-to-decision considerations for bariatric surgery and weight-loss and weight-management devices](#)).

Multimodal interventions

Summary of evidence

WHO commissioned a systematic review on the effects of combined (multimodal) health-related behaviour changing interventions for children 0 to 9 years of age with obesity ([57](#)). The review found a total of 23 healthcare-based interventions in primary care facilities and hospitals, and 11 community-based interventions in schools, churches, and community centres. Interventions included sessions on dietary modification, physical activity, and behaviour change ([Annex 2. Multimodal interventions](#)).

This review found very low- to moderate-certainty evidence for the effects of healthcare-based multimodal interventions on BMI z-scores, physical well-being, physical functioning, emotional functioning, physical activity, and quality of life ([Annex 2. Summary of findings table 11.1](#)).

Healthcare-based interventions may result in little to no difference in BMI z-scores at 12 months follow-up (MD -0.15, 95% CI -0.23 to -0.06; 16 studies; 2397 participants, very low-certainty evidence), at 18 months (MD -0.16, 95% CI -0.28 to -0.04; two studies; 223 participants, low-certainty evidence), at 24 months (MD -0.08, 95% CI -0.18 to 0.02; four studies; 608 participants, low-certainty evidence), and at 48 months (MD -0.15, 95% CI -0.38 to 0.08; one study; 171 participants, low-certainty evidence). These interventions may improve physical well-being (the Paediatric quality of life inventory (PedsQL) physical score final value standard mean difference (SMD) was 0.05, 95% CI -0.09 to 0.19; two studies; 757 participants, moderate-certainty evidence; the change from baseline SMD was 1.16, 95% CI -0.73 to 3.04; two studies; 56 participants, very low-certainty evidence), but resulted in little to no difference in mental well-being at 12 months follow-up (PedsQL emotional or psychosocial scores SMD 0.02, 95% CI -0.12 to 0.16; two studies; 757 participants, moderate-certainty evidence). Interventions may slightly increase physical activity and quality of life ([Annex 2. Summary of findings table 11.1](#)).

Similarly, the review found very low- to moderate-certainty evidence for the effects of community-based interventions. Community-based multimodal interventions may result in little to no difference in BMI z-scores at 12 months (MD 0.02, 95% CI -0.08 to 0.12; five studies; 420 participants, moderate-certainty evidence) and at 24 months follow-up (MD 0.01, 95% CI -0.11 to 0.12; two studies; 190 participants, moderate-certainty evidence). These interventions may

result in little to no difference in physical well-being, mental well-being, self-reported physical activity, and quality of life ([Annex 2. Summary of findings table 11.2](#)).

Information on adverse events was scant. One study on healthcare-based interventions reported adverse events unrelated to the intervention, while two others reported isolated events related to physical activity. No information on adverse events was reported for community-based interventions.

There are other systematic reviews addressing the effects of behaviour changing interventions that also reported modest short-term improvements in weight among children with obesity or overweight. Long-term effects remain unclear.

Two related Cochrane reviews were published in 2016 and 2017. Mead and colleagues, published in 2017, found very low- to low-certainty evidence that multi-component behaviour-changing interventions that incorporate diet, physical activity and behaviour change may be beneficial in achieving small, short-term reductions in BMI, BMI z-scores and weight in children aged 6 to 11 years ([51](#)).

In 2016, Colquitt and colleagues completed a similar Cochrane review on preschool children up to 6 years of age with overweight or obesity; they included seven RCTs on multi-component interventions and reported very low- to low-certainty evidence that multi-component interventions appear to be an effective treatment option for preschool children with overweight or obesity ([194](#)).

Similar results were reported by other systematic reviews. However, because these reviews included both children and adolescents, they may be indirect in informing effects on children. Ho et al. ([195](#)) conducted a systematic review of evidence in the paediatric population (under 18 years of age) with obesity, finding that multimodal lifestyle interventions can improve weight and cardio-metabolic outcomes. Salam et al. ([196](#)) found low- to moderate-certainty evidence that combining diet with exercise, diet with behavioural therapy, or a combination of diet, exercise and behavioural therapy may reduce BMI. Whitlock et al. ([128](#)) reported that behavioural interventions in schools or specialty health care settings can lead to small to moderate short-term improvements. Zolotarjova et al. ([129](#)) reviewed 16 studies from 1995 to 2017, all showing reductions in BMI (or z-scores) and cardiovascular risk factors.

Studies with long follow-up periods are scant, therefore, benefits and harms in the long run are uncertain ([197](#)).

Recommendation
WHO recommends a structured multimodal intervention including a combination of diet, physical activity, and behavioural components for the integrated management of children with obesity*. It should consider age, gender, health status, food preferences, nutritional education, physical fitness, cultural context, and the child's interests, values and preferences as well as resources and support of parents and caregivers. It should be delivered and supervised by health workers with knowledge on nutrition, physical activity, and behaviour changing interventions, and involve parents and/or caregivers. * Other components of multimodal interventions include changes in sleep behaviour and in sedentary behaviour patterns, and the use of digital technologies. Multimodal interventions could involve family, friends, caregivers and schools; improve access to care; and promote awareness and educational campaigns for children, caregivers, schools and communities.
Strength of the recommendation: Strong.
Quality of the evidence: Very low.

Justification

The GDG considered this recommendation to be strong because children with obesity and their parents value the perceived benefits associated with a healthy diet and staying active, including weight loss, social acceptance, and self-esteem ([Annex 3. Evidence-to-decision considerations for multimodal interventions](#)). Even though the benefits are small, the balance between benefits and harms still favours the intervention. Multimodal interventions are likely to be acceptable and feasible if they are appropriate for age, gender, and ethnicity; if they are personalized; and if they acknowledge parental financial situation and schedules. Relatedly, the GDG acknowledged that multimodal interventions may incur costs on families and that the effect on equity is unclear. Underserved communities, girls, and minoritized ethnic groups are less likely to have access ([Annex 3. Evidence-to-decision considerations for multimodal interventions](#)).

The WHO-commissioned review retrieved RCTs of multimodal interventions delivered either in healthcare settings or in community settings, for example, schools, churches, and community centres. Interventions consisted of dietary modification, physical activity, and behavioural modifications compared to usual care. Results were similar in both settings, including small effects on BMI, physical well-being, and quality of life.

Remarks

The recommendations on diet, physical activity and behavioural components established during this guideline development process could form the basis of a multimodal intervention. This guideline includes recommendations on sleep behaviour, sedentary behaviour, digital technologies, and the need for involving family, friends, caregivers, schools and the community ([57](#)).

The nature of the intervention can be decided based on the results of a detailed initial clinical assessment that considers anthropometric measures as well as a comprehensive family and medical history, a review of psychosocial and behavioural factors (such as eating habits, physical activity, and sleep routines), and relevant laboratory tests where appropriate ([75](#)).

Parental involvement can enhance the effectiveness of lifestyle interventions. Parents can support the child throughout the intervention, change their own behaviours, and adapt parenting styles.

Multimodal interventions may be cost-effective due to potential benefits in weight management and the prevention of chronic diseases.

Referral from the primary health care setting to specialized care may be required, including notification of other health workers and clear, compassionate communication with the family (75).

The involvement of paediatric obesity experts, secondary or specialized care, and/or multidisciplinary teams in multimodal lifestyle interventions could be an option.

While there is no ideal follow-up interval for children with obesity, the frequency of visits should consider the child's overall clinical condition, coexisting conditions, medication use, and social vulnerability (75).

Whole-of-society approaches addressing the causes of inequities in access are required to enhance participation in obesity management interventions.

Support from governments, schools, and the community could facilitate the implementation of multimodal interventions.

Research gaps

Research on multimodal interventions in children should prioritize well-designed and well-reported RCTs and prospective controlled cohort studies reporting efficacy, effectiveness, safety profile, long-term secondary effects, weight regain, and cost.

Multimodal interventions need to consider the specific barriers that children face in order to prevent inequities in obesity health outcomes.

Studies on cost-effectiveness analysis of multimodal interventions for children with obesity.

Studies on the cost or resources use of multimodal interventions in children with obesity.

Summary of judgements

The GDG agreed that the benefits and harms for both healthcare-based and community-based multimodal interventions are small. The balance of desirable and undesirable effects likely favours the intervention, with very low-quality evidence.

The GDG voted that this recommendation should be strong, and highlighted that there is probably no important variability in how children and their parents value the main outcomes. Children prefer to participate in multimodal interventions because they value the perceived benefits associated with a healthy diet and staying active, including weight loss, social acceptance, and self-esteem. Parents and children value interventions that include supportive interactions, and that focus not only on weight loss but also on changing behaviour and improving self-esteem (92, 131). Multimodal interventions are likely to be acceptable and feasible. Multimodal interventions that are personalized and that incorporate supportive interactions with health workers and schools are more acceptable (96, 113). Support from stakeholders such as governments, teachers and other school staff, as well as the community could foster feasibility.

Costs are unclear; families may incur costs associated with the components of multimodal interventions including diet, exercise, and behaviour change. Based on indirect evidence from adolescents, the GDG agreed that the intervention is likely to be cost-effective. Effects on health equity are unclear. Underserved communities, girls, and minoritized ethnic groups are at a higher risk of obesity and are less likely to participate in obesity management interventions (122, 130, 131) (**Annex 3. Evidence-to-decision considerations for multimodal interventions**).

Guideline development methodology

This guideline adheres to the procedures set out in the WHO Handbook for guideline development (34).

Participants in the guideline development process

The WHO Obesity Steering Committee ([Annex 4. WHO Obesity Steering Committee](#)), under the leadership of the Department of Nutrition and Food Safety, managed the entire guideline development process. All related activities were coordinated by the Responsible Technical Officer. The WHO Obesity Steering Committee supervised key technical tasks such as the retrieval, assessment, and synthesis of evidence as well as assessing disclosures of conflicts of interests. Furthermore, the Committee monitored emerging information to determine when updates to the guideline might be required.

The WHO Obesity Steering Committee also played a central role in supporting the composition of the GDG, formulating questions and identifying outcomes, drafting recommendations and determining strength, and finalizing and submitting both the planning proposal and the final guideline to the WHO Guidelines Review Committee (GRC). In addition, the WHO Obesity Steering Committee oversaw the drafting, peer review, publication and dissemination of the guideline.

The WHO Secretariat convened individuals with diverse expertise, perspectives, and skills relevant to the care and management of children living with obesity as members of the GDG ([Annex 5. WHO Guideline Development Group](#)). As such, the GDG included broad representation in terms of gender, age and geography, with members drawn from all WHO regions and from countries of varying income levels. Besides input from the WHO Obesity Steering Committee, the selection of GDG members was supported by WHO expert advisory panels, past GDG participants, and a Call for experts distributed via the WHO Nutrition and Food Safety website mailing lists and social media platforms. To promote transparency and enhance public confidence, the names and brief biographies of GDG members were published on the WHO website two weeks prior to each meeting, giving the public time to review and provide comments.

The systematic review teams ([Annex 6. Systematic review teams](#)) retrieved, assessed, and synthesized all relevant evidence under the supervision of the WHO Secretariat. Throughout the guideline development process, the Guideline Methodologist played a key role by offering specialized technical and methodological guidance. This support extended across evidence retrieval, assessment, and synthesis, as well as the formulation of recommendations and the drafting of the final guideline. The systematic review teams and the guideline methodologist

delivered objective and thorough syntheses of findings to both the WHO Obesity Steering Committee and the GDG to support the development of informed recommendations.

Each meeting of the GDG brought together its members, systematic review teams, relevant subject-matter experts, observers ([Annex 7. Observers](#)), and representatives from the WHO Secretariat ([Annex 8. WHO Secretariat](#)). Observers included stakeholders and organizations with specialized knowledge in content areas, evidence evaluation, and guideline development. They provided technical input during the evidence synthesis phase and upheld strict confidentiality regarding both the development process and its outcomes.

External reviewers ([Annex 9. External reviewers](#)) comprised a diverse group of stakeholders, for example, technical specialists, programme managers, end-users, advocacy organizations, and individuals directly affected by the conditions addressed in the guideline. Their role was to conduct a critical appraisal of the final version of the guideline.

Declarations of interest and management of conflicts of interest

Conflicts of interests were addressed in accordance with WHO Basic documents, WHO policies on expert disclosures, and the procedures outlined in the WHO Handbook for guideline development ([34](#)). To ensure full transparency, the WHO Obesity Steering Committee, in close coordination with the Department of Compliance, Risk Management and Ethics, considered all declarations.

All experts attending WHO meetings were required to declare any interests relevant to the meeting prior to their participation. This included GDG members, systematic review team members, observers, and external reviewers. In addition, all participants verbally disclosed any potential conflicts of interest at the start of each meeting. Each GDG member was also required to submit an updated curriculum vitae; they attended the meetings in their personal capacity, not as representatives of their respective institutions. Lastly, all GDG meeting participants completed confidentiality undertaking forms.

Declarations were reviewed alongside publicly available information from online sources or media outlets to detect any positions or statements that could indicate financial or non-financial conflicts, whether perceived or real, that might compromise impartiality. Any identified concerns were evaluated individually in consultation with the WHO Office of Compliance, Risk Management and Ethics.

Conflicts of interest declared during GDG meetings, and the corresponding actions to address them, are presented in Table 2.

Table 2: Conflicts of interest declarations, and how potential conflicts were addressed during the guideline development process

Meeting	Participant	Group	Conflict of interest	Action
First and sixth Guideline Development Group meetings	Dr Louise Baur	Guideline Development Group	Dr Baur reported receiving speaker fees from Novo Nordisk, for a presentation on “Management of adolescent obesity” (virtual meeting).	Allowed to participate as member of the GDG.

Meeting	Participant	Group	Conflict of interest	Action
First and fourth Guideline Development Group meetings	Dr Catherine Birken	Guideline Development Group	Dr Birken declared funding for Canadian Institutes of Health Research, Edwin S. H Leong Center for Healthy Children, Heart and Stroke Foundation of Canada, Physician Services Inc. and Walmart Foundation.	Allowed to participate as member of the GDG.
First Guideline Development Group meeting	Dr William Dietz	Guideline Development Group	Dr Dietz reported grant support from Novo Nordisk for convenings to develop a guide (in press) for primary care providers for the management of adult obesity in primary care settings. He was not compensated for his work on this project.	Allowed to participate as member of the GDG.
First and fourth Guideline Development Group meetings	Dr Tim Lobstein	Guideline Development Group	Dr Lobstein reported a consultancy for the World Obesity Federation.	Allowed to participate as member of the GDG.
First Guideline Development Group meeting	Professor Aliakbar Sayyari	Guideline Development Group	Prof Sayyari reported being the Chairperson of the IRAN-ECHO (Ending Children Obesity) project since 2018.	Allowed to participate as member of the GDG.

Meeting	Participant	Group	Conflict of interest	Action
Third to eighth Guideline Development Group meetings	Dr Liubai Li	Guideline Development Group	Dr Li reported being commissioned by WHO to complete two manuscripts related to dietary interventions and to behaviour changing interventions, both in the management of obesity.	Asked to recuse herself during the guideline decision-making process regarding topics of dietary and behaviour changing interventions.
Fourth Guideline Development Group meeting	Mr Eduard Baladia	Guideline Development Group	Mr Baladia declared that his employer, the Spanish Academy of Nutrition, received funding from Danone for a survey on knowledge, attitudes and practices for nutrition professionals.	Allowed to participate as member of the GDG.

Formulation of questions and outcome selection

The process for selecting questions and outcomes for guideline development started with an initial list of questions and outcomes. This initial list, proposed by the WHO Obesity Steering Committee ([Annex 4. WHO Obesity Steering Committee](#)), underwent a public notice between 12 February and 12 April 2021. The WHO Secretariat engaged with WHO regional offices, various departments and programmes, and country offices in order to identify potential stakeholders for participation in this public consultation.

The WHO Secretariat invited representatives from: Member States; intergovernmental organizations, UN agencies and other international partners; non-State actors officially linked with WHO, such as nongovernmental organizations, private sector entities, philanthropic foundations, and academic institutions; multi-stakeholder initiatives such international experts and WHO advisory panels; WHO collaborating centres; scientific societies; grassroots organizations; members of WHO mailing lists; and individuals affected by obesity, their families, and the general public. Additionally, members of the WHO Obesity Steering Committee ([Annex 4. WHO Obesity Steering Committee](#)) facilitated contact details for international experts, advisory panels, scientific societies, and relevant mailing list members. The WHO Secretariat also reached out to the public using available platforms, including the WHO website and social media channels.

Following the public consultation, the WHO Secretariat and the WHO Obesity Steering Committee completed a Delphi consensus survey. Results of this prioritization work were presented to the GDG; members participated in online meetings to discuss the proposed questions and outcomes. Subsequently, they completed a second round of ratings via an online

survey. The WHO Obesity Steering Committee reviewed the GDG's deliberations and analysed the results. Based on this, a final list of questions was drafted and returned to the GDG for approval. Once approved, the finalized questions and outcomes were submitted to the WHO GRC for final review and ratification.

Evidence retrieval, synthesis and assessment

The WHO Secretariat commissioned Cochrane and non-Cochrane systematic reviews to support the guideline development process. The WHO Obesity Steering Committee and the Systematic review teams searched and compiled relevant references for each guideline question. The retrieval, assessment, and synthesis of evidence followed the WHO handbook for guideline development (34), GRADE methodology (198, 199), and Cochrane guidance (68, 69) where relevant. Comprehensive searches were completed across major scientific literature databases, grey literature sources and the WHO International Clinical Trials Registry Platform (ICTRP), among other sources. When needed, the WHO Secretariat contacted authors and consulted experts. No language restrictions were applied.

According to the WHO Handbook for guideline development and GRADE, the quality of evidence reflects the level of confidence that effect estimates are reliable enough to guide specific decisions or recommendations (34). For each outcome, the systematic review teams rated evidence quality against four categories: high, moderate, low, or very low. Factors such as risk of bias, inconsistency or heterogeneity, indirectness, imprecision, and publication bias contributed to lowering quality, whereas considerations like a large effect size, dose-response relationships, and confounding factors improved it. After assessing all outcomes, an overall confidence rating in the effect estimates was assigned to inform the recommendation. The GRADE Summary of Findings tables are presented in [Annex 2. GRADE summary of findings tables](#).

Developing recommendations

Based on the outcomes of evidence retrieval, synthesis, and assessment, the WHO Secretariat and the WHO Obesity Steering Committee drafted initial recommendations. These drafts were shared with the GDG both prior to and during GDG meetings. The Secretariat appointed a Chair and, if needed, a Co-Chair, to facilitate discussions during GDG meetings. Members of the WHO Secretariat and the systematic review teams were present to provide answers to questions and manage meeting logistics. Only GDG members had voting rights during GDG meetings.

In formulating and finalizing recommendations, the GDG took into account the results of the evidence retrieval, synthesis, and assessment, alongside evidence-to-decision frameworks prepared by the systematic review teams using GRADE methodology. These frameworks synthesized evidence for each PICO question, evaluating factors such as the balance between benefits and harms, stakeholder values and preferences, costs and cost-effectiveness, equity, acceptability and feasibility ([Annex 3. Summary of Guideline Development Group considerations to determine the strength of the recommendations](#)). Moreover, the GDG explicitly considered additional aspects including human rights, sociocultural adaptability, societal impact, health system implications, implementation strategies, monitoring and evaluation, and research gaps.

Recommendations were discussed thoroughly by the GDG, which sought consensus and then conducted anonymous voting on both the wording and strength of each recommendation. Approval required a two-thirds majority of members. If consensus was not achieved, further deliberation time was granted along with additional voting rounds. When requested, any dissenting views were documented in the guideline.

External review

The WHO Secretariat convened independent content experts from various panels both within and outside WHO for an external assessment of the guideline ([Annex 9. External reviewers](#)). These experts were not part of the guideline development process (34); they provided comments on the final version of the guideline. External assessment of the guideline focused on identifying errors or missing information, addressing clarity, highlighting setting-specific concerns, and considering implications for implementation. External assessment did not result in changes to the content or strength of the recommendations as voted by the GDG. The process can be valuable in fostering engagement with relevant stakeholders, anticipating potential controversies, and enhancing clarity of the guideline text.

Final guideline manuscript and WHO Guidelines Review Committee approval

A preliminary version of the guideline manuscript was drafted by the responsible technical officer of the guideline and shared with the WHO Obesity Steering Committee for input. The final version, after external peer review and GDG revision, was approved by the WHO GRC.

Dissemination, implementation, monitoring, evaluation, and ethical considerations

Dissemination

The dissemination of WHO guidance aims to ensure that relevant stakeholders have access to recommendations and key remarks. The WHO Secretariat will emphasize access for stakeholders facing greater or specific barriers to information, particularly those who play a vital role in implementation. This includes policy-makers and decision-makers at the subnational level who are responsible for disseminating guideline content.

This guideline and its recommendations will be disseminated widely through various electronic channels, including webinars, posters, slide presentations, the WHO Nutrition website (200), social media platforms, WHO Nutrition mailing lists, and the WHO e-Library of Evidence for Nutrition Actions (eLENA) (201). eLENA hosts WHO nutrition-related guidelines along with supporting materials such as systematic reviews and other evidence underpinning the guidelines, biological and behavioural rationales, and additional resources contributed by Member States and global partners. The guideline will also be distributed through an extensive international network, which includes WHO country and regional offices, ministries of health and other related offices, WHO collaborating centres, universities, other UN agencies, and nongovernmental organizations. To aid end-users, derivative products like summaries and compilations of normative statements may be developed.

Implementation

This guideline is relevant to all WHO Regions and Member States. Recommendations can be integrated into a continuum-of-care framework for child and adolescent health programmes, aligning with existing initiatives and national guidance where available. The guideline can be used to support national health policies, strategies, and plans in shaping a country's vision, policy priorities, and strategic approaches to safeguarding population health. Ideally, the guideline should be implemented in contexts where the intervention is coordinated with education, social development, or other sectors. Connecting these recommendations with other cross-sectoral efforts enhances both sustainability and opportunities for scaling up.

A thorough identification and assessment of social determinants of health, including gender norms, roles, and relations affecting the target populations is recommended early in the implementation process. Continuous evaluation of the intervention's accessibility and acceptability is important to guide implementation. This is especially critical in settings where

social norms and determinants create unequal conditions and opportunities among different groups. For example, gender norms in some environments may limit opportunities for girls and boys, both in and out of school. In other settings, social perceptions related to ethnicity or race influence how certain populations access and utilize interventions.

Monitoring and evaluating guideline implementation

The WHO Secretariat will assess guideline impact both within and across countries through monitoring and evaluation by examining their global adoption and adaptation. Establishing an effective system for routine data collection is essential to ensure that programmes remain effective and sustainable. This system should capture key information such as health determinants, therapeutic adherence, and programme performance indicators, all of which are vital to advancing the right to health for all population groups.

In concordance with the “leave no one behind” commitment outlined in the 2030 Agenda for Sustainable Development, tracking disparities among different groups in terms of intervention accessibility, availability, acceptability, equity and quality will inform the design of improved public health programmes.

Ethical considerations

Ethics play a fundamental role in science, research, policy-making, and implementation, with every area of human activity facing ethical challenges. As such, ethics encompass standards of what is considered right or wrong, fair or unfair, guiding individuals on their rights, obligations, and responsibilities toward society and others. Ethical principles prompt reflection on whether an intervention provides benefits to individuals and communities, prevents harm at both individual and societal levels, promotes the equitable distribution of health benefits across social groups (thus contributing to health equity), and respects and upholds human rights.

Evaluating the accessibility and acceptability of obesity management is crucial for informing the design and development of effective programmes. This evaluation is especially important in contexts where social norms and determinants create unequal conditions and opportunities for different groups, for example girls or children not attending school, while in others, social attitudes related to ethnicity or minoritized communities influence how people access and utilize interventions. By integrating these considerations into the implementation of this guideline, programmes can more effectively identify facilitators and barriers to success, enabling better planning for scaling up efforts.

Updating recommendations

In line with the proposed living guideline approach, the WHO Secretariat will continue to track research developments related to obesity, particularly in areas where the quality of evidence was deemed low or very low. The WHO Secretariat will also invite suggestions for new questions to consider throughout this ongoing process. Research developments may include new findings, evolving considerations and stakeholder or user interests, and changes in the values, preferences, acceptability, feasibility or cost-effectiveness of interventions. Additional focus areas will include human rights, equity, and gender-related factors; issues concerning coverage; updated definitions or thresholds for diagnosing obesity and its severity; the impact of new technologies and social media; and the growing need for tailored recommendations for specific groups such as children with obesity-related complications, migrant communities, or minoritized populations.

WHO will also assess new evidence and data regarding the effects and safety of interventions, particularly bariatric surgery, pharmacotherapy, and the potential inclusion of anti-obesity medications in WHO guidelines and documents including WHO Essential Medicine List. It will also consider the views and perspectives of children, their parents, health workers, and other stakeholders affected by the interventions. Recent WHO guidance may also influence this guideline's content, for example, WHO guidance on GLP-1 RA for adults with obesity or any updates on the Codex Alimentarius standards, guidelines and codes of practice released by WHO and FAO (79).

Guideline updates and the proposed living guideline approach will include consideration of questions developed but not prioritized in the current process, as well as new evidence or emerging considerations that justify revisiting or modifying existing recommendations. This process will be assessed and coordinated by the WHO Department of Nutrition and Food Safety and will adhere to formal procedures outlined in the WHO Handbook for guideline development (34). In collaboration with systematic review teams, the WHO Obesity Steering Committee will assess whether new evidence or emerging considerations justify revisiting or modifying existing recommendations and if the new data alter the supporting evidence or affect the recommendation's reliability. Any updates will be integrated into the overall guideline, with changes clearly marked and shared through usual WHO communication platforms.

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Annex1. Background questions

Genetic or familial factors

Question 1. Are there genetic, hereditary, and familial factors that need to be considered when managing children with obesity?

Obesity during early childhood results from a combination of genetic, environmental, and developmental influences. Research has identified over one hundred genetic locations, predominantly within 12 to 15 key genes, that are consistently linked with obesity in children (73). Many of these genetic variants are also associated with obesity in adulthood, indicating that inherited influences on body composition tend to remain stable throughout life. Notably studied genes include FTO—especially the SNP rs9939609, which has been linked to modest increases in BMI and replicated in populations across Europe, Asia, and the Americas—as well as MC4R and several others involved in regulating appetite and energy balance, such as TMEM18, SEC16B, ADCY3, BDNF, and NEGR1 (73). While researchers have explored gene-gene interactions and developed genetic risk scores, results have so far been inconclusive. These observations support the view that obesity is polygenic, involving many genes with small effects that interact with environmental factors (73).

Early-life environmental factors can also affect how genes are expressed through epigenetic changes. Among these, DNA methylation has been the most thoroughly investigated mechanism, commonly assessed using blood or cord blood samples. Some studies have linked specific CpG sites with future obesity risk (74). Circulating microRNAs (miRNAs) also show altered expression patterns in children with obesity, though these findings are inconsistent due to differences in study design and the biological samples analysed.

Despite growing insights, significant gaps remain, particularly in understanding how environmental agents, such as endocrine-disrupting chemicals (EDCs) influence epigenetic mechanisms associated with obesity development (74).

Initial clinical assessment

Question 2. What are the components of an initial clinical assessment* when managing children with obesity?

*** Besides anthropometry and physical examination, an initial clinical assessment may include family and psycho-social history, behaviour (such as diet, physical activity, sleep) and biochemical parameters.**

When evaluating children with overweight and obesity, the initial clinical assessment should go beyond measuring height and weight and include a detailed family and medical history, a review of psychosocial and behavioural factors (such as eating habits, physical activity, sleep routines), and relevant laboratory tests where appropriate (75). There should be appropriate physical space and including larger equipment (for example, examination table, chair, blood pressure cuffs).

Taking a comprehensive history from the caregiver is essential to guide treatment and build a positive, trusting relationship. This discussion should be age-appropriate, respectful, and culturally sensitive, using open-ended questions that encourage caregiver input. It is important to assess factors like the child's usual diet (including portion sizes and frequency of high-sugar or processed foods), time spent being physically active versus sedentary, and sleep patterns. Family history plays an important role and should include any cases of obesity, type 2 diabetes, or gestational diabetes during the patient's mother's pregnancy. Health workers should also ask about long-term medication use (such as corticosteroids) and psychosocial issues that may impact the child's well-being, such as family stress or limited access to healthy food and safe play environments (75).

The physical exam should be complete and gentle, covering the child's growth, development, vital signs, and body systems. Key signs to check include high blood pressure, signs of insulin resistance like darkened skin patches (acanthosis nigricans), or physical features suggestive of hormonal issues (for example, moon face, or central fat accumulation). Height, weight, BMI-for-age, waist circumference and other anthropometric measures as well as developmental milestones should all be recorded, with referrals made for further assessment if needed (75).

Follow-up

Question 3. What is the optimal frequency of follow-up (for example, intensive follow-up (three months or less) compared to non-intensive follow-up (over three months)) in the clinical setting for the integrated management of children with obesity?

Are there specific indications according to sex/gender or disability?

How often should anthropometric, dietary and physical activity measurements be monitored and tracked in the clinical setting?

In the context of ongoing care for obesity and chronic conditions, there is no single ideal follow-up schedule for children. The frequency of follow-up should be based on the child's clinical condition, presence of other health problems, any prescribed medications, and whether the visit was routine or in response to new or worsening symptoms. Health workers should guide caregivers to return for a follow-up visit after a specific number of days and to check the child's progress or response to treatment, which may be before the scheduled follow up visit (75).

Although no fixed schedule is determined by sex, care should be inclusive and age appropriate. Growth monitoring tools, including weight, length/height, and BMI-for-age, are available and should be used separately for boys and girls. It is also important to assess other influences on the child's health, including family stress, caregiver mental health, food insecurity, or exposure to violence or neglect.

Children with complex care needs, such as those with a combination of chronic health conditions, developmental delays, or social vulnerabilities, require coordinated and individualized follow-up.

Flexible communication options, such as caregiver phone check-ins or digital reminders, may help support ongoing follow-up and reinforce healthy routines, especially for families living in remote or underserved areas (75).

Referral

Question 4. What are the criteria for a referral to specialized obesity management care* when managing children with obesity?

*** Specialized obesity management care including but not limited to endocrinologist, dietitian, clinical nutritionist, paediatrician, psychologist, medical laboratory technologist, or another member of a multidisciplinary team.**

Referral to specialized services should be considered when initial efforts, such as improvements in diet and increase in physical activity, do not lead to progress, or when a child has obesity-related health conditions that need more advanced care. This may include referral to nutritionists, psychologists, or paediatric endocrinologists (75).

If the cause of obesity appears to be complex or beyond lifestyle factors, specialist evaluation is recommended. When referring a child to specialist services or hospital care, it is important to communicate clearly and compassionately with the family. Caregivers should be informed about the reason for the referral, what to expect during the visit, and how the care team will support the child. Offering reassurance is important: families should know that the referral will provide access to appropriate expertise, diagnostic tools, and trained staff.

A written referral should include a summary of the child's medical background, reasons for referral, and previous interventions. This helps ensure coordinated and effective care in the next stage of evaluation or treatment (75).

Gender- or sex-specific considerations

Question 5. Are there any gender- or sex-specific aspects that need to be considered when managing children with obesity in the primary health care setting?

There are important sex- and gender-related factors to consider when managing obesity in children in primary health care. Boys and girls may experience and respond to obesity differently. For example, girls may be more affected by how others see their bodies and may become upset or worried about their weight, which can lead to eating disorders or to avoid being active. Boys may be less likely to talk about how they feel or ask for help, even if they are struggling emotionally or socially because of their weight (33, 76, 77).

Health workers should be aware of these differences and use a gender-sensitive approach when working with children and families. This means using kind, respectful words, helping all children feel safe and included, and designing activities that every child can enjoy. For example, physical activity programmes at school or in the community should make sure girls feel welcome and safe to join, especially in places where girls may have fewer chances to play or be active (33, 76, 77).

Sex and gender also interact with other factors like poverty, disability, and background. For instance, girls in poor households may have fewer healthy diet or physical activity options, and children with disabilities may have a harder time joining in physical activities or getting regular health care due to barriers in the surrounding environment (33, 76, 77).

Disability-specific considerations

Question 6. Are there any disability*-specific aspects that need to be considered when managing children with obesity in the primary health care setting?

*** Disability refers to the outcome of the interaction between health conditions and impairments that a child might have with personal and environmental factors.**

Children with obesity and disability often require personalized attention, as their underlying impairments or health conditions can significantly impact their growth, development, and daily life. For example, some underlying impairments or health conditions may affect eating behaviours and energy balance, and when coupled with barriers in the surrounding environment, they can affect their ability to participate in activities with peers. These challenges can also place emotional and financial stress on families and caregivers, especially when frequent medical care is needed (32, 78, 79).

Primary care providers should ensure that assessments and care plans are adapted to the child's functional abilities and communication needs. Standard growth monitoring tools may not be appropriate for all children with disabilities, and interventions should be flexible and family-centred. Using frameworks like the WHO's International Classification of Functioning (ICF) can support a more holistic understanding of each child's needs (32, 78, 79).

Ultimately, inclusive care that addresses both medical and social aspects -while involving caregivers as active partners- is essential for supporting healthy growth and well-being in children with disabilities and obesity (32, 78).

Mental health considerations

Question 7. What are the approaches for treating and/or co-managing mental health conditions* in children with obesity?

Should considerations regarding how mental health issues can exacerbate obesity or vice versa be explored – and if yes, starting at what age?

*** WHO conceptualizes mental health as a “state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community”. Mental health conditions include but are not limited to eating disorders, anxiety, stress, depression, isolation, suicidal ideation, weight-based stigmatisation and victimisation, low self-esteem and poor body image.**

Addressing mental health is essential when treating children with obesity, and the relationship between mental health conditions and obesity should be considered very early and at every stage of care. Mental health issues such as anxiety, depression, low self-esteem, and emotional dysregulation can contribute to unhealthy eating behaviours, physical inactivity, sleep disturbances, and social withdrawal, all of which increase the risk of obesity. Conversely, children with obesity may experience stigma, bullying, or exclusion, which can negatively impact their emotional well-being, forming a bidirectional relationship between obesity and mental health (80).

Effective management in primary care requires an integrated and family-centred approach. This includes routine screening for emotional and behavioural issues using developmentally appropriate tools, providing psychoeducation to caregivers, and promoting nurturing caregiver-child relationships. Early interventions, such as caregiver support and emotional regulation strategies, are recommended as part of holistic obesity care even in younger children as these years are critical for shaping self-image, eating behaviours, and coping skills.

Approaches should also be inclusive and responsive to children with neurodevelopmental conditions or disabilities, who may face additional emotional and behavioural challenges and are more likely to experience obesity. In these cases, care plans should be individualized and coordinated with mental health, educational, and social services. Psychological interventions such as cognitive behavioural strategies, play-based therapy, and caregiver-led support programmes have shown promise in improving outcomes for both mental health and weight-related concerns (80).

In summary, mental health and obesity in children are deeply interconnected. Primary care settings should address both conditions early and together, using inclusive, developmentally appropriate, and family-engaged strategies to improve long-term health and well-being.

Provider competencies

Question 8. What is the competency-based training (required knowledge, attitude and skills) that primary health care workers should receive to manage children with obesity for improved health, functioning and obesity-associated disability?

Primary health care services are essential for recognizing, managing, and coordinating care for children with obesity at an early stage. To help health workers provide high-quality, child-focused care, a set of core competencies has been outlined based on current evidence about the roles and training needs of primary care providers. These competencies are grouped into four main areas (81):

1. Medical knowledge, patient care, and procedural skills: Emphasizes accurate use of BMI charts, percentiles and growth charts, early recognition of obesity-related comorbidities, and adherence to evidence-based treatment guidelines. Health workers should provide developmentally appropriate care and refer patients to specialists when necessary.
2. Interpersonal and communication skills: Highlights the use of empathetic, non-stigmatizing and non-judgemental communication, motivational interviewing, and culturally responsive counselling. It also stresses the importance of engaging families, recognizing social determinants of health, and connecting patients with community-based supports.
3. Practice-based learning, improvement, and professionalism: Underscores the need to incorporate obesity-specific competencies into pre-service education and continuing professional development. Training should address provider bias, developmental considerations, and include regular assessment of competency.
4. Systems-based practice: Promotes interdisciplinary collaboration, timely referrals, and integration of obesity care into clinical workflows and electronic health records. It calls for enabling policies, sustainable resources, and scalable, context-sensitive strategies to support implementation across diverse health systems.

These competencies enable primary care providers to: (1) evaluate and manage obesity in children using safe, evidence-based, and age-appropriate approaches; (2) communicate clearly and compassionately to involve both the child's caregivers and the child in care decisions; (3) work closely with specialists to ensure children receive well-coordinated and complete care; and (4) engage in ongoing learning and skill development to consistently deliver high-quality obesity care (11).

Annex 2. GRADE summary of findings tables

Annex 2 includes standardized tables summarizing the main findings of evidence syntheses for each of the questions included in the development of this guideline. These tables adhered to guidance methodology and provide the following GRADE Working Group levels of certainty:

High certainty: We are very confident that the true effect lies close to that of the effect estimate.

Moderate certainty: We are moderately confident in the effect estimate. The true effect is likely to be close to the effect, but there is a possibility that it is substantially different.

Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the effect estimate.

Very low certainty: We have very little confidence in the effect estimate. The true effect is likely to be substantially different from the effect.

Summary of findings: Dietary interventions

Question 1. Dietary interventions

In children with obesity (P), what is the effect of dietary intervention (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Summary of findings table 1.1. Calorie reduction compared to no reduction in calories

Patient or population*: Children 0-9 years of age or 0-9 years of age and above

Setting: Home-based, or hospital-based, or metabolic laboratory-based

Intervention: Calorie reduction

Comparison: No reduction in calories

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no reduction in calories	Risk with calorie reduction			
Body weight (kg) 0–9y	No studies in this review reported on these outcomes.				
Body weight (kg) 0–9y+					
Body mass index (z-score) 0–9y	Mean BMI: 2.4	MD was 0.08 lower (0.20 lower to 0.04 higher)	77 (1 RCT)	⊕⊕⊖⊖ Low ^a	
Body mass index (z-score) 0–9y+	Mean BMI: 2.4	MD was 0.08 lower (0.20 lower to 0.04 higher)	77 (1 RCT)	⊕⊕⊖⊖ Low ^a	

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no reduction in calories	Risk with calorie reduction			
Waist circumference (cm) 0–9y	Mean waist circumference: 68.6 cm	MD 1.26 lower (1.93 lower to 0.59 lower)	77 (1 RCT)	⊕⊕⊕⊖ Low ^a	
Waist circumference (cm) 0–9y+	Mean waist circumference: 68.6 cm	MD 1.26 lower (1.93 lower to 0.59 lower)	77 (1 RCT)	⊕⊕⊕⊖ Low ^a	
Systolic blood pressure (mmHg) 0–9y	No studies in this review reported on these outcomes.				
Systolic blood pressure (mmHg) 0–9y+					
Hours of sedentary activity 0–9y					
Hours of sedentary activity 0–9y+					
Quality of life 0–9y					
Quality of life 0–9y+					
Adverse events 0–9y					
Adverse events 0–9y+					

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

* “0–9y” indicates children in the 0-to-9-year age group; 0–9y+ indicates children in the 0 to >9-year age group, if age-stratified data for ≤9 years were not available.

^a Downgraded by one level for risk for bias: analysis included stud(y)ies assessed to have some concerns; optimal information size not met.

Summary of findings table 1.2. Low carbohydrate intake alone compared to no modification or intake of high carbohydrate foods

Patient or population*: Children 0-9y or 0-9y+

Setting: Home-based, or hospital-based, or metabolic laboratory-based

Intervention: Low carbohydrate intake alone

Comparison: No modification or intake of high carbohydrate foods

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no modification or intake of high carbohydrate foods	Risk with low carbohydrate intake alone			
Body weight (kg) 0–9y					
Body weight (kg)0–9y+	No studies in this review reported on these outcomes.				
Body mass index (z-score) 0–9y					
Body mass index (z-score) 0–9y+	Mean BMI z-score: 2.3	MD 0.04 lower (0.24 lower to 0.16 higher)	51 (1 RCT)	⊕⊕⊕⊕ Very low ^a	
Waist circumference (cm) 0–9y					
Waist circumference (cm) 0–9y+	Mean waist circumference: 97.5 cm	MD was 0.50 higher (5.74 lower to 6.74 higher)	51 (1 RCT)	⊕⊕⊕⊕ Very low ^b	
Systolic blood pressure (mmHg) 0–9y					
Systolic blood pressure (mmHg) 0–9y+					
Hours of sedentary activity 0–9y					
Hours of sedentary activity 0–9y+	No studies in this review reported on these outcomes.				
Quality of life 0–9y					
Quality of life 0–9y+					
Adverse events 0–9y					
Adverse events 0–9y+					

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

* "0–9y" indicates children in the 0-to-9-year age group; 0–9y+ indicates children in the 0 to >9-year age group, if age-stratified data for ≤9 years were not available.

^a Downgraded by one level for risk for bias: the only study included in this analysis was assessed to have some concerns; downgraded by one level for indirectness of population: data for this analysis were retrieved from studies which included the 0–9y+ age range; downgraded by three levels for imprecision: optimal information size not met; wide confidence intervals crossing the clinical threshold and the line of null effect.

^b Downgraded by one level for risk for bias: the only study included in this analysis was assessed to have some concerns; downgraded by one level for indirectness of population: for this analysis were retrieved from studies which included the 0–9y+ age range; downgraded by two levels for imprecision: optimal information size not met; wide confidence intervals crossing the line of null effect.

Summary of findings 1.3. Low glycaemic index (GI) foods compared to no modification or high GI foods

Patient or population*: Children 0-9y or 0-9y+

Setting: Home-based or hospital-based or metabolic laboratory-based

Intervention: Low GI foods

Comparison: No modification or high GI foods

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with high GI or no modification	Risk with low GI			
Body weight (kg) 0–9y	-	Not pooled	(0 RCTs)	-	
Body weight (kg) 0–9y+	-	Not pooled	(0 RCTs)	-	
Body mass index (kg/m²) 0–9y	-	Not pooled	(0 RCTs)	-	
Body mass index (kg/m²) 0–9y+	Mean body mass index: 28.8 kg/m²	MD 2.09 lower (3.80 lower to 0.39 lower)	48 (2 RCTs)	⊕⊕⊕⊕ Very low ^a	
Waist circumference (cm) 0–9y	-	Not pooled	(0 RCTs)	-	
Waist circumference (cm) 0–9y+	Mean waist circumference: 94.26 cm	MD 2.59 lower (6.60 lower to 1.42 higher)	99 (3 RCTs)	⊕⊕⊕⊕ Very low ^b	
Systolic blood pressure (mmHg) 0–9y	-	Not pooled	(0 RCTs)	-	
Systolic blood pressure (mmHg) 0–9y+	Mean systolic blood pressure: 117 mmHg	MD 2.48 higher (3.77 lower to 8.73 higher)	48 (2 RCTs)	⊕⊕⊕⊕ Very low ^b	

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with high GI or no modification	Risk with low GI			
Hours of sedentary activity 0–9y					
Hours of sedentary activity 0–9y+					
Quality of life 0–9y	No studies in this review reported on these outcomes.				
Quality of life 0–9y+					
Adverse events 0–9y					
Adverse events 0–9y+					

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

* “0–9y” indicates children in the 0-to-9-year age group; 0–9y+ indicates children in the 0 to >9-year age group, if age-stratified data for ≤9 years were not available.

^a Downgraded by one level for risk for bias: analysis included studies assessed to have some concerns and high risk of bias; downgraded by one level for indirectness of population: data for this analysis were retrieved from studies which included the 0–9y+ age range; downgraded by one level for imprecision: optimal information size not met.

^b Downgraded by one level for risk for bias: analysis included studies assessed to have some concerns and high risk of bias; downgraded by one level for indirectness of population: data for this analysis were retrieved from studies which included the 0–9y+ age range; downgraded by three levels for imprecision: optimal information size not met; wide confidence intervals crossing the clinical threshold and the line of null effect.

Summary of findings 1.4. High protein intake alone compared to no modification or low protein intake

Patient or population*: Children 0-9y or 0-9y+

Setting: Home-based or hospital-based or metabolic laboratory-based

Intervention: High protein diet

Comparison: No modification or low protein diet

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no modification or low protein intake	Risk with high protein intake alone			
Body weight (kg) 0–9y -		Not pooled	(0 RCTs)	-	
Body weight (kg) 0–9y+	Mean body weight: 38.8 kg	MD 3.30 higher (2.44 higher to 4.16 higher)	50 (1 RCT)	⊕⊕⊕⊕ Very low ^a	
Body mass index (kg/m ²) 0–9y -		Not pooled	(0 RCTs)	-	
Body mass index (kg/m ²) 0–9y+	Mean body mass index: 21.69 kg/m ²	MD 0.43 higher (0.20 higher to 0.66 higher)	50 (1 RCTs)	⊕⊕⊕⊕ Very low ^a	

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no modification or low protein intake	Risk with high protein intake alone			
Waist circumference (cm) 0–9y	-	Not pooled	(0 RCTs)	-	
Waist circumference (cm) 0–9y+	Mean waist circumference: 76.3 cm	MD 1.56 higher (0.83 higher to 2.29 higher)	50 (1 RCT)	⊕⊕⊕⊕ Very low ^b	
Systolic blood pressure (mmHg) 0–9y	-	Not pooled	(0 RCTs)	-	
Systolic blood pressure (mmHg) 0–9y+	Mean systolic blood pressure: 107 mmHg	MD 2.02 higher (0.66 higher to 3.38 higher)	50 (1 RCT)	⊕⊕⊕⊕ Very low ^b	
Hours of sedentary activity 0–9y	No studies in this review reported on these outcomes.				
Hours of sedentary activity 0–9y+					
Quality of life 0–9y					
Quality of life 0–9y+					
Adverse events 0–9y					
Adverse events 0–9y+					

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

^a Downgraded by one level for risk for bias: the only study included in this analysis was assessed to have some concerns; downgraded by one level for indirectness of population: data for this analysis were retrieved from studies which included the 0–9y+ age range; downgraded by one level for imprecision: optimal information size not met.

^b Downgraded by one level for risk for bias: the only study included in this analysis was assessed to have some concerns; downgraded by one level for indirectness of population: data for this analysis were retrieved from studies which included the 0–9y+ age range; downgraded by two levels for imprecision: optimal information size not met; wide confidence intervals crossing the clinical threshold.

Summary of findings 1.5. Intake low fat and high carbohydrate diet compared to high fat and low carbohydrate diet

Patient or population*: Children 0-9y or 0-9y+

Setting: Home-based or hospital-based or metabolic laboratory-based

Intervention: Low fat and high carbohydrate diet

Comparison: High fat and low carbohydrate diet

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with high fat and low carbohydrate diet	Risk with low fat and high carbohydrate diet			
Body weight (kg) 0–9y	No studies in this review reported on this outcome.				
Body weight (kg) 0–9y+					
Body mass index (kg/m²) 0–9y	-	Not pooled	(0 RCTs)	-	
Body mass index (kg/m²) 0–9y+	Mean body mass index: 28.7 kg/m²	MD 1.13 higher (0.35 lower to 2.61 higher)	98 (1 RCT)	⊕⊖⊖⊖ Very low ^a	
Waist circumference (cm) 0–9y	No studies in this review reported on these outcomes.				
Waist circumference (cm) 0–9y+					
Systolic blood pressure (mmHg) 0–9y					
Systolic blood pressure (mmHg) 0–9y+					
Hours of sedentary activity 0–9y					
Hours of sedentary activity 0–9y+					
Quality of life 0–9y					
Quality of life 0–9y+					
Adverse events 0–9y					
Adverse events 0–9y+					

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

* "0-9y" indicates children in the 0-to-9-year age group; 0-9y+ indicates children in the 0 to >9-year age group, if age-stratified data for ≤9 years were not available.

^a Downgraded by one level for risk for bias: the only study included in this analysis was assessed to have high risk of bias; downgraded by one level for indirectness of population: data for this analysis were retrieved from studies which included the 0-9y+ age range; downgraded by three levels for imprecision: optimal information size not met; wide confidence intervals crossing the clinical threshold and the line of null effect.

Summary of findings: Physical activity, sedentary behaviour, and sleep

Question 2. Physical activity

In children with obesity (P), what is the effect of physical activity (I) compared to no intervention (C) for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Question 3. Sedentary behaviour

In children with obesity (P), what characteristics of sedentary behaviour (I) in different durations, frequencies, patterns, or types (I, C) are associated with improved health, functioning and reduced obesity-associated disability (O) for the integrated management of obesity?

Question 4. Sleep

Should children with obesity (P), improve sleep and/or sleep hygiene (I) in different duration, frequencies, or patterns as measured by objective and subjective methods (C) for improved health, functioning and reduced obesity-associated disability (O) for the integrated management of obesity?

Summary of findings table 2.1. Physical activity (any form) compared to no intervention

Patient or population: Children with obesity

Setting: schools (3 RCTs) and gym (one RCT)

Intervention: Physical activity (any form)

Comparison: Control

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with control	Risk with physical activity (any form)				
BMI (kg/m²)– lower is better	The median BMI was 28 kg/m²	MD 1.52 kg/m² lower (2.74 lower to 0.29 lower)	-	118 (2 RCTs)	⊕⊕⊕⊕ Very low ^{a,b}	The evidence is very uncertain about the effect of physical activity (any form) on BMI; relative change 5% lower (95% CI 10% lower to 1% lower).
BMI (kg/m²) at 4 weeks follow-up– lower is better	The mean BMI at 4 weeks follow-up was 29.43 kg/m²	MD 2.45 kg/m² lower (4.08 lower to 0.81 lower)	-	59 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,b}	The evidence is very uncertain about the effect of physical activity (any form) on BMI at 4 weeks follow-up; relative change 8% lower (95% CI 14% lower to 3% lower).

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with control	Risk with physical activity (any form)				
BMI z-score– lower is better	The mean BMI z-score was 2.6 SD	MD 0.1 SD lower (0.22 lower to 0.02 higher)	-	222 (1 RCT)	⊕⊕⊕⊕ Very low ^{c,d,e}	The evidence is very uncertain about the effect of physical activity (any form) on BMI z-score; relative change 5% lower (95% CI 11% lower to 1% higher).
Body weight (kg) - lower is better	The median body weight was 40 kg	MD 0.86 kg lower (3.17 lower to 1.46 higher)	-	118 (2 RCTs)	⊕⊕⊕⊕ Very low ^{a,f}	The evidence is very uncertain about the effect of physical activity (any form) on body weight; relative change 2% lower (95% CI 8% lower to 4% higher).
Body weight (kg) at 4 weeks follow- up (post- intervention)– lower is better	The mean body weight at 4 weeks follow-up (post- intervention) was 38 kg	MD 1.03 kg lower (3.74 lower to 1.69 higher)	-	59 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,f}	The evidence is very uncertain about the effect of physical activity (any form) on body weight at 4 weeks follow-up; relative change 3% lower (95% CI 9% lower to 4% higher).
Mental well-being: Depressive symptoms– lower scores are better assessed with: The Children's Depression Inventory	The mean mental well-being: Depressive symptoms was 6.8	MD 0.5 lower (2.15 lower to 1.15 higher)	-	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,g}	The evidence is very uncertain about the effect of physical activity (any form) on depressive symptoms; relative change 7% lower (95% CI 32% lower to 17% higher).
Mental well-being: Depressive symptoms– Depressive symptoms: females–lower scores are better assessed with: The Children's Depression Inventory	The mean mental well-being: Depressive symptoms– Depressive symptoms: females was 6.78	MD 0.85 lower (1.06 lower to 0.64 lower)	-	107 (1 RCT)	⊕⊕⊕⊕ Very low ^{b,g}	The evidence is very uncertain about the effect of physical activity (any form) on depressive symptoms in females; relative change 12% lower (95% CI 16% lower to 9% lower).

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with control	Risk with physical activity (any form)				
Mental well-being: Depressive symptoms–Depressive symptoms: males–lower scores are better assessed with: The Children's Depression Inventory	The mean mental well-being: Depressive symptoms males was 4.56	MD 0.9 higher (0.59 higher to 1.21 higher)	-	68 (1 RCT)	⊕⊕⊕⊕ Very low ^{b,g}	The evidence is very uncertain about the effect of physical activity (any form) on depressive symptoms in males; relative change 20% higher (95% CI 13% higher to 26% higher).
Mental well-being: Anger expression–lower scores are better assessed with: The Paediatric Anger Expression Scale	The mean mental well-being: Anger expression was 7.6	MD 0.3 lower (1.31 lower to 0.71 higher)	-	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{f,g}	The evidence is very uncertain about the effect of physical activity (any form) on anger expression; relative change 4% lower (95% CI 17% lower to 9% higher).
Mental well-being: Anger in–lower scores are better assessed with: The Paediatric Anger Expression Scale	The mean mental well-being: Anger in was 10	MD 0 (0.76 lower to 0.76 higher)	-	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{f,g}	The evidence is very uncertain about the effect of physical activity (any form) on anger in; relative change 0% (95% CI 8% lower to 8% higher).
Mental well-being: Anger out–lower scores are better assessed with: The Paediatric Anger Expression Scale	The mean mental well-being: Anger out was 9	MD 1 lower (1.59 lower to 0.41 lower)	-	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{b,g}	The evidence is very uncertain about the effect of physical activity (any form) on anger out; relative change 11% lower (95% CI 18% lower to 4% lower).

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with control	Risk with physical activity (any form)				
Mental well-being: Anger control—lower scores are better assessed with: The Paediatric Anger Expression Scale	The mean mental well-being: Anger control was 11	MD 0 (0.59 lower to 0.59 higher)	-	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{f,g}	The evidence is very uncertain about the effect of physical activity (any form) on anger control; relative change 0% (95% CI 5% lower to 5% higher).
Mental well-being: Self-perception—higher scores are better assessed with: The Harter Self-Perception Profile for Children	The mean mental well-being: Self-perception was 3.3	MD 0.1 higher (0.07 lower to 0.27 higher)	-	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{f,g}	The evidence is very uncertain about the effect of physical activity (any form) on self-perception; relative change 3% higher (95% CI 2% lower to 8% higher).
Mental well-being—Positive screen—lower is better assessed with: The Children's Depression Inventory	47 per 1000	33 per 1000 (8 to 144)	RR 0.71 (0.16 to 3.07)	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{g,h}	The evidence is very uncertain about the effect of physical activity (any form) on positive screen; relative change 29% lower (95% CI 84% lower to 207% higher); NNT ⁱ .
Mental well-being—Self-harm—lower is better assessed with: The Children's Depression Inventory	153 per 1000	99 per 1000 (44 to 222)	RR 0.65 (0.29 to 1.45)	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{g,i}	The evidence is very uncertain about the effect of physical activity (any form) on self-harm; relative change 35% lower (95% CI 71% lower to 45% higher); NNT ⁱ .
Health-related quality of life—lower is better assessed with: PedsQL child's self-report	The mean health-related quality of life was 81 points	MD 0.6 points lower (4.22 lower to 3.02 higher)	-	175 (1 RCT)	⊕⊕⊕⊕ Very low ^{g,k}	The evidence is very uncertain about the effect of physical activity (any form) on health-related quality of life; relative change 8% lower (95% CI 57% lower to 41% higher).

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	№ of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with control	Risk with physical activity (any form)				
Body fat percentage– lower is better	The mean body fat percentage was 39 %	MD 1.23 % lower (2.5 lower to 0.03 higher)	-	456 (3 RCTs)	⊕⊕⊕⊕ Very low ^{l,m}	The evidence is very uncertain about the effect of physical activity (any form) on body fat percentage; relative change 1% lower (95% CI 7% lower to 4% higher).
Sum of skinfolds– lower is better	The mean sum of skinfolds was 47 mm	MD 1.8 mm lower (8.88 lower to 5.28 higher)	-	59 (1 RCT)	⊕⊕⊕⊕ Very low ^{l,n}	The evidence is very uncertain about the effect of physical activity (any form) on sum of skinfolds; relative change 4% lower (95% CI 19% lower to 11% higher)
Adverse events (minor)–lower is better	128 per 1000	458 per 1000 (250 to 840)	RR 3.57 (1.95 to 6.55)	222 (1 RCT)	⊕⊕⊕⊕ Very low ^{b,c}	The evidence is very uncertain about the effect of physical activity (any form) on minor adverse events; relative change 257% more (95% CI 95% more to 555% more); NNH ^o 3 (95% CI 1 to 8).
Adverse events (serious)– lower is better	13 per 1000	14 per 1000 (1 to 151)	RR 1.08 (0.10 to 11.76)	222 (1 RCT)	⊕⊕⊕⊕ Very low ^{c,f}	The evidence is very uncertain about the effect of physical activity (any form) on serious adverse events; relative change 8% more (95% CI 90% less to 1.067% more); NNH ^o .

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with control	Risk with physical activity (any form)				
Physical well-being (not reported)	-	-	-	-	-	-
Presence of obesity comorbidities (not reported)	-	-	-	-	-	-
Obesity-associated disability (not reported)	-	-	-	-	-	-

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

- ^a Issues of RoB: selection, reporting, and other biases.
- ^b Small sample size.
- ^c Issues of RoB: selection, attrition, reporting, and other biases.
- ^d Considerable statistical heterogeneity (I² >90%).
- ^e Wide confidence intervals cross the minimal clinically important difference of 0.25 standard deviation (SD) and small sample size. We assumed a minimal clinically important between-group difference of 0.25 SD on BMI z-score.
- ^f Wide confidence intervals and small sample size.
- ^g Issues of RoB: selection, performance, detection, and reporting.
- ^h Wide confidence intervals and small sample size, including only seven events in total.
- ⁱ NNT (number needed to treat) was not calculated, as the outcome did not show a between-group difference.
- ^j Wide confidence intervals and small sample size, including only 22 events in total.
- ^k Wide confidence intervals cross the minimal clinically important difference of 4.36 and small sample size. We assumed a minimal clinically important between-group difference of 4.36 for a PedsQL child's self-report is 4.36 raw units.
- ^l Issues of RoB: selection, detection, reporting and other biases.
- ^m Wide confidence intervals.
- ⁿ Issues of RoB: selection and other biases.
- ^o NNH (number needed to harm) was not calculated, as the outcome did not show a between-group difference. (MCID) of >2 mmHg on SBP.

Summary of findings table 2.2. Combined training (low dose) compared to combined training (high dose)

Patient or population: Children with obesity

Setting: Schools

Intervention: Combined training (low dose)

Comparison: Combined training (high dose)

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with combined training (high dose)	Risk with combined training (low dose)				
Body-mass index z-score—lower value is better	The mean body-mass index z-score was 2.02 SD	MD 0.12 SD higher (0.1 higher to 0.14 higher)	-	144 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,b}	The evidence is very uncertain about the effect of combined training at high or low dose on BMI z-score; relative change 6% higher (95% CI 5% higher to 7% higher).
Body fat percentage (%)—lower value is better	The mean body fat percentage was 39.11 %	MD 1.07 % higher (0.74 lower to 2.88 higher)	-	144 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,c}	The evidence is very uncertain about the effect of combined training at high or low dose on body fat percentage; relative change 3% higher (95% CI 2% lower to 8% higher).
Fasting glucose (mg/dL)—lower value is better	The mean fasting glucose was 91.8 mg/dL	MD 0.5 mg/dL lower (2.77 lower to 1.77 higher)	-	144 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,c}	The evidence is very uncertain about the effect of combined training at high or low dose on fasting glucose; relative change 0.5% lower (95% CI 3% lower to 2% higher).
Adverse events (minor)	479 per 1000	436 per 1000 (307 to 623)	RR 0.91 (0.64 to 1.30)	144 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,d}	The evidence is very uncertain about the effect of combined training at high or low dose on minor adverse events; relative change 9% less (95% CI 36% less to 30% more); NNH ^e .
Adverse events (serious)	0 per 1000	0 per 1000 (0 to 0)	RR 3.08 (0.13 to 74.45)	144 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,f}	The evidence is very uncertain about the effect of combined training at high or low dose on serious adverse events; relative change 208% more (95% CI 87% less to 7.345% more); NNH ^e .

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

^a Issues of RoB: selection, reporting, and other biases.

^b Wide confidence intervals cross MID of 0.25 SD and small sample size. We assumed a minimal clinically important between-group difference (MCID) of 0.25 SD on BMI z-score.

^c Wide confidence intervals and small sample size.

^d Wide confidence intervals and small sample size, including only 66 events in total.

^e NNH (number needed to harm) was not calculated, as the outcome did not show a between-group difference.

^f Wide confidence intervals and small sample size, including only one event in total.

Summary of findings table 2.3. Combined training (aquatic) compared to combined training (videogames)

Patient or population: Children with obesity

Setting: Gyms

Intervention: Combined training (aquatic)

Comparison: Combined training (videogames)

Outcomes	Anticipated absolute effects (95% CI)		Relative effect (95% CI)	No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with combined training (videogames)	Risk with combined training (aquatic)				
Body-mass index (kg/m²)—lower values are better	The mean body-mass index was 27.36 kg/m²	MD 0.9 kg/m² lower (3.21 lower to 1.41 higher)	-	39 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,b}	The evidence is very uncertain about the effect of combined training (aquatic or videogames) on BMI; relative change 3% lower (95% CI 11% lower to 5% higher).
Body-mass index (kg/m²) at 4 weeks follow-up—lower values are better	The mean body-mass index at 4 weeks follow-up was 27 kg/m²	MD 0.03 kg/m² higher (2.54 lower to 2.6 higher)	-	39 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,b}	The evidence is very uncertain about the effect of combined training (aquatic or videogames) on BMI at 4 weeks follow-up; relative change 0.1% higher (95% CI 8% lower to 10% higher).
Body weight (kg)—lower values are better	The mean body weight was 36.8 kg	MD 1.3 kg lower (5.66 lower to 3.06 higher)	-	39 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,b}	The evidence is very uncertain about the effect of combined training (aquatic or videogames) on body weight; relative change 3% lower (95% CI 15% lower to 18% higher).
Body weight (kg) at 4 weeks follow-up—lower values are better	The mean body weight at 4 weeks follow-up was 36.8 kg	MD 0.7 kg lower (5.7 lower to 4.3 higher)	-	39 (1 RCT)	⊕⊕⊕⊕ Very low ^{a,b}	The evidence is very uncertain about the effect of combined training (aquatic or videogames) on body weight at 4 weeks follow-up; relative change 2% lower (95% CI 15% lower to 11% higher).

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

^a Issues of RoB: selection, reporting, and other biases.

^b Wide confidence intervals and small sample size.

Summary of findings: Behaviour changing interventions

Question 5. Behaviour changing interventions

In children with obesity (P), what is the effect of behaviour changing interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Summary of findings table 5.1. Technical-level treatment components of cognitive behavioural therapy

Population: Children and adolescents with overweight or obesity

Setting: Any

Intervention: Technical-level treatment components of cognitive behavioural therapy

Comparison: Minimal education

Treatment components	Outcomes (follow-up)	Number of participants (studies) treated with the specific component	Certainty of the evidence (GRADE)	Anticipated effects (95% CI)	
				Risk with minimal education alone	Risk with target treatment
Device-monitoring	BMI z-score (assessed at the end of treatment)	1167 (18 studies)	⊕⊕⊕⊖ Low ^a	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2 .	0.00 higher BMI z-score (0.06 lower to 0.07 higher).
	Body fat (%) (assessed at the end of treatment)	502 (7 studies)	⊕⊕⊕⊖ Moderate	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9% .	3.69 higher fat mass % (0.56 higher to 6.83 higher).
	Waist circumference (cm) (assessed at the end of treatment)	638 (8 studies)	⊕⊕⊕⊖ Low ^a	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm .	1.48 higher waist circumference in cm (2.16 lower to 5.11 higher).
	Height (cm) (assessed at the end of treatment)	493 (8 studies)	⊕⊕⊕⊖ Low	The mean height at the end of the treatment ranged from 121.5 cm to 171.7 cm .	1.46 higher height in cm (0.20 higher to 2.72 higher).
	Quality-of-life score (assessed at the end of treatment)	402 (5 studies)	⊕⊕⊕⊖ Low ^a	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6 .	0.15 higher quality-of-life score (0.17 lower to 0.48 higher).

Treatment components	Outcomes (follow-up)	Number of participants (studies) treated with the specific component	Certainty of the evidence (GRADE)	Anticipated effects (95% CI)	
				Risk with minimal education alone	Risk with target treatment
Feedback	BMI z-score (assessed at the end of treatment)	3594 (45 studies)	⊕⊕⊕⊖ Low ^a	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2.	0.02 higher BMI z-score (0.02 lower to 0.07 higher).
	Body fat (%) (assessed at the end of treatment)	919 (12 studies)	⊕⊕⊕⊕ Moderate	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9%.	2.73 lower fat mass % (5.31 lower to 0.14 lower).
	Waist circumference (cm) (assessed at the end of treatment)	1125 (15 studies)	⊕⊕⊕⊖ Low ^a	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm.	1.15 higher waist circumference in cm (1.11 lower to 3.41 higher).
	Quality-of-life score (assessed at the end of treatment)	936 (9 studies)	⊕⊕⊕⊖ Low	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6.	0.77 lower quality-of-life score (1.34 lower to 0.20 lower).
	Mental health score (assessed at the end of treatment)	348 (3 studies)	⊕⊕⊕⊕ Moderate ^a	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67.	0.04 lower mental health score (0.24 lower to 0.17 higher).
Parental involvement	BMI z-score (assessed at the end of treatment)	7953 (89 studies)	⊕⊕⊕⊖ Moderate	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2.	0.09 lower BMI z-score (0.16 lower to 0.03 lower).
	Body fat (%) (assessed at the end of treatment)	1993 (28 studies)	⊕⊕⊕⊕ Moderate ^a	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9%.	0.55 lower fat mass % (2.85 lower to 1.74 higher).
	Waist circumference (cm) (assessed at the end of treatment)	2760 (37 studies)	⊕⊕⊕⊖ Low ^a	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm.	0.10 higher waist circumference in cm (2.13 lower to 2.32 higher).
	Height (cm) (assessed at the end of treatment)	1782 (25 studies)	⊕⊕⊕⊖ Very low ^a	The mean height at the end of the treatment ranged from 121.5 cm to 171.7 cm.	0.02 lower height in cm (0.55 lower to 0.50 higher).
	Quality-of-life score (assessed at the end of treatment)	1783 (17 studies)	⊕⊕⊕⊖ Very low ^a	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6.	0.09 higher quality-of-life score (0.17 lower to 0.34 higher).
	Mental health score (assessed at the end of treatment)	487 (6 studies)	⊕⊕⊕⊖ Very low ^a	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67.	0.09 lower mental health score (0.46 lower to 0.28 higher).

Treatment components	Outcomes (follow-up)	Number of participants (studies) treated with the specific component	Certainty of the evidence (GRADE)	Anticipated effects (95% CI)	
				Risk with minimal education alone	Risk with target treatment
Preplanning	BMI z-score (assessed at the end of treatment)	1779 (27 studies)	⊕⊕⊕⊖ Low ^a	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2.	0.01 higher BMI z-score (0.05 lower to 0.07 higher).
	Body fat (%) (assessed at the end of treatment)	499 (8 studies)	⊕⊕⊕⊕ Moderate	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9%.	3.05 lower fat mass % (5.82 lower to 0.28 lower).
	Waist circumference (cm) (assessed at the end of treatment)	615 (10 studies)	⊕⊕⊕⊖ Low ^a	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm.	0.46 lower waist circumference in cm (3.57 lower to 2.65 higher).
	Quality-of-life score (assessed at the end of treatment)	125 (3 studies)	⊕⊕⊕⊖ Very low ^a	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6.	0.20 lower quality-of-life score (1.05 lower to 0.64 higher).
	Mental health score (assessed at the end of treatment)	214 (2 studies)	⊕⊕⊕⊖ Very low ^a	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67.	0.01 lower mental health score (0.36 lower to 0.33 higher).
Problem solving	BMI z-score (assessed at the end of treatment)	3755 (49 studies)	⊕⊕⊕⊖ Low ^a	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2.	0.00 lower BMI z-score (0.05 lower to 0.04 higher).
	Body fat (%) (assessed at the end of treatment)	1052 (20 studies)	⊕⊕⊕⊕ Moderate	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9%.	2.90 higher fat mass % (0.30 higher to 5.50 higher).
	Waist circumference (cm) (assessed at the end of treatment)	1735 (25 studies)	⊕⊕⊕⊖ Low ^a	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm.	1.18 lower waist circumference in cm (3.78 lower to 1.42 higher).
	Quality-of-life score (assessed at the end of treatment)	891 (10 studies)	⊕⊕⊕⊖ Very low ^a	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6.	0.15 lower quality-of-life score (0.71 lower to 0.40 higher).
	Mental health score (assessed at the end of treatment)	355 (5 studies)	⊕⊕⊕⊖ Low ^a	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67.	0.34 higher mental health score (0.22 lower to 0.90 higher).

Treatment components	Outcomes (follow-up)	Number of participants (studies) treated with the specific component	Certainty of the evidence (GRADE)	Anticipated effects (95% CI)	
				Risk with minimal education alone	Risk with target treatment
Relaxation training	BMI z-score (assessed at the end of treatment)	68 (4 studies)	⊕⊕⊕⊖ Moderate	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2 .	0.16 higher BMI z-score (0.00 lower to 0.32 higher).
	Body fat (%) (assessed at the end of treatment)	52 (3 studies)	⊕⊕⊕⊖ Moderate	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9% .	8.08 higher fat mass % (0.82 higher to 15.34 higher).
	Waist circumference (cm) (assessed at the end of treatment)	52 (3 studies)	⊕⊕⊕⊖ Low ^a	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm .	5.50 lower waist circumference in cm (12.46 lower to 1.46 higher).
	Quality-of-life score (assessed at the end of treatment)	10 (1 studies)	⊕⊕⊕⊖ Very low ^a	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6 .	0.22 lower quality-of-life score (0.73 lower to 0.29 higher).
	Mental health score (assessed at the end of treatment)	34 (2 studies)	⊕⊕⊕⊖ Moderate ^a	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67 .	0.18 lower mental health score (0.46 lower to 0.11 higher).
Rule-setting	BMI z-score (assessed at the end of treatment)	964 (16 studies)	⊕⊕⊕⊖ Low ^a	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2 .	0.00 higher BMI z-score (0.08 lower to 0.09 higher).
	Body fat (%) (assessed at the end of treatment)	245 (2 studies)	⊕⊕⊕⊖ Moderate	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9% .	4.32 higher fat mass % (0.16 higher to 8.47 higher).
	Waist circumference (cm) (assessed at the end of treatment)	482 (5 studies)	⊕⊕⊕⊖ Very low ^a	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm .	0.95 lower waist circumference in cm (7.26 lower to 5.36 higher).
	Quality-of-life score (assessed at the end of treatment)	54 (2 studies)	⊕⊕⊕⊖ Very low ^a	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6 .	0.56 higher quality-of-life score (0.42 lower to 1.53 higher).

Treatment components	Outcomes (follow-up)	Number of participants (studies) treated with the specific component	Certainty of the evidence (GRADE)	Anticipated effects (95% CI)	
				Risk with minimal education alone	Risk with target treatment
Stimulus control	BMI z-score (assessed at the end of treatment)	3487 (42 studies)	⊕⊕⊕⊖ Moderate	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2.	0.07 lower BMI z-score (0.12 lower to 0.01 lower).
	Body fat (%) (assessed at the end of treatment)	1027 (15 studies)	⊕⊕⊕⊖ Low ^a	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9%.	2.66 higher fat mass % (1.12 lower to 6.44 higher).
	Waist circumference (cm) (assessed at the end of treatment)	1176 (17 studies)	⊕⊕⊕⊖ Low ^a	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm.	0.42 lower waist circumference in cm (3.04 lower to 2.20 higher).
	Quality-of-life score (assessed at the end of treatment)	521 (8 studies)	⊕⊖⊖⊖ Very low ^a	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6.	0.39 higher quality-of-life score (0.89 lower to 1.67 higher).
	Mental health score (assessed at the end of treatment)	244 (3 studies)	⊕⊕⊕⊖ Low ^a	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67.	0.07 lower mental health score (0.22 lower to 0.07 higher).

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. **MD:** Mean difference. **RCT:** Randomized controlled trial. **RR:** Risk ratio.

Footnotes:

^a Downgraded by one level for imprecision.

The downgrading reasons for RoB, heterogeneity, indirectness and publication bias were shown only for direct estimates due to the method limitation. The downgrading reasons due to inadditivity, intransitivity, incoherence, and imprecision were shown for all pooled estimates.

Summary of findings table 5.2. Conceptual-level treatment components of cognitive behavioural therapy

Population: Children and adolescents with overweight or obesity

Setting: Any

Intervention: Conceptual-level treatment components of CBT

Comparison: Minimal education

Treatment components	Outcomes (follow-up)	Number of participants (studies) treated with the specific component	Certainty of the evidence (GRADE)	Anticipated effects (95% CI)	
				Risk with minimal education alone	Risk with target treatment
Behavioural therapy	BMI z-score (assessed at the end of treatment)	3934 (44 studies)	⊕⊕⊕⊖ Low ^e	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2 .	0.08 lower BMI z-score (0.10 lower to 0.05 lower).
	Body fat (%) (assessed at the end of treatment)	1428 (20 studies)	⊕⊕⊕⊖ Moderate ^b	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9% .	1.16 lower fat mass % (1.68 lower to 0.64 lower).
	Waist circumference (cm) (assessed at the end of treatment)	1438 (21 studies)	⊕⊕⊕⊖ Moderate ^b	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm .	1.70 lower waist circumference in cm (2.74 lower to 0.67 lower).
	Quality-of-life score (assessed at the end of treatment)	1204 (10 studies)	⊕⊕⊕⊖ Moderate ^a	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6 .	0.16 higher quality-of-life score (0.03 higher to 0.30 higher).
	Mental health score (assessed at the end of treatment)	16 (1 study)	⊕⊕⊕⊖ Moderate ^c	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67 .	1.00 higher mental health score (4.07 lower to 6.07 higher).

Treatment components	Outcomes (follow-up)	Number of participants (studies) treated with the specific component	Certainty of the evidence (GRADE)	Anticipated effects (95% CI)	
				Risk with minimal education alone	Risk with target treatment
Cognitive behavioural therapy	BMI z-score (assessed at the end of treatment)	1622 (29 studies)	⊕⊕⊕⊕ Very low ^f	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2 .	0.07 lower BMI z-score (0.10 lower to 0.03 lower).
	Body fat (%) (assessed at the end of treatment)	710 (11 studies)	⊕⊕⊕⊕ Low ^d	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9% .	1.00 lower fat mass % (1.69 lower to 0.31 lower).
	Waist circumference (cm) (assessed at the end of treatment)	1200 (17 studies)	⊕⊕⊕⊕ Low ^d	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm .	1.76 lower waist circumference in cm (2.86 lower to 0.67 lower).
	Quality-of-life score (assessed at the end of treatment)	351 (6 studies)	⊕⊕⊕⊕ Low ^d	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6 .	0.44 higher quality-of-life score (0.26 higher to 0.63 higher).
	Mental health score (assessed at the end of treatment)	196 (2 studies)	⊕⊕⊕⊕ Moderate ^c	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67 .	0.04 lower mental health score (0.93 lower to 0.86 higher).
Cognitive therapy	BMI z-score (assessed at the end of treatment)	184 (2 studies)	⊕⊕⊕⊕ Low ^e	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2 .	0.03 lower BMI z-score (0.17 lower to 0.11 higher).
Psychoeducation	BMI z-score (assessed at the end of treatment)	408 (6 studies)	⊕⊕⊕⊕ Very low ^c	The mean BMI z-score at the end of the treatment ranged from 1.34 to 4.2 .	0.06 lower BMI z-score (0.14 lower to 0.01 higher).
	Body fat (%) (assessed at the end of treatment)	216 (5 studies)	⊕⊕⊕⊕ Very low ^c	The mean fat mass at the end of the treatment ranged from 26.2% to 47.9% .	0.15 higher fat mass % (0.91 lower to 1.22 higher).
	Waist circumference (cm) (assessed at the end of treatment)	137 (3 studies)	⊕⊕⊕⊕ Low ^e	The mean waist circumference at the end of the treatment ranged from 66 cm to 115.2 cm .	0.74 higher waist circumference in cm (2.03 lower to 3.51 higher).
	Quality-of-life score (assessed at the end of treatment)	134 (2 studies)	⊕⊕⊕⊕ Very low ^c	The mean quality-of-life score at the end of the treatment ranged from 63.7 to 86.6 .	0.05 lower quality-of-life score (0.35 lower to 0.26 higher).
	Mental health score (assessed at the end of treatment)	16 (1 study)	⊕⊕⊕⊕ Moderate ^c	The mean mental health score at the end of the treatment ranged from 5.7 to 6.67 .	0.00 higher mental health score (5.93 lower to 5.93 higher).

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. **MD:** Mean difference. **RCT:** Randomized controlled trial. **RR:** Risk ratio.

Footnotes:

- ^a Downgraded by one level for imprecision.
- ^a Downgraded by one level for RoB.
- ^b Downgraded by one level for heterogeneity.
- ^c Downgraded by one level for imprecision.
- ^d Downgraded by one level for RoB and one level for heterogeneity.
- ^e Downgraded by one level for RoB and one level for imprecision.
- ^f Downgraded by one level for RoB, one level for heterogeneity, and one level for imprecision.

The downgrading reasons for RoB, heterogeneity, indirectness and publication bias were shown only for direct estimates due to the method limitation. The downgrading reasons due to inadditivity, intransitivity, incoherence, and imprecision were shown for all pooled estimates.

Summary of findings: Digital health interventions

Question 6. Digital health interventions

In children with obesity (P), what is the effect of digital health interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Summary of findings Table 6.1. Digital interventions combined with conventional care compared to conventional care alone

Population: Children aged 0 to 9 years and adolescents aged 10 to 19 years

Setting: Any

Intervention: Digital interventions combined with conventional care

Comparison: Conventional care alone

Outcomes (follow-up)	Number of participants	Certainty of the (studies) evidence (GRADE)	Anticipated absolute effects (95% CI)	
			Risk with conventional care alone	Risk with digital intervention plus conventional care
BMI z-score (assessed at the end of the study)	170 (2 studies)	⊕⊕⊕⊕ Very low ^a	The mean BMI z-score at the end of the study ranged from 2 to 2.34 .	0.05 higher BMI z-score (0.06 lower to 0.16 higher).
BMI (kg/m²) (assessed at the end of the study)	138 (2 studies)	⊕⊕⊕⊕ Very low ^b	The mean BMI at the end of the study ranged from 29.3 to 30.4 kg/m² .	0.06 lower BMI (1.39 lower to 1.26 higher).
Waist circumference (cm) (assessed at the end of the study)	203 (3 studies)	⊕⊕⊕⊕ Low ^c	The mean waist circumference at the end of the study ranged from 84.9 to 101 cm .	1.16 lower waist circumference in cm (3.91 lower to 1.60 higher).
Fat mass (%) (assessed at the end of the study)	203 (3 studies)	⊕⊕⊕⊕ Moderate ^d	The mean fat mass at the end of the study ranged from 35.2% to 42.4% .	2.63 lower fat mass % (4.47 lower to 0.78 lower).

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. **MD:** Mean difference. **RCT:** Randomized controlled trial. **RR:** Risk ratio.

Footnotes:

- ^a Downgraded by one level for RoB: high RoB for allocation concealment in one study; performance bias (no blinding of participants and personnel) in both studies; and incomplete outcome data in one study. Downgraded by two levels for imprecision (only two small studies and 95% confidence interval includes no effect).
- ^b Downgraded by one level for high risk of performance bias (no blinding of participants and personnel in two studies). Downgraded by two levels for imprecision (only two small studies, and 95% confidence interval includes no effect).
- ^c Downgraded by one level for RoB (high RoB for allocation concealment in one study and performance bias in all studies). Downgraded by one level for imprecision (the 95% confidence interval includes no effect).
- ^d Downgraded by one level for RoB (high RoB for allocation concealment in one study and for performance bias in all studies).

Summary of findings 6.2. Digital interventions alone compared to conventional care alone

Patient or population: Children aged 0 to 9 years and adolescents aged 10 to 19 years

Setting: Any

Intervention: Digital interventions alone

Comparison: Conventional care alone

Outcomes (follow-up)	Number of participants (studies)	Certainty of the evidence (GRADE)	Anticipated absolute effects (95% CI)	
			Risk with conventional care alone	Risk with digital intervention plus conventional care
BMI z-score (assessed at end of study)	185 (3 studies)	⊕⊕⊖⊖ Low ^a	The mean BMI z-score at the end of the study ranged from 2.2 to 3.12 .	0.01 higher BMI z-score (0.09 lower to 0.11 higher).
BMI (kg/m²) (assessed at end of study)	26 (1 study)	⊕⊖⊖⊖ Very low ^b	The mean BMI at the end of the study was 39.4 kg/m² .	3.90 lower BMI (11.06 lower to 3.26 higher).
Waist circumference (cm)	26 (1 study)	⊕⊖⊖⊖ Very low ^b	The mean waist circumference at the end of the study was 115.6 cm .	4.30 lower waist circumference (16.45 lower to 7.85 higher).

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. **MD:** Mean difference. **RCT:** Randomized controlled trial. **RR:** Risk ratio.

Footnotes:

- ^a Downgraded by one level for RoB (high RoB for allocation concealment in one study, blinding of participants and personnel in all studies); downgraded by one level for imprecision (the 95% confidence interval includes no effect).
- ^b Downgraded by one level for RoB (high RoB for blinding of participants and personnel in the only study included); downgraded by two levels for imprecision (only one small study, and 95% confidence interval includes no effect).

Summary of findings: Pharmacotherapy

Question 7. Pharmacotherapy

In children with obesity (P), what is the effect of pharmacotherapy interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Question 8. Alternatives for medications known to cause weight gain

Should children with obesity (P), change to alternatives for medications known to cause weight gain (I) in comparison to no change (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Summary of findings 7.1. Any pharmacological interventions compared to placebo

Patient or population: Children and adolescents with obesity

Setting: Outpatient clinic, children's hospital, community clinic, division of paediatrics, paediatric endocrine centres

Intervention: Pharmacological interventions

Comparison: Placebo

Outcomes	Anticipated absolute effects (95% CI)			No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with placebo	Risk with pharmacological interventions	Relative effect (95% CI)			
BMI change follow-up: median 11 months		MD 1.80 kg/m² lower (2.36 lower to 1.24 lower)	-	3091 (25 RCTs)	⊕⊕⊕⊖ Low ^{a,b}	
Weight change follow-up: median 11 months		MD 5.47 kg lower (7.45 lower to 3.5 lower)	-	2380 (20 RCTs)	⊕⊕⊕⊖ Low ^{b,c}	
Any adverse events follow-up: median 13.5 months	846 per 1000	872 per 1000 (846 to 906)	RR 1.03 (1.00 to 1.07)	1877 (8 RCTs)	⊕⊕⊕⊖ Moderate ^d	
Discontinuation due to adverse events follow-up: median 12 months	23 per 1000	40 per 1000 (21 to 76)	RR 1.70 (0.90 to 3.22)	2255 (14 RCTs)	⊕⊕⊕⊖ Low ^{e,f}	
Incidence or severity of obesity-related outcomes follow-up: mean 6 months	No evidence of a difference between sibutramine and placebo (data reported as number of participants with high blood pressure, glucose, triglycerides, total cholesterol, LDL, HDL).			51 (1 RCT)	⊕⊕⊕⊖ Low ^{g,h}	

Outcomes	Anticipated absolute effects (95% CI)			No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with placebo	Risk with pharmacological interventions	Relative effect (95% CI)			
Quality of life assessed with: Impact of Weight on Quality of Life (IWQOL) – Kids questionnaire Scale from: 0 to 100 follow-up: median 14 months		MD 1.02 points higher - (1.94 lower to 3.98 higher)		741 (4 RCTs)	⊕⊕⊕⊖ Moderate ^h	

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. MD: Mean difference. RCT: Randomized controlled trial. RR: Risk ratio.

Footnotes:

- ^a Downgraded due to six studies at high RoB, 12 at some concerns.
- ^b Downgraded due to substantial heterogeneity.
- ^c Downgraded due to six studies at high RoB and eight having some concerns.
- ^d Downgraded due to one study at high RoB and five having some concerns.
- ^e Downgraded due to four studies at high RoB and six having some concerns.
- ^f Downgraded due to imprecision, number of events was small (<200).
- ^g Downgraded due to high RoB (single study).
- ^h Downgraded due to imprecision, wide conference intervals.

Summary of findings 7.2. Any pharmacological interventions compared to no intervention

Patient or population: Children and adolescents with obesity

Setting: Outpatient clinic, children's hospital, community clinic, division of paediatrics, paediatric endocrine centres

Intervention: Pharmacological interventions (metformin)

Comparison: No intervention

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no intervention	Risk with pharmacological interventions (metformin)			
BMI change follow-up: median 6 months		MD 1.51 Kg/m² lower (2.29 lower to 0.73 lower)	151 (3 RCTs)	⊕⊕⊕⊖ Very low ^{a,b}	
Weight change follow-up: median 6 months		MD 3.2 Kg lower (6.12 lower to 0.28 lower)	42 (1 RCT)	⊕⊕⊕⊖ Very low ^{c,d}	
Any adverse events —not reported	-	-	-	-	
Discontinuation due to adverse events - not reported	-	-	-	-	
Incidence or severity of obesity-related outcomes: not reported		-	-	-	

Outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with no intervention	Risk with pharmacological interventions (metformin)			
Quality of life: not reported	-	-	-	-	

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. **MD:** Mean difference. **RCT:** Randomized controlled trial. **RR:** Risk ratio.

Footnotes:

^a All studies judged at high RoB for the outcome.

^b Wide confidence interval.

^c Study judged at high RoB for the outcome.

^d Single study, wide confidence interval.

Summary of findings: Multimodal interventions

Question 11. Multimodal interventions

In children with obesity (P), what is the effect of multimodal interventions delivered by a multidisciplinary team (I) compared to standard care (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Summary of findings table 11.1. Healthcare-based multimodal health-related behaviour changing interventions compared to control for children living with obesity

Patient or population: Children living with obesity and their parents (critical outcomes)

Setting: Healthcare (primary care and specialized care)

Intervention: Healthcare-based multimodal health behaviour-changing interventions

Comparison: Control

Critical outcomes	Anticipated absolute effects (95% CI)		No of participants (studies)	Certainty of the evidence (GRADE)	Comments
	Risk with control	Risk with healthcare-based multimodal health behaviour changing interventions			
Physical well-being assessed with: physical score from the PedsQL Scale from: 0 to 100 <i>(higher scores indicate improvement)</i> <i>follow-up: 12 months</i>	-	SMD 0.05 higher (0.09 lower to 0.19 higher)	757 (2 RCTs)	⊕⊕⊕⊖ Moderate ^a	Healthcare-based multimodal interventions likely results in little to no difference in physical well-being (final value) at 12 months.

Critical outcomes	Anticipated absolute effects (95% CI)				Comments
	Risk with control	Risk with healthcare-based multimodal health behaviour changing interventions	No of participants (studies)	Certainty of the evidence (GRADE)	
Physical well-being assessed with: physical functioning from the PedsQL or physical subscale from the DUX-25 Scale from: 0 to 100 <i>(higher scores indicate improvement)</i> <i>follow-up: 12 months</i>	-	SMD 1.16 higher (0.73 lower to 3.04 higher)	56 (2 RCTs)	⊕⊕⊕⊕ Very low ^{a,b,c}	Healthcare-based multimodal interventions may improve physical well-being (change from baseline) at 12 months, but the evidence is very uncertain.
Mental well-being assessed with: emotional or psychosocial scores from the PedsQL inventory <i>(higher scores indicate improvement)</i> <i>follow-up: 12 months</i>	-	SMD 0.02 higher (0.12 lower to 0.16 higher)	757 (2 RCTs)	⊕⊕⊕⊕ Moderate ^a	Healthcare-based multimodal interventions likely results in little to no difference in mental well-being at 12 months.
Physical activity–objective assessed with: steps/day by the pedometer or moderate-to-vigorous physical activity by the accelerometer <i>(higher scores indicate improvement)</i> <i>follow-up: 12 months</i>	-	SMD 0.23 higher (0.16 lower to 0.63 higher)	278 (3 RCTs)	⊕⊕⊕⊕ Low ^{a,b}	Healthcare-based multimodal interventions may result in an improvement in physical activity–objective at 12 months.
Physical activity–objective assessed with moderate to vigorous physical activity by the accelerometer <i>(higher scores indicate improvement)</i> <i>follow-up: 18 months</i>	-	SMD 0.07 lower (0.43 lower to 0.29 higher)	127 (1 RCT)	⊕⊕⊕⊕ Low ^{a,c}	Healthcare-based multimodal interventions may result in little to no difference in physical activity–objective at 18 months.

Critical outcomes	Anticipated absolute effects (95% CI)				Comments
	Risk with control	Risk with healthcare-based multimodal health behaviour changing interventions	No of participants (studies)	Certainty of the evidence (GRADE)	
Physical activity–subjective assessed with: ad hoc questionnaire, Previous day physical activity recall questionnaire, child physical activity subscale of the Family Health Behaviours Scale (FHBS), questionnaire: outdoor active playtime (h/d), or SESCOA (Self-efficacy Scale for Children's Physical Activity)–Barriers <i>(higher scores indicate improvement)</i> <i>follow-up: 12 months</i>	-	SMD 0.01 higher (0.2 lower to 0.22 higher)	776 (5 RCTs)	⊕⊕⊕⊖ Low ^{a,b}	Healthcare-based multimodal interventions may result in little to no difference in physical activity–subjective at 12 months.
Physical activity–subjective assessed with: SESCOA (Self-efficacy Scale for Children's Physical Activity)–Barriers or questionnaire from sports activity minutes/week <i>(higher scores indicate improvement)</i> <i>follow-up: 24 months</i>	-	SMD 0.15 higher (0.47 lower to 0.77 higher)	275 (2 RCTs)	⊕⊕⊕⊖ Low ^{a,b}	Healthcare-based multimodal interventions may result in little to no difference in physical activity–subjective at 24 months.
Health-related quality of life assessed with: PedsQL or DUX-25 Scale from: 0 to 100 <i>(higher scores indicate improvement)</i> <i>follow-up: 12 months</i>	The median health-related quality of life was 75.2	MD 0.36 higher (1.18 lower to 1.9 higher)	921 (5 RCTs)	⊕⊕⊕⊖ Moderate ^a	Healthcare-based multimodal interventions likely results in little to no difference in health-related quality of life at 12 months.
Obesity-associated disability - not reported					
Adverse events	One study reported adverse events unrelated to the intervention. The other two studies reported isolated events related to physical activity.		614 (3 RCTs)	⊕⊖⊖⊖ Very low ^{a,e}	The evidence is very uncertain about the effect of healthcare-based multimodal interventions on adverse events.

Critical outcomes	Anticipated absolute effects (95% CI)				Comments
	Risk with control	Risk with healthcare-based multimodal health behaviour changing interventions	No of participants (studies)	Certainty of the evidence (GRADE)	
Anthropometry assessed with: BMI z-score follow-up: 12 months	The median BMI z-score was 2.01	MD 0.15 lower (0.23 lower to 0.06 lower)	2397 (16 RCTs)	⊕⊕⊕⊕ Very low ^{a,b,f}	Healthcare-based multimodal interventions may have little to no effect on BMI z-score at 12 months, but the evidence is very uncertain.
Anthropometry assessed with: BMI z-score follow-up: 18 months	The median BMI-z score was 2.06	MD 0.16 lower (0.28 lower to 0.04 lower)	223 (2 RCTs)	⊕⊕⊕⊕ Low ^{a,g}	Healthcare-based multimodal interventions may result in little to no difference in BMI z-score at 18 months.
Anthropometry assessed with: BMI z-score follow-up: 24 months	The median BMI z- score was 1.99	MD 0.08 lower (0.18 lower to 0.02 higher)	608 (4 RCTs)	⊕⊕⊕⊕ Low ^{a,b}	Healthcare-based multimodal interventions may result in little to no difference in BMI z-score at 24 months.
Anthropometry assessed with: BMI z-score follow-up: 48 months	The median BMI z-score was -0.25 change from baseline	MD 0.15 change from baseline lower (0.38 lower to 0.08 higher)	171 (1 RCT)	⊕⊕⊕⊕ Low ^{a,g}	Healthcare-based multimodal interventions may result in little to no difference in BMI z-score at 48 months.

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. **MD:** Mean difference. **RCT:** Randomized controlled trial. **RR:** Risk ratio.

Footnotes:

^a Downgraded one level due to risk of bias: the included study was at an overall high RoB.

^b Downgraded due to inconsistency: between-study variability is high.

^c Downgraded one level due to imprecision: although the confidence interval does not cross the minimally important difference, it is a study with a small sample size (<240, below the lower threshold for optimal information size).

^d Downgraded two levels due to imprecision: the confidence interval contains substantial benefits and harms and the sample size is small (<240, below the lower threshold for optimal information size).

Summary of findings Table 11.2. Community-based multimodal health-related behaviour interventions compared to control for children living with obesity

Patient or population: Children living with obesity and their parents (critical outcomes)
Setting: Community (schools, churches, community centres)
Intervention: Community-based multimodal health behaviour-changing interventions
Comparison: Control

Community-based multimodal health behaviour-changing interventions compared to control for children living with obesity and their parents

Critical outcomes	Anticipated absolute effects (95% CI)				Comments
	Risk with control	Risk with community-based multimodal health behaviour-changing interventions	No of participants (studies)	Certainty of the evidence (GRADE)	
Physical well-being assessed with: physical score from the PedsQL inventory (higher scores indicate improvement) follow-up: 12 months	The median physical well-being was 79.02	MD 2.92 higher (3.63 lower to 9.47 higher)	87 (1 RCT)	⊕⊕⊕⊖ Low ^{a,b}	Community-based multimodal interventions may result in little to no difference in physical well-being at 12 months.
Overall mental well-being assessed with: psychosocial score from the PedsQL inventory or the Strength and Difficulties Questionnaire (lower scores indicate improvement) follow-up: 12 months	-	SMD 0.04 lower (0.23 lower to 0.16 higher)	428 (2 RCTs)	⊕⊕⊕⊕ Moderate ^a	Community-based multimodal interventions likely results in little to no difference in overall mental well-being at 12 months.
Physical activity-objective assessed with minutes/day moderate to vigorous physical activity or average percent of day spent in moderate to vigorous physical activity by the accelerometer (higher scores indicate improvement) follow-up: 12 months	-	SMD 0.02 lower (0.27 lower to 0.23 higher)	481 (4 RCTs)	⊕⊕⊕⊖ Low ^{a,c}	Community-based multimodal interventions may result in little to no difference in physical activity-objective at 12 months.
Physical activity-objective assessed with minutes/day moderate to vigorous physical activity by the accelerometer (higher scores indicate improvement) follow-up: 24 months	-	SMD 0.06 higher (0.15 lower to 0.26 higher)	362 (2 RCTs)	⊕⊕⊕⊕ Moderate ^a	Community-based multimodal interventions likely results in little to no difference in physical activity-objective at 24 months.

Health-related quality of life assessed with: PedsQL or EQ-5D-Y (higher scores indicate improvement) follow-up: 12 months	The median health-related quality of life was 79.04	MD 0.58 higher (2.11 lower to 3.27 higher)	653 (4 RCTs)	⊕⊕⊕⊖ Low ^{a,c}	Community-based multimodal interventions may result in little to no difference in health-related quality of life at 12 months.
Health-related quality of life assessed with: PedsQL (higher scores indicate improvement) follow-up: 24 months	The median health-related quality of life was 5.1 change from baseline	MD 4.3 change from baseline higher (0.76 lower to 9.36 higher)	121 (1 RCT)	⊕⊕⊕⊖ Low ^{a,b}	Community-based multimodal interventions may result in a small benefit in health-related quality of life at 24 months.
Obesity-associated disability - not reported					
Adverse events - not reported					
Anthropometry assessed with: BMI z-score follow-up: 12 months	The median BMI z-score was 2.33	MD 0.02 higher (0.08 lower to 0.12 higher)	420 (5 RCTs)	⊕⊕⊕⊕ Moderate ^a	Community-based multimodal interventions likely results in little to no difference in BMI z-score at 12 months.
Anthropometry assessed with: BMI z-score follow-up: 24 months	The median BMI z-score was -0.12 change from baseline	MD 0.01 change from baseline higher (0.11 lower to 0.12 higher)	190 (2 RCTs)	⊕⊕⊕⊕ Moderate ^{a,e}	Community-based multimodal interventions likely results in little to no difference in BMI z-score at 24 months.
Anthropometry assessed with: BMI z-score follow-up: 36 months	The median BMI z-score was -0.3 change from baseline	MD 0 change from baseline (0.24 lower to 0.24 higher)	68 (1 RCT)	⊕⊕⊕⊖ Very low ^{a,f}	Community-based multimodal interventions may have little to no effect on BMI z-score at 36 months, but the evidence is very uncertain.

The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval. **MD:** Mean difference. **RCT:** Randomized controlled trial. **RR:** Risk ratio.

Footnotes

^a Downgraded one level due to risk of bias: the included study was at an overall high RoB.

^b Downgraded one level due to imprecision: the confidence interval crosses the minimally important difference and the sample size is small (<240, below the lower threshold for optimal information size).

^c Downgraded one level due to inconsistency: high between-study variability.

^d Downgraded one level due to imprecision: the confidence interval crosses the minimally important difference.

^e Downgraded one level due to imprecision: although the confidence interval does not cross the minimally important difference, it is a study with a small sample size (<240, below the lower threshold for optimal information size).

^f Downgraded two levels due to imprecision: the confidence interval contains benefits and harms and the sample size is small (<240, below the lower threshold for optimal information size).

^g Not downgraded due to inconsistency: between-study variability is high, but the distribution of the point estimates crosses the minimally important difference.

^h Downgraded one level due to imprecision: the confidence interval contains benefits and harms.

Annex 3. Summary of Guideline Development Group considerations to determine the strength of the recommendations

Evidence-to-decision considerations for dietary interventions

Question 1. Dietary interventions

In children with obesity (P), what is the effect of dietary intervention (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Evidence-to-decision considerations

Benefits	The GDG agreed that the benefits of dietary interventions alone were small and variable, depending on the type of dietary intervention.
Harms	GDG members highlighted that the risk for adverse events is likely small. However, high-protein or ketogenic diet intake may result in undesirable outcomes, for example, increases in BMI.
Certainty of evidence	The certainty of evidence for critical outcomes was very low.
Values and preferences	Children with obesity valued the potential benefits of dietary approaches aimed at promoting healthy food choices (96). The GDG highlighted that children and their parents valued interventions that involve the entire family unit, with fun and hands-on activities. Schools play a key role in ensuring coordinated activities and consistent messaging (92, 96).
Balance between benefits and harms	The GDG considered that the balance between benefits and harms probably favours the intervention.
Resources	The GDG highlighted that financial constraints may hinder parents from adhering to intervention-specific food or meal plans (92, 98). There is a need for nutrition knowledge and various abilities, such as cooking skills.
Cost-effectiveness	No studies addressed the issue of cost-effectiveness for dietary interventions.

Equity	Cultural, socioeconomic, and environmental factors, including the school environment, intertwine to influence dietary behaviour, affecting both immediate choices and long-term health outcomes (99, 100). Gender, culture, ethnicity, socioeconomic status, and parental input critically influence diet and the corresponding health outcomes (101-107). Early education and the environment play crucial roles in children's long-term health.
Acceptability	Dietary interventions were more likely to be acceptable when they were personalized, age-appropriate, and culturally sensitive.
Feasibility	Feasibility varies depending on cost and knowledge required to prepare healthy meals and caregiver involvement, among other variables (92, 97, 98).

Evidence-to-decision considerations for physical activity, sedentary behaviour, and sleep

Question 2. Physical activity

In children with obesity (P), what is the effect of physical activity (I) compared to no intervention (C) for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Question 3. Sedentary behaviour

In children with obesity (P), what characteristics of sedentary behaviour (I) in different durations, frequencies, patterns, or types (I, C) are associated with improved health, functioning and reduced obesity-associated disability (O) for the integrated management of obesity?

Question 4. Sleep

Should children with obesity (P), improve sleep and/or sleep hygiene (I) in different duration, frequencies, or patterns as measured by objective and subjective methods (C) for improved health, functioning and reduced obesity-associated disability (O) for the integrated management of obesity?

Evidence-to-decision considerations

Benefits	The GDG considered that, although small, the benefits of physical activity are clear for all ages and health statuses.
Harms	Undesirable effects are likely to be trivial to small. To avoid physical or mental harm, the type, intensity and duration of physical activity should consider age, physical and health status.
Certainty of evidence	The certainty of evidence for critical outcomes was very low.
Values and preferences	The GDG determined that there is probably no important variability in how much children value physical activity. Parents and children value informal and fun activities while considering safety and weather conditions (92, 113).

Balance between benefits and harms	According to the GDG, the balance between benefits and harms probably favours physical activity.
Resources	The GDG agreed that costs vary. Access to parks, athletic facilities, and recreation areas may be provided at low or no cost. Structured physical activity intervention programmes, such as school-based programmes, or programmes led or prescribed by health workers may increase costs.
Cost-effectiveness	Physical activity interventions may be cost-effective due to potential benefits of physical activity in weight management and prevention of chronic diseases. Economic analyses reported that physical activity programmes are cost-effective due to large costs of physical inactivity (114). They also result in potential benefits of physical activity in obesity management and prevention of chronic diseases (115-121).
Equity	Worldwide, women, minoritized ethnic groups, disadvantaged communities, and individuals living with disabilities or chronic diseases are more prone to inactivity (122). Access to safe, affordable, and suitable programmes and spaces for physical activity may increase equity if access to all is ensured, considering that children in low-income settings and those with disabilities may experience barriers to accessing opportunities to engage in physical activity.
Acceptability	Children and caregivers favoured interventions that incorporate fun, informal (non-competitive) physical activity and that use technology (92, 113).
Feasibility	The GDG underscored that feasibility relies on the provision of safe spaces, equipment, and facilities at different setting at low or no cost.

Evidence-to-decision considerations for behaviour changing interventions

Question 5. Behaviour changing interventions

In children with obesity (P), what is the effect of behaviour changing interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Evidence-to-decision considerations

Benefits	The GDG determined that benefits are small and dependant on the components of the behaviour changing intervention.
Harms	The risk of adverse events is probably low.
Certainty of evidence	The certainty of evidence for critical outcomes was very low.

Values and preferences	The GDG found that there is probably no important uncertainty or variability regarding values and preferences. Children and their caregivers value supportive communication, relationships and interactions as well as the participation of peers, families, schools, and health workers. Children and their families are motivated by the expectation that behaviour changing interventions will help them achieve long-term lifestyle changes (55). Family involvement is important for intervention success, as well as supportive communication and interactions (55).
Balance between benefits and harms	The GDG voted that the balance between benefits and harms favours the intervention.
Resources	Costs vary depending on the setting and delivery strategy, the specific behaviour changing strategy, and the required logistics and health workers.
Cost-effectiveness	Cost-effectiveness is unknown; no relevant studies were identified.
Equity	The GDG highlighted that marginalized communities and those of low socio-economic status, girls, minoritized ethnic groups, and children with disabilities may experience barriers accessing behaviour changing interventions for obesity management (122, 130, 131).
Acceptability	According to the GDG, behaviour changing interventions that are fun, enjoyable, and that consider the specific needs of participants are acceptable to children with obesity and their parents (55, 113).
Feasibility	Feasibility may be enhanced by considering social determinants of health such a lack of access, time, transport, and other personal circumstances.

Evidence-to-decision considerations for digital health interventions

Question 6. Digital health interventions

In children with obesity (P), what is the effect of digital health interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and to reduce obesity-associated disability (O)?

Evidence-to-decision considerations

Benefits	Digital interventions in combination with conventional care or alone, may lead to small benefits. Evidence on children is limited; most studies include either adolescents alone or a combination of children and adolescents without providing disaggregated data.
Harms	Undesirable effects are unknown.

Certainty of evidence	The certainty of evidence was very low.
Values and preferences	GDG determined that there is likely uncertainty or variability in values and preferences. Indirect evidence from adolescents reported that people valued the effectiveness of digital health interventions, but they were also concerned over data security (160-163).
Balance between benefits and harms	The GDG voted that the balance of desirable and undesirable effects likely favours the intervention.
Resources	Costs vary depending on various factors such as delivery format, development process, components of intervention, workers involved, and settings.
Cost-effectiveness	There were no direct data on cost-effectiveness. Indirect data from adolescents suggests that digital health interventions could be less costly and more effective compared to no intervention.
Equity	The GDG highlighted that impact on equity varies. Disadvantaged populations face barriers to accessing digital health interventions (122, 130, 131). Barriers include limited resources, poor internet connectivity and low digital literacy. Despite the rapid increase in internet usage, equitable access to health information remains a challenge (166).
Acceptability	GDG members considered that digital health interventions are acceptable. Users of digital health interventions for obesity management in general reported positive experiences and expressed interest in continuing use (164, 165).
Feasibility	The GDG agreed that digital health interventions are likely feasible. Barriers to implementation included limited resources, poor Internet connectivity and low digital literacy (164, 165).

Evidence-to-decision considerations for pharmacotherapy

Question 7. Pharmacotherapy

In children with obesity (P), what is the effect of pharmacotherapy interventions (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Question 8. Alternatives for medications known to cause weight gain

Should children with obesity (P), change to alternatives for medications known to cause weight gain (I) in comparison to no change (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Evidence-to-decision considerations

Benefits	There is very limited evidence available for children. Overall analyses including both children and adolescents reported small benefits. The GDG determined that desirable effects may be small to moderate.
Harms	GDG members agreed that undesirable effects are likely small. Evidence on harms is limited to analyses including both children and adolescents.
Certainty of evidence	The certainty of evidence was low.
Values and preferences	The GDG concluded there is uncertainty about values and preferences; most relevant evidence comes from adolescents.
Balance between benefits and harms	Given the scant available evidence on children, the GDG considered the balance between benefits and harms is unknown.
Resources	Resource requirements vary, although they are likely to be moderate to large. The GDG mentioned that the cost of any pharmacological interventions for people with obesity depends on multiple factors, including setting, coverage, types, dose, and duration of medicine.
Cost-effectiveness	There were no studies on cost-effectiveness for children.
Equity	The GDG found there is no clarity on effect on equity. Obesity and overweight can be consequence of inequity and can further cause inequity in treatment outcomes (190).
Acceptability	The GDG highlighted that acceptability is unclear; there is no evidence from children. Supportive communication between health workers and children with obesity and their parents or caregivers regarding all other possible treatment options is key.
Feasibility	The GDG reported that feasibility is unclear. In general, the timing of obesity management therapy needs to be appropriate in terms of available treatment options and the young person's readiness to try different interventions.

Evidence-to-decision considerations for bariatric surgery and weight-loss and weight-management devices

Question 9. Bariatric surgery

In children with obesity (P), what is the effect of gastric bypass and other bariatric surgery options (I) compared to no intervention (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Evidence-to-decision considerations

Benefits	The GDG considered that, due to lack of studies, benefits are unclear.
Harms	Similarly to benefits, harms are unclear.
Certainty of evidence	There were no included studies.
Values and preferences	There is no empirical evidence on values and preferences regarding weight-loss or weight-management devices for children. Values and preferences are uncertain.
Balance between benefits and harms	Unclear.
Resources	Unknown.
Cost-effectiveness	Unknown.
Equity	Unknown.
Acceptability	Unknown.
Feasibility	Unknown.

Evidence-to-decision considerations for multimodal interventions

Question 11. Multimodal interventions

In children with obesity (P), what is the effect of multimodal interventions delivered by a multidisciplinary team (I) compared to standard care (C) in the clinical setting for the integrated management of obesity to improve health, functioning and reduce obesity-associated disability (O)?

Evidence-to-decision considerations

Benefits	The GDG considered that the benefits of multimodal interventions, based either in health care settings or in community settings, were small.
Harms	In general, the risk of adverse events may be low.
Certainty of evidence	The certainty of evidence was very low.

Values and preferences	There is probably no important variability in values and preferences. Parents and children value interventions including supportive interactions and focused not only on weight loss but also behaviour change and self-esteem improvement. Children prefer participating in multimodal interventions because they value the perceived benefits associated with a healthy diet and staying active, including weight loss, social acceptance, and self-esteem. Parents and children value interventions including supportive interactions and focus not only on weight loss but also behaviour change and self-esteem improvement (92, 131).
Balance between benefits and harms	Probably favours the intervention.
Resources	GDG members highlighted that cost requirements vary. Multimodal interventions may incur costs on parents and adolescents; the extent of these costs will depend on the specific aspects of the intervention.
Cost-effectiveness	The GDG voted that cost-effectiveness likely favours the intervention. Indirect evidence from adolescents reported that multimodal interventions may be cost-effective due to potential benefits in weight management and prevention of chronic diseases.
Equity	The effect of multimodal interventions on equity is unclear. There is a need to address the multiple causes of inequities among underserved communities, girls, and minoritized ethnic groups (122, 130, 131).
Acceptability	The GDG considered that multimodal interventions are acceptable. Multimodal interventions that are appropriate for age, gender, and ethnicity; that are personalized; and that incorporate supportive interactions with health workers and schools are more acceptable (92, 131).
Feasibility	Multimodal interventions are feasible. Financial constraints and parental schedule may hamper the implementation of these interventions.

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