

UK National Screening Committee

Obesity screening in children

31 October 2018

Aim

1. To ask the UK National Screening Committee (UK NSC) to make a recommendation, based on the evidence presented in this document, whether or not screening for obesity in children up to 11 years old meets the UK NSC criteria for a systematic population screening programme.

Previous UK NSC recommendation

2. The current UK NSC recommendation not to screen for obesity in children dates from 2006. This is because there was:
 - a lack of prospective evidence that child obesity is associated with adult morbidity
 - uncertainty that BMI is a reliable enough measure of obesity as defined by excess body fat
 - uncertainty whether child height, for example if a child was tall or short for their age, could have an influence on the reliability of the BMI measure, likelihood of obesity persisting or affecting longer term health
 - a lack of evidence that treatment is effective in the long-term and is not associated with adverse outcomes, including psychological effects
 - a lack of trials comparing child obesity screening programmes with no screening or with other approaches

Evidence summary

3. Two evidence summaries were produced by Bazian Ltd, in accordance with the triennial review process. These addressed screening for obesity in two age groups, the under fives and children aged between seven and 11. <https://legacyscreening.phe.org.uk/obesity>



4. The current evidence summaries address questions generated by uncertainties and lack of evidence identified in the previous review. The aim is to assess whether the volume and direction of the evidence produced since 2006 is sufficient to change the current UK NSC recommendation on screening for obesity in children.

5. The conclusion of the current evidence summaries is that population screening for obesity in children should not be recommended. The volume, quality and direction of evidence published since 2010 does not indicate that there have been significant changes in the evidence base.
 - There is consistent evidence from large prospective cohorts that child obesity aged 7-11 years increases risk of obesity in early adulthood by about 4-5 times. In this age group, this part of criterion 1 was met. The evidence is less clear for children under 5 years of age. In this age group a more limited body of evidence pointed broadly in the same direction. However there was a small volume of studies and these were based on smaller numbers of obese children, tended to follow up to adolescence rather than adulthood and were less consistent in their outcomes. In this age group, this part of criterion 1 was not met.
 - The review concluded that the association between obesity in childhood and cardiometabolic outcomes was uncertain. In children aged 7-11 associations between obesity and adult type 2 diabetes, metabolic syndrome and coronary heart disease were reported. However in relation to stroke, hypertension and breast cancer no association was reported. In children under 5 years of age, few studies had followed obese young children into adulthood and assessed these outcomes. In both age groups the associations and non associations were considered uncertain because of issues relating to the studies. These included variable timing and method of assessment of both child adiposity and adult outcomes, and high risk of bias from attrition and confounding. In both age groups this part of criterion 1 was not met.
 - For the 7 – 11 age group the review of reported a meta analysis of BMI test performance when used for screening for overweight and obesity. This focused on single measurements of BMI. Overall the meta analysis reported an moderate sensitivity and high specificity. However the range of reported test values was wide and the number of



studies was quite limited. In addition, the reference standard used in some of the studies was not the gold standard and adjustment for age at testing was not reported in some studies. Other tests such as waist to height ratio (WHtR) were considered. However very few studies were found. In children under 5 years of age, no studies of test performance were found. In both age groups criterion 5 was not met.

- No studies have directly assessed interventions in screen-detected populations in either age group. In both age groups trials provide evidence that multicomponent behavioural interventions for overweight to obese children and their families can result in small improvements in BMI over a short period of time. However the clinical significance of this is not clear either in the short term or in the longer term. Similarly, the optimal format or duration of these interventions is unclear. No evidence was found which suggested that behavioural interventions are harmful, but neither was any evidence found suggesting that they improve health-related quality of life or self-esteem, or parent-child relationships. For both age groups criterion 10 was not met.

Consultation

6. A three month consultation was hosted on the UK NSC website. Direct emails were sent to ten stakeholder organisation. **Annex A**
7. Comments were received from eight stakeholders:
 - i. Nuffield Department of Primary Care
 - ii. Obesity Group of the British Dietetic Association
 - iii. Royal College of Paediatrics and Child Health
 - iv. Royal College of Physicians
 - v. HENRY (Health, Exercise, Nutrition for the Really Young)
 - vi. Dr Margaret Ashwell OBE and Mrs Sigrid Gibson, researchers on central obesity
 - vii. Mr Richard Welbourn, Past-President, British Obesity and Metabolic Surgery Society
 - viii. Sarah Vince-Cain, registered dietitian
8. The following themes were reflected across the small number of responses:



- Overall, the majority of responses favoured screening. However the weakness of the evidence base was acknowledged by some stakeholders. The context of rising rates of overweight and obesity in all age groups underpinned the sense of urgency and, though this was not shared by all stakeholders, a sense that action on the basis of weak evidence could be justified. Linked to the sense of urgency about this issue was a concern that a recommendation not to introduce screening may result in inactivity and undermine the National Child Monitoring Programme (NCMP).

Response: These reviews do not recommend population based screening. However the intention is not to advocate inactivity on obesity in the relevant sections of the health service or to make a recommendation which negatively impacts upon the NCMP which is a valuable epidemiological tool. However, the UK NSC aims to ensure that screening does more good than harm at reasonable cost. A high bar of evidence is required for this because screening is delivered in large populations of predominantly healthy people. In addition UK NSC recommendations are provisional and the Committee returns to each recommendation at regular intervals. The evidence summaries used to support UK NSC recommendations focus on key issues and criteria. They do not address all the issues which need to be addressed to evaluate the viability of a screening programme. The reviews can highlight areas requiring further consideration either in the next review, between reviews, or in the longer term.

- Across responses there was an acknowledgement that the evidence base relating to the effectiveness of interventions at the individual and / or family level remains weak. However the responses were mixed regarding the significance that should be given to this. For example one response considered it to be a critical gap in the evidence which justified the conclusion of the reviews. Other responses considered that a lack of evidence of effectiveness may be less important than evidence of no effect. In addition to this, the absence of reports of harms from these interventions was emphasised in one response.

Response: No evidence in screen detected populations was identified in the review. This is important for the UK NSC as these populations may respond differently to behavioural interventions compared with populations identified by other mechanisms. Given the limited effectiveness of interventions in populations which have been studied the



review's conclusion that there is limited understanding of which elements of multicomponent interventions work is also an important consideration before recommending screening with a view to intervening at the individual and / or family level. This is particularly the case as one study did report negative feelings amongst parents to who child weight measurement results had been fed back. While the review concluded that this was difficult to interpret a systematic review published after the evidence summary's search dates found that perceptions of weight status could contribute to weight gain rather than improved weight management¹.

- In relation to BMI as the screening test, some stakeholders felt the sensitivity and specificity values reported in the review would be adequate for screening. However others considered single measurements of BMI to be difficult to interpret and proposed serial measurements starting in the early years and continuing throughout the teenage years. Others considered WHtR a superior test and submitted a number of papers for consideration.

Response: Though the summary in the review focused on the BMI performance values it should be noted that a number of other issues were identified. For example the overall volume of BMI screening studies was quite limited with 11 studies included in the meta-analysis. The range of the reported results was very broad, for example sensitivity ranged from 23% to 96%. In addition there was uncertainty about adjustment for age in some of the studies and the multi-component gold standard was not used in most studies. These issues may affect the reliability of the overall estimate of the test values. The proposal that serial BMI measurements should be undertaken throughout childhood and adolescence is based on recognition of the practical limitations of single measurements. However this is a screening strategy which was not considered in the review. All submitted papers, for example those relating to WHtR, published within the review's search dates will be discussed with the reviewers and considered for inclusion in the review. This was not possible to achieve in the short time between the end of the consultation and the UK NSC meeting.

¹ Haynes, A et al, A systematic review of the relationship between weight status perceptions and weight loss attempts, strategies, behaviours and outcomes, *Obesity Reviews*, 2018 Mar; 19(3): 347–363



- All stakeholders questioned the review's conclusion that the link between obesity in childhood and adverse health outcomes in adulthood was subject to uncertainty. However one stakeholder group did agree that the problems inherent in long term cohort studies may affect the outcomes reported in the studies.

Response: The reviewers have been asked to consider the comments and submitted papers relating to this issue. However it should be noted that the review suggested that any uncertainty relating to the study outcomes applied to both outcomes for which there was an association (eg type 2 diabetes, CHD and metabolic syndrome) and those for which there was not an association (eg hypertension, breast cancer and stroke).

Recommendation

9. The Committee is asked to approve the following recommendation:
Systematic population screening for obesity in children up to 11 years should not be recommended.
10. The main reason for this is that there is:
 - an absence of evidence relating to the benefits and harms of interventions to manage or reduce BMI in children detected by screening
 - insufficient evidence relating to the benefits and harms of interventions to manage or reduce BMI in children more generally

An updated recommendation on the natural history of obesity in childhood and the test will be made when the reviewers have considered the comments and submitted papers. However without an effective intervention it is not possible to recommend a national screening programme.

11. In addition, it is proposed that before the next review the UK NSC Secretariat should explore the possibility of further work to follow on from the systematic review of the relationship between perceptions of weight status and behaviour.



*UK National
Screening Committee*

Table of UK NSC criteria considered in the review to be completed following reviewers assessment of stakeholder comments and submitted publications.

List of organisations contacted:

- Association for the Study of Obesity
- British Obesity Surgery Patient Association
- Faculty of Public Health
- Institute of Child Health
- Obesity Group of the British Dietetic Association
- Royal College of General Practitioners
- Royal College of Physicians
- Royal College of Physicians and Surgeons of Glasgow
- Royal College of Physicians of Edinburgh
- Royal College of Surgeons



UK National Screening Committee
Screening for obesity in children –an evidence review
Consultation comments pro-forma

Name:	Professor Donal O'Donaghue	Email address:	xxxx xxxx
Organisation (if appropriate):	Royal College of Physicians (RCP)		
Role:	RCP registrar		
Do you consent to your name being published on the UK NSC website alongside your response?			
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
For which evidence summary are you submitting comments?			
<ul style="list-style-type: none"> • Screening in children up to 5 years old <input checked="" type="checkbox"/> • Screening in children between 7 and 11 years of age <input checked="" type="checkbox"/> 			
Section and / or page number	Text or issue to which comments relate	Comment	
General	General	The RCP is grateful for the opportunity to respond to the above consultation. We have liaised with our Advisory Group on Weight and Health and would like to make the following comments.	

General	The recommendation that children should not be screened for obesity	<p>We are strongly opposed to the recommendation that children should not be screened for obesity. As the report recommends, more evidence should be sought but that is not a reason to not recommend it.</p> <ol style="list-style-type: none">1. Screening of children who are or are not obese is only one aspect of it. Children are gaining weight throughout childhood and detecting those who are crossing centiles is also an important objective.2. There is certainly evidence that children who are overweight develop problems and often persist in being overweight later in life.3. While there may be a lack of evidence that treating children is safe and effective, this is because not enough studies have been done rather than studies have been done which prove that it is not safe and not effective. The systems are simply not in place and should be.4. The review itself says that it was a rapid process.5. Its recommendations should not be taken forward. <p>https://www.nejm.org/doi/full/10.1056/NEJMoa1803527</p>
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Overview

The childhood obesity epidemic presents one of the greatest health threats to both children's and the UK's future¹. Weight status in childhood is an important predictor of overweight, obesity, health and mortality risk across the life course, and we know that children who are obese are around five times more likely to grow into adults who are obese². It follows, therefore, that the lack of progress to date in reducing childhood obesity will translate to significant additional morbidity and mortality in the future adult population, placing increased social and economic burdens on future generations.

Our State of Child Health report 2017 called for Government to extend the National Child Measurement Programme to additionally measure children after birth, before school and during adolescence. We believe that the infrastructure currently exists to rapidly enable reinstatement of universal monitoring of child weight and growth from infancy to adolescence, particularly in England. Measuring should begin from birth, the beginning of the critical first two years of a child's life, to its final years of attending secondary school. These adolescent measurements are as important as screening in earlier childhood to ensure that signs of overweight in females of childbearing age are eliminated before the parents of tomorrow leave school for the adult world.

We recognise that there is a lack of strong evidence supporting routine weight monitoring. However this is not the same as evidence of lack of effectiveness. In the fight against childhood obesity, there is a growing consensus that actions should be considered if they have face validity and are likely to contribute to obesity prevention, even where strong evidence is lacking. Recent evidence from adults that 30 second interventions by GPs can result in significant weight loss³ suggest that measurement and brief interventions may be similarly effective in children.

There is currently no financial incentive for GPs to measure children, whilst measuring the BMI of an adult is an established element of the Quality and Outcomes Framework that provides additional payments to GPs. This is clear discrimination against children, and should be a priority for the NHS.

We are concerned that the approach taken in the two documents (*Screening for obesity in children <5 years* and *Screening for obesity in children age 7-11 years*) is dismissive, and could threaten the future of child measurement and of the national child measurement programme. We would like to highlight the following evidence under three themes picked out across both documents to demonstrate support for continued obesity screening and weight measurement in children.

¹ RCPCH State of Child Health report 2017. https://www.rcpch.ac.uk/sites/default/files/2018-09/soch_2017_uk_web_updated_11.09.18.pdf

² Simmonds, M., Lewellyn, A., Owen, C. G. & Woolacott, N. Predicting adult obesity from childhood obesity: A systematic review and meta-analysis. *Obes. Rev.* 17, 95–107 (2016)

³ Aveyard et al 2016. Screening and brief intervention for obesity in primary care: a parallel, two-arm, randomised trial. *Lancet*, 2016 Nov 19;388(10059):2492-2500

1. Links with other health problems

Section and / or page number	Text or issue to which comments relate
Screening for obesity in children <5 years. Page 4	<i>The review found that overweight or obese children up to 5 years of age may remain overweight or obese later in life. But it is not clear whether this leads to health problems. Some long-running studies suggest that there might be a risk of some overweight or obese children developing diabetes. Other studies do not suggest that child obesity is not linked with problems like heart disease.</i>
Screening for obesity in children age 7-11 years. Page 4	<i>The review found that overweight or obese children aged 7 to 11 years are about 4-5 times more likely to become overweight or obese as adults. Some long running studies suggest that 7 to 11 year olds with higher body may be more likely to develop diabetes. It's less clear whether there could be any links with other health problems like heart disease or high blood pressure. Problems with the studies make it difficult to be sure of these results. For example, only a small group of the original participants were available at the end of the studies. This makes it difficult to know if the results are reliable. They also looked at children born over 60 years ago when obesity was much less common</i>

Comments

Both documents claim that the link between childhood obesity and later health problems is unclear. To question this link is simply inaccurate. A number of systematic reviews have shown that weight status in early childhood is an important predictor of overweight and obesity in later life and of health and mortality risk across the life-course.⁴⁵⁶

Being overweight or obese during childhood can:⁷⁸

- Lead to an increased risk of a host of conditions including Type 2 diabetes, high blood pressure, cardiovascular disease and bowel cancer.
 - Numbers of children with Type 2 diabetes have risen significantly, with an increase in those receiving treatment within paediatric diabetes units of 41% since 2014, coinciding with the obesity epidemic.⁹
- Negatively impact educational attainment.
- Lead to low self-esteem and negative body image, and limit the ability to take part in physical activity.

⁴ WHO. Report of the commission on ending childhood obesity. 2016. Available from www.who.int/end-childhood-obesity/en/

⁵ Brophy S et al. Risk factors for childhood obesity at age 5: analysis of the Millennium Cohort Study. BMC Public Health 2009; (9): 467.

⁶ Gardner DS et al. Contribution of early weight gain to childhood overweight and metabolic health: a longitudinal study. Pediatrics 2009; 123(1): 67-73

⁷ Caird J et al. Childhood obesity and educational attainment: a systematic review. 2011.

⁸ Griffiths LJ et al. Self-esteem and quality of life in obese children and adolescents: a systematic review. International Journal of Paediatric Obesity 2010; 5(4): 282-304.

⁹ Office for National Statistics (2017) [National Child Measurement Programme 2017](#) ONS: London

- Increase visits to the GP.

Assessing weight status in early childhood is an essential part of a coordinated approach to childhood obesity prevention, and for individuals it is key to taking action to help children stay on or return to a healthy weight across their life. Recognition is a problem: it is estimated that a third of parents in England are unable to recognise that their children are overweight¹⁰.

Other benefits of growth trend data

The following non-exhaustive list outlines conditions where growth trend data is highly relevant to management and interpretation of treatment responses:

- Drug dose calculations
- Food intolerance, cow's milk allergy, coeliac disease
- Failure to thrive
- Gastro-oesophageal reflux disease (GORD) and infantile vomiting
- Safeguarding issues, child neglect, and monitoring of foster children
- Self-harm risk assessment in teenagers
- Risk assessment in emerging eating disorders – it is crucial that health professionals have appropriate reference ranges for teenagers in order to assess physical risks from anorexia
- Morbid obesity in children – tracking of weight change in order to consider type 2 diabetes, cardiovascular and non-alcoholic fatty liver disease risks.
- Depression and anxiety and bullying – is body image a factor?
- Precocious or delayed puberty
- Assessing children in relation to anaesthetic risk
- Using change in growth trend to interpret risk of serious underlying condition if a child presents with medically unexplained physical symptoms (MUPS)

¹⁰ Black JA et al. Child obesity cut-offs as derived from parental perceptions: cross-sectional questionnaire. *British Journal of General Practice* 2015; 65(633): e234-239

2. Use of BMI measure

Section and / or page number	Text or issue to which comments relate
Screening for obesity in children <5 years. Page 4	<i>The main test is measurement of body mass index (BMI) which uses height and weight. Other tests for obesity are also available. But no research has been published about the accuracy of these tests in children up to 5 years of age.</i>
Screening for obesity in children age 7-11 years. Page 4	<i>The main test for obesity is measurement of body mass index (BMI) which uses height and weight. If a BMI measure indicates overweight or obesity this is likely to be correct. But the test would miss some children with excess body fat. There was a lack of information on why this might be. Some studies suggest that other tests may be better than BMI but there were only a small number of studies. More research would help to confirm this finding, including looking at the feasibility of undertaking such measurements.</i>

Comments

A single growth measurement (ie height, weight and calculated BMI measured at a distinct point in time) is difficult to interpret without the ability both to view trends and to compare with the population, and what is normal. This is only achieved by comparison of a child's data with age and sex appropriate norms (e.g. on growth charts). The obesity thresholds for adults (e.g. BMI of 30kg/m²) are essentially meaningless in children – who need their BMI assessed for age and sex to identify overweight and obesity.

We recognise that assessing BMI in children is more complicated than in adults, because children's BMI will change as they grow and mature. BMI centiles should therefore be used to measure how far a child's BMI is above or below the average BMI value for their age and sex, and usually categorised as healthy weight, overweight or underweight. This method of measurement is well-established and there are a variety of evidence-based, age related growth charts to choose from.¹¹

Measurement is an important part of the Healthy Child Programme and as part of the partnership between the Professional Record Standards Body (PRSB) and NHS Digital there are now established standards¹² for measurement, including height, weight, head circumference and BMI. These standards have been endorsed /supported by 19 organisations and involved 3 workshops and over 2000 consultations received. The idea of these standards is to allow GPs to view the trend of growth from birth and importantly the growth before the NCMP that happens in Reception (remembering that by then a third are overweight or obese).¹³

¹¹ <https://www.rcpch.ac.uk/resources/uk-world-health-organisation-growth-charts-2-18-years>

¹² <https://theprsb.org/standards/healthychildrecord-2/>

¹³ Royal College of Paediatrics and Child. State of Child Health. 2017. <https://www.rcpch.ac.uk/state-of-child-health>

3. Interventions for overweight and obese children

Section and / or page number	Text or issue to which comments relate
Screening for obesity in children <5 years. Page 4	<i>Interventions are available for overweight and obese children. These usually aim to increase physical activity and change diet. Sometimes they include parents as well as children. These have resulted in small reductions in weight over a short period of time. But it is not clear if the weight reductions would continue over a longer period of time without ongoing support. At the same time the studies did not look at children found through screening. This is important as children found in this way might respond in a different way to the offer of these interventions.</i>
Screening for obesity in children age 7-11 years. Page 4	<i>Interventions are available for overweight and obese children. These usually aim to increase physical activity and change diet. Sometimes they involve parents as well as children. These have resulted in small reductions in weight over a short period of time. But most studies have not followed children up beyond 12 months. It is not clear if the weight reductions would continue over a longer period of time without ongoing support.</i>

Comments

Routine linkage of existing data on birthweight/infant growth data with national measurement programme data at the individual level would provide weight/BMI trajectory data for individuals, particularly in England where a second school-age (year 6) measurement occurs. This would allow identification of individuals rapidly gaining weight and allow early intervention. This is particularly important as the effectiveness of interventions when children are already obese is very low.¹⁴

There is under-referral of children where increasing BMI centile trends are a concern. This may reflect inadequate service provision to refer children with obesity to as well as historically dismissive attitudes to obesity amongst health professionals. There is a recognised need in the health system to integrate health prevention strategies into primary care assessments as part of the 'making every contact count' agenda. Recent research has highlighted a lack of confidence by GPs in having difficult conversations about obesity during consultations.¹⁵ Currently, few conversations around child weight management are happening in primary care – and only 9% of GPs surveyed recently felt confident in starting a discussion on weight management¹⁶.

Time is often cited as a barrier to discussing health promotion matters, however that does not mean that it does not warrant the additional investment. This is particularly important in UK primary care

¹⁴ Oude LH, Baur L, Jansen H, et al. Interventions for treating obesity in children. *CochraneDatabaseSystRev* 2009; (1): CD001872

¹⁵ Johnson R, Robertson W. Evaluation of the Eat Well Move More child weight management service. Division of Health Sciences, Warwick Medical School, University of Warwick: Coventry, 2016

¹⁶ Viner et al. Understanding and improving general practitioner (GP) use of childhood BMI surveillance data from NCMP. Available on request.

where GPs have appointments typically of ten minutes' duration to discuss the reason for attendance and other ongoing issues; clinicians are free, of course, to spend as long as they see fit.

Research has demonstrated that behaviourally-informed, very brief, physician-delivered opportunistic interventions are acceptable to patients and an effective way to reduce population mean weight.¹⁷ Separate research in East London has demonstrated that children who are overweight are more likely to consult GPs for weight management, particularly around the time of the NCMP measurements.¹⁸ This demonstrates the need for measurement to facilitate conversations about weight and, thinking longer-term, to facilitate weight interventions.

There is an emerging anxiety about children whose growth data indicates that they are severely obese, yet their parents are not engaging. The CHAMPS¹⁹ project has shown that where parents do engage in their child's growth data, they can influence the weight trajectory that their child is on. Increased weight data would allow for better and earlier trend identification and more opportunities to engage with parents and patients and influence a child's growth.

Creating a focus on child growth measurement would stimulate greater engagement with discussing weight issues with families. The need for normalisation of measurement is increasingly recognised – including an active response to that information, rather than normalisation or denial of obesity.

Summary of RCPCH policy priorities on child weight measurement

- The National Child Measurement Programme should be extended to measure children after birth, before they start school and during adolescence in order to monitor trends and act quickly.
- Children should be given parity with adults under the Quality and Outcomes Framework (QOF) so that GPs are equally incentivised to measure children and young people's BMI.
- Capacity for measurement in primary care should be strengthened, with the necessary IT systems and measuring instruments routinely available to accurately measure and record a child's BMI.
- A consistent approach should be developed across health professions to capture data effectively, and information about a child's weight should be accessible to all professionals who need it.

About the RCPCH

The College is a UK organisation which comprises over 15,000 members who live in the UK, Ireland and abroad and plays a major role in postgraduate medical education, as well as professional standards.

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¹⁷ <https://www.ncbi.nlm.nih.gov/pubmed/27789061>

¹⁸ [https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(17\)32972-0.pdf](https://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(17)32972-0.pdf)

¹⁹ <https://champshealth.org/>



**UK National Screening Committee
Screening for obesity in children –an evidence review**

Consultation comments pro-forma

Name:	XXXX XXXX	Email address:	XXXX XXXX
Organisation (if appropriate):	HENRY		
Role:	Policy Manager		
Do you consent to your name being published on the UK NSC website alongside your response?			
Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> (please publish as HENRY response)			
For which evidence summary are you submitting comments?			
<ul style="list-style-type: none"> • Screening in children up to 5 years old <input checked="" type="checkbox"/> • Screening in children between 7 and 11 years of age <input type="checkbox"/> 			
Section and / or page number	Text or issue to which comments relate	Comment	
		<i>Please use a new row for each comment and add extra rows as required.</i>	

HENRY (Health, Exercise, Nutrition for the Really Young) is an early years charity with expertise in the prevention and management of early child obesity. HENRY delivers evidence-based, multi-layered behaviour change programmes and effective services to support parents to achieve healthier outcomes for themselves and their children – including improved nutrition, emotional wellbeing, parenting efficacy, breastfeeding, and becoming more active. We predominantly support families living in areas of social deprivation. Alongside this we have trained health and early years practitioners to support families to prevent and manage early child obesity and provide children with the best possible start in life – working in partnership with local authorities, NHS Trusts and other key national and local organisations.

Comments below relate to screening in children up to 5 years old

Child obesity is one of the greatest public health challenges we face today. Nearly a quarter of children in England are overweight or obese by the time they start primary school (aged 4-5 years), rising to around one third by the time children leave primary school aged 11. Stark inequalities exist, with children from our most deprived communities more than twice as likely to be obese as children from more affluent areas¹.

Early screening would provide a critical opportunity to identify children at risk of obesity and to provide appropriately designed interventions to address current and prevent future obesity and related ill-health. Lifestyle habits are developed in the early, formative years. Intervening when children are young, when lifestyle habits are being formed, is likely to produce more successful outcomes than later interventions² when family lifestyle routines become more ingrained. Furthermore, the early years is a time when parents have more contact with health professionals and services, and are more receptive to help and support³.

We are therefore disappointed with the recommendation of this review. We have no issue with the diligent work undertaken by the reviewers, but rather the evidence criteria, which excludes world-class national surveillance data, high quality studies and government reports/analysis. Rather than a lack of evidence per se, the authors have reached their conclusions based on a paucity of published study data. Nevertheless, application of such rigorous criteria still produces some evidence in support of screening.

Childhood obesity prevention is a priority for the World Health Organization and national governments around the world. In England, the government has recently published Chapter 2 of its childhood obesity plan⁴ with a commendable, ambitious targets to halve child obesity by 2030 and to reduce obesity inequalities between the least and most deprived children. Early child obesity screening – with tailored, well-evaluated interventions – would provide a credible and effective foundation upon which to reach such important public health targets.

National surveillance data and government reports, along with academic studies highlighted in this latest Bazian review combine to produce a logical case in

support of early screening:

1. The UK has worrying levels of obesity among pre-school children
2. The UK has high levels of obesity among 4-5 year olds
3. Obesity tracks between the first (aged 4-5) and final (aged 10-11) years of primary school
4. Obesity tracks from childhood and adolescence into adulthood
5. Obesity in childhood has negative health impacts
6. Obesity in adults had negative health impacts
7. Some evidence of effective interventions to manage/treat early child obesity

1. The UK has worrying levels of obesity among preschool children

Latest national obesity survey data for preschool aged children (Health Survey for England 2015)⁵ identified rates of obesity among 2-4 year olds of 11% (CI: 9.3%-13.2%). These rates of obesity are similar to those seen when children enter primary school.

2. The UK has high levels of obesity among 4-5 year olds

Recent data from the National Child Measurement Programme¹ shows that 9.5% of children in Reception (aged 4-5 years) are obese, with a further 12.8% overweight. Severe obesity affects 2.4% (14, 659) reception-aged children in England annually.

3. Obesity tracks between the first (aged 4-5) and final (aged 10-11) years) of primary school

Public Health England longitudinal analysis of NCMP data examined how weight status tracks in individual children during primary school⁶. Results show that of children obese (including severely obese) in Reception, around 80% will remain obese in Year 6. Of those overweight (excluding obese and severely obese) in Reception, only around one third will have become a healthy weight by Year 6 (31% will remain overweight, around 30% will become obese, and

13% severely obese). The authors conclude that for most children, unhealthy excess weight (≥ 91 st centile) tracks from Reception to Year 6.

A Millennium Cohort Study⁷ showed that the chances of becoming obese (including severely obese) at age 11 were 5.7% (95% CI: 5.2% to 6.2%) for a healthy weight 5-year-old and 32.3% (29.8% to 34.8%) for an overweight 5-year-old. The chance of an obese 5-year-old remaining obese was 68.1% (63.8% to 72.5%), and a severely obese 5-year-old had a 50.3% (43.1% to 57.4%) chance of remaining severely obese by age 11.

When considered alongside Bazian author's findings (that a child who is overweight at age 5 has increased risk of future obesity), these studies and analyses strengthen the case for obesity tracking throughout childhood.

From 2013, all child NCMP records have included a unique NHS identifier to enable tracking of individual children between Reception Year (aged 4-5 years) and Year 6 (aged 10-11 years). Longitudinal data will be available on the 2013 cohort, and all subsequent cohorts from autumn 2019. We recommend therefore that the UK National Screening Committee revisit the issue of screening of under 5 year olds in the light of this new child obesity tracking data in 2019.

4. Obesity tracks from childhood and adolescence into adulthood

It is internationally accepted that child obesity tracks into adolescence and to adulthood with multiple studies showing that obese children and adolescents are far more likely than their normal weight peers to go on to become obese adults^{8,9,10,11}.

5. Obesity in childhood has negative health impacts

Childhood obesity has immediate and long-term effects on physical, social, and emotional health.

- These include asthma, sleep apnoea, bone and joint problems, type 2 diabetes (a condition previously only rarely seen outside childhood) and risk factors for heart disease^{12,13,14,15}.
- Children with obesity are bullied and teased more than their normal weight peers^{14,16} and are more likely to suffer from social isolation, depression, and lower self-esteem^{16,17,18}.

6. Obesity in adults has negative health impacts

It is internationally acknowledged and accepted that adult obesity is linked to a wide range of diseases, most commonly:

- type 2 diabetes
- hypertension
- some cancers
- heart disease
- stroke
- liver disease

Obesity is also be associated with poor psychological and emotional health, and poor sleep. Obese adults may also be more likely to suffer from stigma which may impact on their self-esteem.

Adult obesity is associated with reduced life expectancy^{19,20}.

7. Some evidence of effective interventions to manage/treat early child obesity

Despite the very stringent inclusion criteria, Bazian authors were able to conclude that some trails indicate that multicomponent interventions for young children have statistically meaningful effects on child BMI. Conversely, authors found no evidence of harmful effects of obesity management interventions for young children.

Other interventions show effective impacts of interventions on key determinants of child obesity and these are worthy of investigation: including Early Intervention Foundation (EIF) assessed programmes (and those currently under EIF review). Interventions and services to improve early child health, including obesity, are more likely to have effective outcomes if they focus on supporting the development of parenting skills. Parenting skills (authoritative, responsive and attuned parenting) and parenting confidence (for example, to be able to hold boundaries around screen time or snacks) are key to behaviour change in families. Programmes such as HENRY which combine support for both behaviour change and the development of parenting skills can have positive impacts on parenting confidence and efficacy, family diet and physical activity, eating behaviours and reductions in the consumption of energy dense foods^{21,22} many of which are sustained.

Given the incontrovertible data evidence of high levels of early child obesity¹⁵ and the therefore significant public health potential for properly resourced early years interventions to prevent future obesity, we feel that wider inclusion criteria should be introduced so that the impacts of a broader range of child

obesity interventions can be assessed.

In conclusion, we urge Government and National Screening Committee to consider the introduction of child weight screening at an early age. An ideal and cost-effective mechanism for surveillance already exists – the Healthy Child Programme mandated health visitor checks with children aged 2-2.5 years. Intelligence suggests that height and weight is currently measured during these checks in many areas. A national survey⁵ revealed that 11% of children aged 2-4 years are already obese. These levels are equal to those we see in Reception year, indicating that obesity is established long before children start school. An early years screening programme would identify children at risk and provide an opportunity for health professionals and other early years practitioners to support families to tackle child obesity early and prevent the often lifelong negative impacts of this disease on health, wellbeing, morbidity and mortality.

Furthermore, by facilitating targeted, tailored interventions for obese preschool aged children (and their families), early child screening is likely to contribute to reducing inequalities in child obesity.

We recommend that the Screening Committee revisit the question of obesity screening of under 5s following the publication of linked NCMP data in 2019.

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UK National Screening Committee
Screening for obesity in children –an evidence review
Consultation comments pro-forma

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Do you consent to your name being published on the UK NSC website alongside your response?			
Yes <input type="checkbox"/>			
For which evidence summary are you submitting comments? Both			
<ul style="list-style-type: none"> • Screening in children up to 5 years old <input type="checkbox"/> • Screening in children between 7 and 11 years of age <input type="checkbox"/> 			
Section and / or page number	Text or issue to which comments relate	Comment	
	Summary:	<i>Please use a new row for each comment and add extra rows as required.</i>	
		BMI is an appropriate measure of excess weight and increased health risks in children. However, there is a lack of evidence for the effectiveness of interventions for children with, or at risk of, obesity. In the absence of such evidence we do not support a national screening programme.	

	<u>Weight is retained into adulthood and is associated with disease</u>	Children who are defined as obese (on the basis of BMI) are five times more likely to be obese in adulthood than those who were not obese. ¹ Children who are obese are at increased risk of non-communicable diseases, particularly type 2 diabetes, cardiovascular disease, and some cancers. ² Health risks of obesity relate both to the magnitude of excess weight, as well as the duration of exposure. ^{3,4} Therefore, children with obesity are at risk of developing more non-communicable diseases at earlier age, increasing the risk of complications and premature mortality.
	<u>BMI is an imperfect measure of adiposity but still a good indicator of children at increased health risks</u>	While the accuracy of BMI varies according to the extent of body fatness, among children who are obese, BMI is a good indicator of children at increased risk of adverse risk factors High BMI-for-age has been shown to have a moderately high (70%-80%) sensitivity and positive predictive value, along with a high specificity (95%). ⁵
	<u>Most interventions to prevent or treat obesity show limited effectiveness</u>	Evidence of effective interventions is limited. A systematic review for interventions to prevent childhood obesity showed that the average weight loss of children in interventions was -0.15kg/m. ⁶ Three recent trials of preventative interventions in schools and families found no significant impact on BMI at follow-up. ⁷⁻⁹
	<u>Lack of trials testing the effect screening and opportunistic intervention</u>	Opportunistic interventions have shown to be effective in adults, ¹⁰ but there is no evidence to show this would work in a similar way for children. There are no trials testing the effectiveness of screening and opportunistic interventions in children. Research is needed to identify acceptable ways to raise issue and how to encourage participation in a programme; as well as finding effective programmes before a national screening programme could be justified.

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**UK National Screening Committee
Screening for obesity in children –an evidence review**

Consultation comments pro-forma

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Yes			
For which evidence summary are you submitting comments? Both			
<ul style="list-style-type: none"> • Screening in children up to 5 years old • Screening in children between 7 and 11 years of age 			
Section and / or page number	Text or issue to which comments relate	Comment	
		<i>Please use a new row for each comment and add extra rows as required.</i>	

Pg 4 (<5)	Screening children for obesity would be to identify those who are obese.	Screening children should be to identify individual BMI status as opposed to identifying those who are classified as obese. Screening in early childhood (at around 2 years of age) would offer a BMI baseline, support parental awareness of children's growth and encourage future monitoring by parents and by the wider health system where necessary.
Pg 4 (<5)	The aim of this would be to help them lose weight in order to prevent health problems in later life.	It is rarely necessary or advisable to promote weight loss in children - weight stabilisation whilst monitoring for linear growth is a preferable approach and supports BMI reduction.
Pg 4 (<5)	But it is not clear whether this leads to health problems.	We know that overweight in childhood is linked with emotional issues and that it tends to lead to overweight in adulthood. Serial measurements, beginning with a screening measurement at 2 years of age would start to illustrate a child's growth pattern and predict, and potentially prevent, overweight in later life.
Pg 6 (7-11)	the majority of obese adults will not have been obese children.	Rates of obesity are progressive and increase through to adulthood. By beginning the process of assessing a child's growth status in early childhood, and raising parental awareness, progressive overweight and obesity through primary years is more likely to be identified and reduced.



UK National Screening Committee
Screening for obesity in children –an evidence review
Consultation comments pro-forma

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Do you consent to your name being published on the UK NSC website alongside your response?			
Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>			
For which evidence summary are you submitting comments?			
<ul style="list-style-type: none"> • Screening in children up to 5 years old <input checked="" type="checkbox"/> • Screening in children between 7 and 11 years of age 			
Section and / or page number	Text or issue to which comments relate	Comment	
		<i>Please use a new row for each comment and add extra rows as required.</i>	
Both documents	General text	It seems a highly unwise, retrograde step to consider withdrawal of national screening for children of school age in the groups ≤ 5 years and 7-11 years which presumably means that the National Child Measurement Programme would be stopped. If this is not the intention, it is unclear from the documents provided what screening is being referred to. https://digital.nhcs.uk/services/national-child-measurement-programme/ The schools measurement programme is currently the only mechanism to document	

		<p>the appalling rise in childhood obesity. Irrespective of whether BMI or weight in these age groups accurately predicts future health problems for the individual, this information, aggregated, is central to much-needed public health strategies to reduce childhood overweight and obesity. Unless the overall data are known, we will not know success rates for systematic prevention or interventions for either of these.</p>
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UK National Screening Committee
Screening for obesity in children –an evidence review

Consultation comments pro-forma

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Yes			
For which evidence summary are you submitting comments?			
<ul style="list-style-type: none"> • Screening in children up to 5 years old 			
Section and / or page number	Text or issue to which comments relate	Comment	
		<i>Please use a new row for each comment and add extra rows as required.</i>	
Purpose/aim of the	'Studies in children aged 6 years were mostly included in this review, although	It is unclear why this review was not for children aged up to and including 6	

review p5	some studies have considered children of 6 years alongside older children so have been covered by the 7-11 review'	years.
Findings and gaps in the evidence p6	'The association with type 2 diabetes only just reached statistical significance'	This means it was statistically significant.
Findings and gaps in the evidence p7	'There is minimal data on potential adverse effects from providing interventions to young children and their parents'	No evidence of adverse effects of multicomponent interventions in young children was identified. It is not clear why this statement is considered part of a rationale for not screening.
Recommendations on screening that can be made on the basis of the current review p7	'Level of evidence insufficient to support a recommendation for screening in children ≤ 5 years- including children at school entry (aged 4-5....)'	Although it is not classed as a screening programme, the National Child Measurement Programme has been instrumental in ascertaining the scale of the childhood obesity problem in England. In addition it has been shown to improve parental awareness of overweight and obesity in their children and has provided evidence of need for the provision of weight management services in different geographical areas and childhood demographics. The need for commissioning of weight management services in many areas of the country has been established as a result of this valuable data source.
Basis for current recommendation p9	'Primary prevention of obesity in children was likely to be the most cost effective step, and it was uncertain whether all effective preventative strategies have been implemented'	We agree that primary prevention is critical and support the current work in this area (most notably by PHE). Nonetheless while primary prevention may be required, it will not address the issue of overweight or obesity in children already affected. In our view, this is not a good reason not to screen.
Summary: criterion 2 not met p21	'Therefore assessment around age 4-5 may only identify a small proportion of those who will become obese in adolescence and adulthood'	This does not suggest that screening should not take place, rather that the optimal age for screening is not clear from this limited data. Generally prospective cohorts suggest that overweight or obesity age 4-5 increases risk of overweight or obesity in later childhood/adolescence (p32). Although there are inconsistencies in the data, 'overweight or obesity at age 5 years generally predicts later overweight/obesity' (p18) appears to contradict the summary. In addition, the recent publication of retrospective and

		<p>prospective data of >50,000 children suggests that tracking of obesity from young children (3 years) into adolescence is the norm (https://www.nejm.org/doi/full/10.1056/NEJMoa1803527). We would also like to draw attention to the current consultation on mandatory calorie labelling for foods and drinks in the out-of-home sector (https://www.gov.uk/government/consultations/calorie-labelling-for-food-and-drink-served-outside-of-the-home). Part of the stated evidence base for this is that 'obese children tend to remain overweight and become obese adults. Moreover, the more obese the child is, the higher the chance of them becoming an obese adult'. We urge that this new evidence is taken into account.</p>
Conclusions p32		<p>We accept the limitations to the data which make conclusions difficult to reach. However a lack of evidence is not the same as evidence of no effect. In our view, this review helps to clarify the research data required, but it does not establish that there is no need for screening. We note the publication of the recent report on child health from the Royal College of Paediatrics and Child Health (https://www.rcpch.ac.uk/resources/state-child-health). The recommendations of the report include 'opportunistic recording of weight and BMI of all children (2-18 years) once a year'. The findings and recommendations of this rapid review are in stark contrast to that of experts and practitioners in the area of child health.</p>
Limitations of the rapid review process p33		<p>We accept the limitations of this rapid review. However we strongly disagree that on the basis of the evidence presented that screening in this age group should not be recommended. We urge the committee to reconsider and in particular to take the new data into account.</p>



UK National Screening Committee
Screening for obesity in children –an evidence review

Consultation comments pro-forma

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Yes			
For which evidence summary are you submitting comments?			
<ul style="list-style-type: none"> • Screening in children between 7 and 11 years of age 			
Section and / or page number	Text or issue to which comments relate	Comment	
		<i>Please use a new row for each comment and add extra rows as required.</i>	
Findings and gaps in	'Child obesity may be a clear risk factor for	The consistent evidence from large prospective cohort studies that child	

the evidence p 6	adult obesity...'	obesity in 7-11 years increases risk of adult obesity suggests that screening in this age group may be beneficial. The clear evidence that adult obesity impacts negatively upon numerous health outcomes therefore suggests that screening in children aged 7-11 years should be promoted.
Findings and gaps in the evidence p 6	'It is estimated that about 30% of obese adults would have been obese as children'	We accept the uncertainties within the data, and that this analysis did not include screening in adolescents. A higher proportion of obese adults may have been obese as adolescents than as children. Nonetheless 30% is a substantial proportion of adults exposed to the potential harms of excess adiposity over decades, and there are no doubts about the health risks associated with adult obesity. In addition, recently published data which included >50,000 children demonstrated that tracking of obesity from children aged as young as 3 years of age into adolescence was the norm (https://www.nejm.org/doi/full/10.1056/NEJMoa1803527). We would also like to draw attention to the current consultation on mandatory calorie labelling for foods and drinks in the out-of-home sector (https://www.gov.uk/government/consultations/calorie-labelling-for-food-and-drink-served-outside-of-the-home). Part of the stated evidence base for this is that 'obese children tend to remain overweight and become obese adults. Moreover, the more obese the child is, the higher the chance of them becoming an obese adult'. We urge that this new evidence is taken into account.
Basis for current recommendation p8	Point 3: 'Without evidence for a safe effective treatment that gives long term benefit, the value of obesity detection would be questionable'	No evidence of effect is not the same as evidence of no effect. No harm of multicomponent behavioural treatments has been demonstrated, and a gap in the literature with regard to long term follow up of interventions should not be a reason for not identifying those at risk. In addition some multicomponent interventions commissioned are linked to improved self-esteem and quality of life.
Basis for current recommendation p9	'Primary prevention of obesity in children was likely to be the most cost effective step...'	We agree that primary prevention is ideal and support the current work being undertaken in particular by PHE and SACN in this regard. However primary prevention even if effective will not address the issue in

		those children already carrying excess body fat, and it is those children who may be missed without screening. Given the higher prevalence of overweight and obesity with deprivation, this could result in further disadvantage to an already vulnerable group.
Discussion of question 1 evidence, Simmonds et al HTA p16	‘Additionally the cohorts commenced many decades ago. There are differences in terms of environmental and lifestyle factors between children today and those born 30 to 60 years ago.’	We agree and this is a significant problem inherent in long term cohort studies. However the environmental and lifestyle risk factors for excess weight are much greater now than they were 30 to 60 years ago, thus it is our view that cohort studies may well underestimate any such associations.
Discussion of Simmonds findings in relation to risks of adult morbidity p19	‘High child BMI is associated with statistically significant increased risks of adult CHD and type 2 diabetes’	Although we accept that the limitations within the data make a definitive answer difficult, the previous point is also relevant here. There appears to be more clarity with regard to type 2 diabetes and the costs of type 2 diabetes are substantial in terms of individual, health and social care costs.
Summary p21	‘Most children who are obese between these ages will be obese adults’ and ‘This means that treatment/preventative interventions targeted at obese children may have limited impact in tackling adult obesity’	Limited impact does not mean no impact. This data suggests that identifying obese children between 7-11 years will be effective in identifying many obese adults of the future. This suggests that <u>in addition</u> to identifying these children, how the 70% of obese adults who were not obese as children can be identified also needs to be addressed. BOTH cohorts need to be identified.
Discussion p35	‘The BMI reduction compared with control is statistically significant but whether the difference would have meaningful clinical effect is unclear and was not reported by the studies.....Whether interventions could reduce risk of cardiometabolic morbidity such as type 2 diabetes or hypertension is also unclear’	A small reduction in BMI in a large group of children may well have significant public health impact, particularly if it was maintained in the longer term. The Foresight report of 1998 was clear that doing nothing was not an option, and evidence should be gathered alongside interventions. Small reductions in BMI in obese children occurring where increasing efforts are being made to address environmental cues which encourage underactivity and overconsumption may well be clinically significant but this is data which needs to be gathered prospectively.
Summary: criterion 10 not met p37	‘There is limited follow-up available beyond 12 months....’	No evidence of longer term impact is not evidence of no effect. This data is needed.

Conclusions p38	'Therefore identifying and treating obese children may be of limited value for identifying all those who may be at risk in adulthood and reducing the overall prevalence of obesity'	We do not agree that this is a reason not to act. In our view this suggests that in addition to screening in children aged 7-11 years, additional screening opportunities to identify the 70% of obese adults who were not obese as children is needed. Exactly when this should occur needs to be ascertained.
Limitations of the rapid review process p39 & 40		We agree that this process results in significant limitations and attempts to address these have been made. However the age groups appear somewhat arbitrary, in that some 6 year old children have been included in this review and others in the sister review (screening in children ≤ 5 years). Data from some 12 year old children has been included in this review. It is not clear why this review was not for children aged 6-12 years. However whether or not this would impact on the findings of the review is not clear. While we accept that BMI alone is not the most reliable weight measurement tool for individuals, it remains the most practical screening tool available.
		We note the publication of the recent report on child health from the Royal College of Paediatrics and Child Health (https://www.rcpch.ac.uk/resources/state-child-health). The recommendations of the report include 'opportunistic recording of weight and BMI of all children (2-18 years) once a year'. The findings and recommendations of this rapid review are in stark contrast to that of experts and practitioners in the area of child health.
		We strongly disagree with the recommendations of the committee for the reasons above. In our view, <u>more</u>, not less, screening is needed. We urge the committee to reconsider their proposal and in particular to take newly published evidence into account.



UK National Screening Committee
Screening for obesity in children –an evidence review
Consultation comments pro-forma

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Do you consent to your name being published on the UK NSC website alongside your response?			
Yes <input type="checkbox"/> yes No <input type="checkbox"/>			
For which evidence summary are you submitting comments?			
<ul style="list-style-type: none"> • Screening in children up to 5 years old <input type="checkbox"/> • Screening in children between 7 and 11 years of age <input type="checkbox"/> yes 			
Section and / or page number	Text or issue to which comments relate	Comment	
		<i>Please use a new row for each comment and add extra rows as required.</i>	
Page 5	..Because of these reasons the conclusion of the review is that screening for obesity in children aged 7 to 11 should not be	We are amazed at this negative conclusion on early screening when so much Government effort is now on childhood obesity.	

	recommended.	
Page 7	..Diagnostic studies would benefit from evaluating alternative non-BMI screening tests in this age group, for example the waist-to-height measure....	<p>Although the consultation defines obesity as excess total body fat, we suggest that central obesity should be the main focus because of its better correlation with metabolic risk. There is a much better case for screening for central obesity .</p> <p>We are very pleased to see that the evidence on waist-to-height ratio, a proxy for central obesity, is being considered as an alternative to BMI in this age group.</p> <p>Our comments mainly relate to the studies which have included waist-to-height ratio in relation to screening for central obesity.</p>
Page 9 Criterion 2	KQ1b) Does obesity in childhood predict the development of morbidity in adulthood, for example, hypertension and type 2 diabetes	The evidence is likely to depend on the definition of obesity used. See above
Page,9 Criterion 5	KQ2a) (Performance of BMI or other screening)	Waist-to-height ratio (WHtR) may be more sensitive than BMI for total fat and especially central/abdominal/visceral fat. (see above)
Page 4	BMI may miss some children with excess body fat. There is a lack of information on why this may be.	The poor sensitivity of BMI as indicator of total fat may be because it does not distinguish FM and FFM or take account of fat distribution. WHtR is less likely to miss over-fat children because their excess body fat tends to be distributed centrally and reflected in girth rather than weight.
Page,9 Criterion 5 Page 4 Page 22	<p>KQ2a) (Performance of BMI or other screening)</p> <p>Some studies suggest that other tests may be better than BMI but there were only a small number of studies.</p>	<p>We have found 2 other systematic review , not included in the update, that are relevant to criterion 5:</p> <ol style="list-style-type: none"> 1. Martin-Calvo et al. Association between Body Mass Index, Waist-to-Height Ratio and Adiposity in Children: A Systematic Review and Meta-Analysis. <i>Nutrients</i>. 2016;8(8). 2. Jensen NS, Camargo TF, Bergamaschi DP. Comparison of methods to measure body fat in

		7-to-10-year-old children: a systematic review. Public Health. 2016;133:3-13.
		<p>1. Martin-Calvo et al. included 5 studies and concluded that both BMI and WHtR were useful to diagnose obesity in pediatric populations.</p> <p>The pooled R2 was not significantly different for BMI and WHtR, but there was high heterogeneity. Sensitivity analysis to exclude one study (which expressed body fat as fat mass index and used only overweight or obese participants), gave a significantly greater pooled estimate for WtHr (R2 = 0.72) compared to BMI (R2 = 0.65) ($z = -6.82$. $p < 0.01$).</p> <p>Moreover, the only study to assess the agreement between the anthropometric measures and DEXA, (taking the standard reference for obesity as a %BF above the 75th age and sex-specific percentile) found higher agreement and higher AUC for the z-score of the WHtR.</p> <p>In boys AUC was 0.91 for the BMI and 0.97 for the WHtR, in girls an AUC of 0.90 for the BMI and 0.94 for the WHtR.</p> <p>2. Jensen et al. included 27 studies of children aged 7-10y. The comparison between the tested methods and the reference showed that body mass index (BMI) and waist circumference (WC) had a moderate positive correlation with percent body fat as calculated by DEXA, air-displacement plethysmography (ADP) or isotope dilution. There was a moderate positive correlation between waist-to-height ratio (WHtR) (NB abstract error refers to weight-to-height) and BF, as estimated by ADP and skinfolds. Performance studies suggest that BMI and WC are very specific but less sensitive methods.</p>
Criterion 5	There should be a simple, safe, precise and validated screening test.	Both reviews by Jensen et al. and Martin Calvo et al. conclude that BMI and WHtR are easy to obtain, harmless, and affordable, and hence good techniques for clinical practice and epidemiological research.

P4	More research would help confirm the feasibility of undertaking such (other) measurements..	
<p>Criterion 5</p> <p>P4</p>	There should be a simple, safe, precise and validated screening test.	<p>There are many studies which conclude that waist-to-height ratio can be used as a screening tool in children. Here is a selection :</p> <ol style="list-style-type: none"> 1. Campagnolo PD, Hoffman DJ, Vitolo MR. Waist-to-height ratio as a screening tool for children with risk factors for cardiovascular disease. <i>Ann Hum Biol.</i> 2011;38(3):265-70. 2. Choi DH, Hur YI, Kang JH, Kim K, Cho YG, Hong SM, et al. Usefulness of the Waist Circumference-to-Height Ratio in Screening for Obesity and Metabolic Syndrome among Korean Children and Adolescents: Korea National Health and Nutrition Examination Survey, 2010-2014. <i>Nutrients.</i> 2017;9(3). 3. Dong B, Wang Z, Arnold LW, Song Y, Wang HJ, Ma J. Simplifying the screening of abdominal adiposity in Chinese children with waist-to-height ratio. <i>Am J Hum Biol.</i> 2016;28(6):945-9. 4. Dou Y, Adalibiek, Sun C, Jiang Y, Dai L, Wu J, et al. [Distribution of waist circumference and waist-to-height ratio and their values in obesity screening among 3-9 years old Han and Uygur ethnic children in Xinjiang Uygur Autonomous Region of China]. <i>Zhonghua Liu Xing Bing Xue Za Zhi.</i> 2016;37(1):50-4. 5. Fujita Y, Kouda K, Nakamura H, Iki M. Cut-off values of body mass index, waist circumference, and waist-to-height ratio to identify excess abdominal fat: population-based screening of Japanese school children. <i>J Epidemiol.</i> 2011;21(3):191-6. 6. Hubert H, Guinhouya CB, Allard L, Durocher A. Comparison of the diagnostic quality of body mass index, waist circumference and waist-to-height ratio in screening skinfold-determined obesity among children. <i>J Sci Med Sport.</i> 2009;12(4):449-51.

	<p>7. Zhou D, Yang M, Yuan ZP, Zhang DD, Liang L, Wang CL, et al. Waist-to-Height Ratio: a simple, effective and practical screening tool for childhood obesity and metabolic syndrome. <i>Prev Med.</i> 2014;67:35-40.</p> <p>8. Yoo EG. Waist-to-height ratio as a screening tool for obesity and cardiometabolic risk. <i>Korean J Pediatr.</i> 2016;59(11):425-31.</p> <p>Further studies on adolescents which conclude that waist-to-height ratio can be used as a screening tool:</p> <p>1. Bauer KW, Marcus MD, El ghormli L, Ogden CL, Foster GD. Cardio-metabolic risk screening among adolescents: understanding the utility of body mass index, waist circumference and waist to height ratio. <i>Pediatr Obes.</i> 2015;10(5):329-37.</p> <p>2. Choi DH, Hur YI, Kang JH, Kim K, Cho YG, Hong SM, et al. Usefulness of the Waist Circumference-to-Height Ratio in Screening for Obesity and Metabolic Syndrome among Korean Children and Adolescents: Korea National Health and Nutrition Examination Survey, 2010-2014. <i>Nutrients.</i> 2017;9(3).</p> <p>3. Liu XL, Yin FZ, Ma CP, Gao GQ, Ma CM, Wang R, et al. Waist-to-height ratio as a screening measure for identifying adolescents with hypertriglyceridemic waist phenotype. <i>J Pediatr Endocrinol Metab.</i> 2015;28(9-10):1079-83.</p> <p>1. Brambilla P, Bedogni G, Heo M, Pietrobelli A. Waist circumference-to-height ratio predicts adiposity better than body mass index in children and adolescents. <i>Int J Obes (Lond).</i> 2013;37(7):943-6.</p> <p>2. Caminiti C, Armeno M, Mazza CS. Waist-to-height ratio as a marker of low-grade inflammation in obese children and adolescents. <i>J Pediatr Endocrinol Metab.</i> 2016;29(5):543-51.</p> <p>3. Chung IH, Park S, Park MJ, Yoo EG. Waist-to-Height Ratio as an Index for</p>
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		<p>Cardiometabolic Risk in Adolescents: Results from the 1998-2008 KNHANES. <i>Yonsei Med J.</i> 2016;57(3):658-63.</p> <p>4. Frayon S, Cavaloc Y, Wattelez G, Cherrier S, Lerrant Y, Ashwell M, et al. Potential for waist-to-height ratio to detect overfat adolescents from a Pacific Island, even those within the normal BMI range. <i>Obes Res Clin Pract.</i> 2017.</p> <p>5. Jiang Y, Dou YL, Xiong F, Zhang L, Zhu GH, Wu T, et al. Waist-to-height ratio remains an accurate and practical way of identifying cardiometabolic risks in children and adolescents. <i>Acta Paediatr.</i> 2018.</p> <p>6. Kromeyer-Hauschild K, Neuhauser H, Schaffrath Rosario A, Schienkiewitz A. Abdominal obesity in German adolescents defined by waist-to-height ratio and its association to elevated blood pressure: the KiGGS study. <i>Obes Facts.</i> 2013;6(2):165-75.</p> <p>7. Lee KK, Park HS, Yum KS. Cut-off values of visceral fat area and waist-to-height ratio: diagnostic criteria for obesity-related disorders in Korean children and adolescents. <i>Yonsei Med J.</i> 2012;53(1):99-105.</p> <p>8. Liu XL, Yin FZ, Ma CP, Gao GQ, Ma CM, Wang R, et al. Waist-to-height ratio as a screening measure for identifying adolescents with hypertriglyceridemic waist phenotype. <i>J Pediatr Endocrinol Metab.</i> 2015;28(9-10):1079-83.</p> <p>9. Lu Q, Iseli TJ, Yin FZ, Ma CM, Liu BW, Lou DH, et al. The relationship between the waist-to-height ratio and glucose and lipid metabolism in Han adolescents. <i>Indian J Pediatr.</i> 2010;77(5):547-50.</p> <p>10. Ma CM, Liu XL, Yin FZ, Gao GQ, Wang R, Lu Q. Hypertriglyceridemic waist-to-height ratio phenotype: association with atherogenic lipid profile in Han adolescents. <i>Eur J Pediatr.</i> 2015;174(9):1175-81.</p> <p>11. Madruga JG, Moraes Silva F, Scherer Adami F. Positive association between waist-to-height ratio and hypertension in adolescents. <i>Rev Port Cardiol.</i> 2016;35(9):479-84.</p> <p>12. Mehta SK. Waist circumference to height ratio in children and adolescents. <i>Clin</i></p>
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		Pediatr (Phila). 2015;54(7):652-8.
P8	BMI may ... also give misleading results if the child is tall or short for their age.	WHtR may be less misleading than BMI because it does not rely on age-specific reference curves
Page 20/21	KQ2 obesity predicting morbidity in later childhood and adulthood	The update summary considers that Criterion 2 was not met, despite evidence from several prospective studies supporting a link between raised BMI at 7-11 years and adult T2DM and metabolic syndrome (Koskinen, 2017). This conclusion was reached because the studies were inconsistent in scope, methods and findings, at risk of attrition bias and that they were old studies. We suggest that for Met S and diabetes, such effect sizes (RR of 2.5 to 3.5) deserve further consideration. Further meta-analyses may be warranted for these outcomes, especially those evaluating non-BMI indicators.
<p>In conclusion, we suggest that the review may be underestimating the power of screening to detect children who may be at risk of cardiometabolic disease in adulthood. This is because the question is confined to total obesity (defined as total body fat) for which the default assessment in population screening is BMI. Screening should focus on central obesity .Performance criterion is considered not met by BMI on grounds of low sensitivity (high false negative rate). However, WHtR has been shown in many studies to be superior to BMI in indicating abdominal (central) obesity and cardiometabolic risk in various populations and age groups.</p> <p>Our recommendation is that research should be commissioned to collate and analyse existing data on WC and WHtR, and that WC (with height to produce WHtR) should be a component of national screening measurement programmes to strengthen evidence on measures of central obesity which relate to metabolic risk.</p>		

