

Impact case study template (REF3b)

Title of case study: Childhood obesity assessment: influence on policy, practice and public perception

1. Summary of the impact - (indicative maximum 100).

With childhood obesity now of global public health and clinical importance, attention had to be directed toward how best to identify the condition and more importantly those who are at further risk of serious obesity-related conditions. This case study illustrates how assessment has moved beyond the simple crude measure, challenging the accepted approach and developed more sensitive and specific assessment tools. Described is a new range of clinical assessment charts which allow practitioners and epidemiologists to evaluate a range of body characteristics known to be linked to morbidity, make a fuller assessment of individual risk and target better and specific intervention.

2. Underpinning research (indicative maximum 500 words)

The underpinning research encompasses the work lead by Prof. David McCarthy beginning in 1998. This unit broadened across disciplines encompassing dietetics and exercise science. Prof. McCarthy strategically repositioned his research from basic obesity science to an applied and population-based approach, pre-empting the need for improved assessment tools given the impending dramatic rise in (childhood) obesity prevalence both nationally and globally. His earlier research on the developmental origins of adult obesity had identified the capacity for abdominal obesity (the more risky type of body fat distribution) to develop early in childhood - at the time considered to be a phenomenon of adulthood. This lack of understanding was reflected in the body mass index (BMI) being the childhood obesity assessment tool – a crude weight-height relationship. He recognised that more sensitive tools were essential which challenged thinking and practice in childhood obesity assessment. In 2001 he published the first (and only) set of UK waist circumference percentile charts (McCarthy et al. 2001). Across a period of 10 years, more than 25 countries including major global populations of USA, Australia and Canada produced national waist circumference references. His charts and associated software were immediately adopted by the Child Growth Foundation (responsible for producing national clinical growth charts) and made available to clinicians, epidemiologists and other healthcare professionals working in obesity assessment and management. These charts are used in clinical practice in paediatric obesity where they determine baseline abdominal adiposity and then used longitudinally to track changes across growth and obesity intervention. They give information in changes in risk for obesity-related morbidity including dyslipidaemia, and type 2 diabetes. He then demonstrated that in contrast to generalised obesity, abdominal obesity had increased in UK children and youths at a far greater rate, thus demonstrating the true extent of obesity-related disease risk in the UK childhood population (McCarthy et al. 2003, McCarthy et al. 2006).

His research extended to develop further sets of childhood clinical charts – specifically to assess total body fatness – the component of body composition directly associated with morbidity. This contrasted with BMI charts which simply assess total body weight in relation to height. Published in 2006, these new charts substantially reduced the risk of misclassifying children compared with BMI whilst at the same time focusing attention away from excess weight.

This research questioned the validity of current assessment guidelines as well as thinking on the relationship between growth and development and body fat accumulation. Additionally it provided an opportunity to further develop and refine the assessment tools in light of new knowledge on body composition-related risk for cardiometabolic diseases in adults and children. This research then addressed the influence of socioeconomic status, ethnicity and weight management intervention on the validity and application of obesity assessment tools. He developed new national references for skeletal muscle mass in children. Sarcopenia (age-related loss of muscle mass) is an emerging important clinical and public health issue. These new muscle charts will allow the tracking of individuals who show early signs of sarcopenia.

2. References to the research (indicative maximum of six references)

Jackson AA, Langley-Evans SC, McCarthy HD (1996) Nutritional influences in early life upon obesity and body proportions. *Ciba Found Symp* 201: 118-29; discussion 129-37, 188-93. Review.

McCarthy HD, Jarrett KV, Crawley HF (2001) The development of waist circumference percentiles in British children aged 5.0-16.9 y. *Eur J Clin Nutr* **55**: 902-7.

McCarthy HD, Ellis SM, Cole TJ (2003). Central overweight and obesity in British youth aged 11-16 years: cross sectional surveys of waist circumference. *Brit Med J* **22**: 326 (7390):624.

McCarthy HD (2006). Body fat measurements in children as predictors for the metabolic syndrome: focus on waist circumference. *Proc Nutr Soc* **65**:385-92

McCarthy HD, Cole TJ, Fry T, Jebb SA, Prentice AM (2006). Body fat reference curves for children. *Int J Obes (Lond)*. 30: 598-602.

McCarthy HD & Ashwell M (2006). A study of central fatness using waist: height ratios in UK children and adolescents over two decades supports the simple message – ‘keep your waist circumference to less than half your height’. *Int J Obesity* **30**: 988-992.

4. Details of the impact (indicative maximum 750 words)

The research findings have impacted to varying extents concerning obesity assessment and intervention in children and public and commercial perception of children’s body shape and size.

i) Clinical practice. Impact is evidenced through clinical assessment charts published alongside other growth charts used in healthcare practice. Evidence of their use is their widespread incorporation into routine paediatric and dietetic assessment, and routine GP and school nurse usage. Nationwide child obesity intervention programmes including MEND and More Life assess abdominal fatness using these national references. The clinical assessment charts and their scientific rationale are included in the major global textbook ‘Principles of Nutritional Assessment’ by Rosalind Gibson, published in 2005. This is impact upon teaching beyond that delivered at this institution and is a text that underpins professional practice in nutrition, dietetics and child health.

ii) Health policy. NICE clinical guidelines now formally recognise that waist measurement in children gives additional information on risk of developing chronic health problems. This can only be interpreted and guidance offered through use of the national references generated in this case study. Recent NICE guidelines on psychosis and schizophrenia in young people (CG155), recommend the monitoring of waist through WC centile charts in patients receiving anti-psychotic drugs due to their effect on weight gain. The International Diabetes Federation now support waist measurement as the “*sine qua non*” for the diagnosis of metabolic syndrome in children, based on the data relating WC with components of the metabolic syndrome. It states the WC>90th centile as the diagnostic criterion, which can only be determined using the charts produced in this case study.

iii) Public Health and surveillance. The National Obesity Observatory endorsed waist measurement in children via a briefing paper titled ‘Measures of central adiposity as an indicator of abdominal obesity’ in 2009. This paper was largely based upon the research output from this case study and most of the content of the report was provided by Prof. McCarthy.

iv) Public and professional awareness. The impact of this underpinning research is strengthened through high-profile dissemination routes, including national daily newspapers (including on-line material). Examples include: The Observer (2007, The changing shape of British children), The

Guardian (2006, The BMI myth) and the Times Higher (London Metropolitan University, Fat is a class issue, July 2010).

Dissemination to specialist audiences include invited presentations at the following conferences:

- The Nutrition Society, summer, 2013 - Childhood nutrition and obesity: current status and future challenges
- 2012 IFST/Leatherhead Food Research, Nutrition for Olympians, nutrition for all.
- Weight Concern 2011, Primary Care 2011.
- Health and wellbeing@work 2010.
- Obesity & Health 2009.
- Association for the study of obesity 2009

A further related example of impact included collaborative activity with the City University of New York to address childhood obesity in the two global cities. One end result was a report 'ObesCities', with a high profile launch at City Hall, London and in New York. The report was endorsed by the Mayor of London.

An additional opportunity was the on-screen expert input into 2 series of the Sky1 programme Fat Families where abdominal obesity and its metabolic consequences was brought to a national TV audience.

v) **Industry/commercial** The body fat charts were produced through collaboration with MRC Human Nutrition Research, Cambridge, London School of Hygiene & Tropical Medicine, Institute of Child Health, London and the Child Growth Foundation, London. Industrial funding from Tanita Eu facilitated this collaboration and also brought this tool into domestic usage through incorporation into home body fat monitors (see link). This industrial impact has extended to include the new children's skeletal muscle reference charts. The manufacturers state that they have almost 50% of the domestic market share. Additional commercial impact is demonstrated through the incorporation of the children's body fat references into a dual X-ray absorptiometry (DXA) scanner.

An innovative impact occurred through consultancy for a UK doll manufacturer. Arklu produced a new doll at the end of 2012 whose shape and dimensions were based on the reference measurements for a healthy 9 year old girl generated from Prof. McCarthy's research. This product was manufactured in response to calls for a more age-appropriate body shape in dolls, including waist, leg length and chest size, It has sold worldwide with enormous global publicity. The impact of this worldwide health message is beyond anything achievable through conventional health promotion routes and illustrates the power of innovative health and commercial collaborations.

5. Sources to corroborate the impact (indicative maximum of 10 references)

i. Clinical practice –The sources below corroborate the commercial availability of the waist charts and the body fat charts which are used in clinical practice.

http://www.healthforallchildren.com/?product_cat=growth-charts

<http://www.mendprogramme.org/aboutobesity/obesityexplained>

ii) Health policy – The documents below indicate the role of waist measurement in the general assessment of children and adolescents, particularly in cases of psychosis and schizophrenia – see section 1.3.15 and table 1, p47.

[\(NICE: Prevention, Identification, Assessment and Management of Overweight and Obesity in Adults and Children\)](#)

NICE: psychosis and schizophrenia: recognition and management in children and young people.

January 2013. <http://www.nice.org.uk/cg155>

iii) Public health practice – This briefing document published by the National Obesity Observatory describes the importance of central adiposity in disease risk. More importantly it also describes the tools for assessing central adiposity in children and adolescents which have been developed from the research which underpins the impact for public health practice in this case study.

http://www.noo.org.uk/NOO_pub/briefing_papers

iv) Public and professional awareness – The following links corroborate how the research in this case study has been brought to a general audience.

<http://www.timeshighereducation.co.uk/story.asp?sectioncode=26&storycode=412455>)

<http://sky1.sky.com/sky1hd-shows/fat-families>

http://www.london.gov.uk/media/press_releases_mayoral/mayor-london-joins-forces-new-york-battle-childhood-obesity

v) Industry/commercial impact – The following links are to site where the waist charts and waist reference data are used in commercial contexts – as part of domestic and clinically body composition analysers – bioimpedance systems and dual energy x-ray absorptiometry scanner.

<https://www.tanitashop.de/en/Why-we-need-to-move-from-BMI-to-BIA>

<http://www.coopersurgical.com/ourproducts/Pages/NorlandXR-800.aspx?order1=XR->

[800&leaf=/ourproducts/boneden/norlandxr/Pages/csland.aspx?LC=Bone%20Densitometry&name=Norland%20XR-800&tc=1](http://www.coopersurgical.com/ourproducts/boneden/norlandxr/Pages/csland.aspx?LC=Bone%20Densitometry&name=Norland%20XR-800&tc=1)

<http://www.lottie.com/for-parents/> - This link indicates the contribution made by the case study in developing the new doll based on his data on children's body dimensions and composition.