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Original research

Development of the Australian standard definition of child/adolescent overweight and obesity

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Abstract (Nutr Diet 2003;60:74–7)
The development of a standard definition of child and adolescent overweight and obesity for inclusion in the Australian National Health Data Dictionary is part of a strategy to address the growing prevalence of obesity among young people in Australia. A standard definition will allow more consistent data to be collected for monitoring the prevalence of overweight and obesity, for research into the causes and consequences of overweight, for public health program evaluation and for evaluating and improving clinical practice.

The proposed definitions were developed following a thorough literature search and were then extensively reviewed by potential stakeholders. Body mass index is the most practical and convenient method for assessing overweight among young people, with an international reference suggested for population and clinical research, and BMI-for-age reference charts suggested for clinical practice.

Key words: body mass index, waist circumference, adiposity, anthropometry, children, adolescents, overweight, obesity

Introduction

In 2001, the Australian Commonwealth Department of Health and Aged Care provided funding to develop a standard definition of child and adolescent overweight and obesity for inclusion in the National Health Data Dictionary (www.aihw.gov.au/knowledgebase/index.html), an online resource for people interested in health related research. Definitions included in the dictionary are peer-reviewed and comply with an approved format. A standard definition could be used in population and clinical research, in health care settings and in non-health care settings such as schools and gymnasia.

Overweight and obesity is a major health problem in Australia, with obesity contributing over 4% of the total burden of disease in 1996 (1). Recent reports have found that 19 to 23% of young Australians are either overweight or obese and that the prevalence of overweight and obesity doubled between 1985 and 1997 (2–4). Among children and adolescents, it is unclear at what level of adiposity health risks begin to rise. There is ample evidence however, that overweight and obese children suffer from a range of health problems. These include immediate problems of psychological dysfunction and social isolation (5–7), as well as the development of risk factors for intermediate and long-term physical problems such as cardiovascular disease and diabetes. In addition, children and adolescents who are overweight and/or obese are more likely to be overweight or obese as adults, with all of the subsequent health implications (8).

Body mass index (BMI; weight/height²) is widely used among adults as a measure of adiposity, with a BMI > 25 kg/m² being indicative of overweight and a BMI > 30 kg/m² being indicative of obesity (9). These cut-off points are related to the points at which the risk of adverse health outcomes rise steeply (9). The absence of a standard definition of overweight and obesity for young people has made research into the health outcomes and comparison of prevalence difficult.

Process for developing a standard definition

In developing an Australian standard definition of child and adolescent overweight and obesity we extensively reviewed both local and international literature. The literature search focussed on three major areas: the currently available methods for measuring adiposity (body fatness),

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the relationship between overweight and obesity and adverse health outcomes in young people, and existing definitions of overweight and obesity.

The second stage of the project involved consultation with a range of stakeholders. Stakeholders included representatives from relevant State and Territory government departments, the Strategic Inter-Governmental Nutrition Alliance (SIGNAL), the Strategic Inter-Governmental Physical Activity and Health (SIGPAH) group and peak bodies representing nutrition and health research such as the Dietitians Association of Australia and the Australasian Society for the Study of Obesity.

Finally, the development of definitions in the standard National Health Data Dictionary format were developed. The Department of Health and Aged Care presented the definitions to the National Health Data Committee.

Measuring adiposity
Adiposity can be measured directly, using techniques such as magnetic resonance imaging (MRI) or can be estimated by indirect or anthropometric techniques such as weight and waist circumference measurements. Power, Lake and Cole suggested that ‘an ideal measure of body fat should be accurate in its estimate of body fat; precise, with small measurement error; accessible, in terms of simplicity, cost and ease of use; acceptable to the subject; and well-documented, with published reference values’. They go on to comment that ‘no existing measure satisfies all these criteria’ (10).

Direct measures of body composition enable estimation of total body fat mass and various components of fat-free mass. Such techniques include underwater weighing, MRI, computerised axial tomography (CAT) and dual energy x-ray absorptiometry. These techniques all require relatively high levels of subject cooperation and are not suitable for small children. In addition, all require high-cost equipment and highly trained personnel. Therefore, methods that measure fat more directly are used predominantly for clinical research in tertiary care settings, but may be used as ‘gold standards’ against which to validate indirect measures of body fatness (11).

Indirect measures of relative adiposity or fatness include waist, hip and other girth measurements, skinfold thickness, bioelectrical impedance analysis (BIA), and indices derived from measured height and weight such as body mass index (BMI), the ponderal index (weight/height3) and Benn’s index (weight/heightp) (12). All can be performed using simple, low-cost equipment. All anthropometric measurements rely on the skill of the person taking the measurement, and the relative accuracy of the technique as a measure of adiposity must be validated against a ‘gold standard’ technique. Among children and adolescents, BMI provides a convenient and accurate estimation of body fat (13).

Defining overweight and obesity
Researchers have used different methods to define overweight and obesity among children and adolescents. For example, weight-for-height, BMI-for-age and other charts have all been used. Body mass index is significantly associated with relative fatness in childhood and adolescence, and is the most convenient way of measuring relative adiposity (14). The International Obesity Task Force (15), and the United States Centers for Disease Control and Prevention (CDC) (16) have recommended BMI as a tool for categorising overweight and obesity among children and adolescents.

Among adults and children, the presence of high levels of abdominal or visceral fat is associated with the metabolic syndrome (17). While abdominal fat is most accurately measured using CT scan or MRI, the most convenient and accessible measure is waist circumference (17). Waist circumference may be useful in clinical practice as a means of determining the response of a child or adolescent to weight control measures. In epidemiological studies, it may be used to characterise a population in terms of abdominal fat distribution and to determine the associated prevalence of risk factors. However, waist circumference cannot be used to categorise a young person as being at high or low risk as there are no accepted cut-off points that define excess abdominal adiposity in this age group.

Having selected BMI, which reference standard should be used?

Epidemiological research
An expert committee convened by the International Obesity Task Force in 1999 determined that although BMI was not perfect as a measure of adiposity, it had been validated against more direct measures of body fatness, and may therefore be appropriate to define overweight and obesity in children and adolescents (15). As previously mentioned, it is not clear at which BMI level adverse health risk factors increase in children, and so the workshop recommended cut-offs based on the accepted adult cut-offs of 25 kg/m² for overweight and 30 kg/m² for obesity.

Subsequently, Cole et al. (18) developed a reference population based on data from national surveys from six countries: United Kingdom, Brazil, the Netherlands, Hong Kong, Singapore and the United States. Using the data from each country, centile curves of BMI were drawn that at 18 years passed through the points of 25 kg/m² and 30 kg/m². The curves from each country were averaged to provide an international reference of age- and gender-specific BMI cut-offs to define overweight and obesity.

The table developed by Cole et al. is extremely useful for epidemiological research, in that children and adolescents can be categorised as non-overweight, overweight or obese. However, the authors acknowledge that the reference data set may not be representative of non-Western populations, and are not intended for use in clinical practice. Indeed, a BMI-for-age chart is more appropriate for clinical use.

Clinical use
In the United States, the Centers for Disease Control and Prevention have recently developed new growth reference charts, including a gender- and age-specific BMI range (16). The new reference charts are based on data from five national health examinations from 1963 to 1994, and five supplementary sources of data. To avoid an upward shift of the weight and BMI curves, data from the
most recent survey for those children aged over six years were excluded (16).

The CDC BMI-for-age reference chart documentation has recommended that those children with a BMI greater than or equal to the 95th percentile be classified as overweight and those children with a BMI between the 85th and 95th percentiles be classified as ‘at risk of overweight’. This approach selects a cut-off point which is arbitrary, and not related to evidence of health risks. It also sets the prevalence at 15% for overweight and 5% for obesity provided the population being studied is similar to the population on which the BMI-for-age chart was based.

The advantage of using BMI-for-age centiles is that a child can be described as being above or below certain centile lines (for example the 85th or 90th centile), which can be useful in a clinical setting. Using this method, a child can be followed over time with serial BMI measures. The problems with the use of BMI-for-age centiles are that data are derived from a reference population, and that classifying a child as overweight or obese based on BMI being above a certain centile is arbitrary. In addition, some clinicians may wrongly interpret the centiles as representing an ideal population rather than a reference population, which may in fact have been developed from a population with a greater prevalence of obesity.

A further problem in the use of BMI-for-age charts is that there are differences in body composition across adult ethnic groups, with one study in Caucasians and Asians showing differences of two to three BMI units in adults with the same body fat composition (19). Studies in the United States have found that African American, Mexican American and Mohawk Indian children carry more central fat at the same BMI than white children (17). An important issue in terms of health risk is whether ethnicity influences the strength or magnitude of the relations between intra-abdominal adipose tissue and the subsequent development of disease risk factors (20).

Some countries, including the United Kingdom, Singapore and the Netherlands have developed their own BMI-for-age reference charts using local data (18). Australia does not have locally derived BMI-for-age charts; paediatric institutions in Australia currently use charts provided by a pharmaceutical company, which are adapted from Hamill PVV ‘National Center for Health Statistics growth curves’ (21). Recently, however, several expert working groups have considered the use of the CDC 2000 charts for use among Australian children (Marina Kern, Commonwealth Department of Health and Ageing, personal communication, 20 November 2001).

**Proposal for Australian use**

The consortium recommended that BMI be used to define overweight and obesity among children and adolescents in Australia, the international growth reference developed by Cole et al. for the International Obesity Task Force (18) be used in research settings, while a suitable BMI-for-age chart be used in clinical practice. While we were not asked to specifically recommend a BMI-for-age chart, the CDC 2000 charts meet the criteria of being part of a group of charts measuring length, height, weight and circumference all derived from the same population. Table 1 summarises the recommendations from the consortium.

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<td>Clinical research</td>
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**References**