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Methodological limitations in measuring childhood and adolescent obesity and overweight in epidemiological studies: does overweight fare better than obesity?

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Abstract

Objectives: International definitions of childhood obesity based on body mass index (BMI) are intended to be used for international comparisons of obesity prevalence. In general, they are not appropriate to be used in clinical practice. The objective of this study is to compare international-ecological vs. national-clinical reference data of obesity in Spain, as well as to describe trends.
Design: Cross-sectional study from a representative national random sample of Spanish children and youth conducted between 1998 and 2000. Prevalence estimates of obesity in a national random sample of Spanish children and youth are presented in this paper, defined by age- and sex-specific BMI national reference standards for the 85th percentile (overweight) and 95th percentile (obesity), as well as by Cole *et al.* criteria. The study protocol included personal data, data on education and socio-economic status for the family and anthropometric measurements.
Setting: Population-based study set in Spain.
Subjects: A random sample of 3534 individuals, aged 2–24 years.
Results: Prevalence of obesity using national reference data was higher (15.3%) than using international data (5.8%), but overweight rates were similar. Agreement observed for both definitions was low for obesity but higher for overweight. Obesity trends among children and adolescents in Spain show increasing patterns in boys but not in girls.
Conclusions: Results indicate the need to standardise the definitions of obesity and overweight in childhood and recommend the use of overweight due to the greater degree of agreement observed among the different methods used. The IOTF reference method underestimates obesity rates in Spanish schoolchildren.

Keywords
Obesity
Overweight
Children
Adolescent
Spain

Obesity is a chronic disease that is complex and multifactorial in nature, which usually develops during childhood and adolescence. Its origins are a mixture of genetic and environmental factors, the most important being related to one's surroundings and conduct, which then form the basis for the imbalance between energy intake and expenditure. Obesity is characterised by an excessive accumulation of body fat that is made manifest by excess body weight and volume[1]. However, it is simplistic to think that obesity only results from excessive consumption and/or insufficient levels of physical activity. Sociodemographic changes, such as the increase in single parent households or the decrease in the number of offspring per family, have affected children's behaviour in various ways including eating and physical activity habits.

Diverse methods are available to assess childhood and adolescent obesity, but the most utilised both in clinical and epidemiological settings consist of evaluating the relationships between age, sex, weight, height and body mass index (BMI). Skinfold measures are also useful, especially the triceps skinfold, as well as other methods that can be applied in certain circumstances (bioelectrical impedance, dual-energy X-ray absorptiometry and nuclear magnetic resonance)[2–4].

Ideally, the definitions of overweight and obesity in children should be based on increased risk of morbidity. There is evidence for a relationship between increased

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paediatric BMI and short- and long-term health outcomes[5], but this is currently insufficient to establish BMI cutoff points. A number of distinct definitions based on centiles of BMI have been used. Accepted definitions are desirable so that trends over time can be monitored, and comparisons can be made between populations[6]. Moreover, established standards would be of use in clinical practice as well as in epidemiological settings.

The objective of the present study is to analyse the methodology applied in the evaluation of childhood and adolescent obesity, via the comparison of distinct cutoff points and/or BMI reference tables within the context of the EnKid study in Spain.

Methodology

EnKid is a population-based study designed to evaluate the eating habits and nutritional status of Spanish children and youth. One of its objectives was to assess the nutritional status of the target population via anthropometric measurements so as to estimate the current prevalence of overweight and obesity and to evaluate trends occurring over the last few decades.

It is an observational cross-sectional epidemiological study carried out in a population-based sample, and whose methodology has been previously described[7–9].

Sample

The study population consisted of all inhabitants between 2 and 24 years residing in Spain. The sample population comprised of all individuals aged 2 to 24 years who resided in Spain and who were registered in the census.

The theoretical sample size was estimated to be 5500 subjects, assuming a 70% participation rate that would result in a sample of around 3850 individuals. The age groups were divided into the following classifications: 2–5 years (pre-school), 6–9 years (school age), 10–13 years (pre-adolescents), 14–17 years (adolescents) and 18–24 years (young adults).

The sampling technique included stratification according to geographical area (six strata) and municipality size (four strata) and randomisation into clusters, with Spanish municipalities being the primary sampling units, and individuals registered in the census within these municipalities comprising the final sample units.

Anthropometric measurements

Anthropometric variables that were measured included weight, height, waist circumference, hip circumference, arm circumference, wrist circumference, head circumference and elbow width.

Weight was measured with electronic bathroom scales previously calibrated to ±0.1 kg. Participants were weighed by the interviewer in the subjects' homes without shoes and wearing only underclothes. Height was estimated using portable pull-down, metal measuring tapes (Kawe model), with subjects in bare feet and under standardised conditions. Waist, hip, arm, wrist and head circumference were measured with non-extendible metric measuring tapes under standardised conditions. Sliding calipers were used to measure elbow width.

Fieldwork

Fieldwork was initiated on May 1, 1998, and ended on April 30, 2000.

Questionnaire administration and anthropometric measurements were conducted via home interviews by 43 dieticians, who had previously undergone a rigorous selection, training and standardisation process. Each of the 43 selected interviewers were provided with an average of 125 subjects to interview.

Survey data was entered by the same field staff into laptop computers which had software specifically designed for this study.

Statistical analysis

Data were analysed using the SPSS statistical package for Windows version 12.0. Results were analysed as a function of diverse variables, which included among others: gender, age group, population size, geographical area, socio-economic level, parental educational level (father, mother and both), educational level of the subject interviewed (in the case of those older than 18 years), tobacco consumption, alcohol consumption and physical activity level.

In order to evaluate obesity, the BMI variable was created (weight in kg/height in m^2). The analysis of obesity in relation to dietary components has been presented in previous publications[10,11].

Definition of obesity

Given the difficulty of determining the prevalence of obesity in this population group and the lack of consensus on which BMI cutoff points should be applied to define it, this study has proceeded to compare obesity prevalence as determined by the most utilised reference values – American[12], International[13] and Spanish[14]. To achieve this objective, obesity was defined applying distinct cutoff points, the majority of which corresponded to values at the 85th percentile (overweight) and the 95th percentile (obesity) by age (years) and sex according to the values published by each study. In the case of the American reference tables in which there are no reference values for those older than 240 months, the last value was utilised for individuals between 20 and 24 years of age. Data from the International study was treated in a similar fashion, as reference values were provided until the age of 18. The latter was then applied as a single value for those between 18 and 24 years of age.

Smoothed BMI percentile curves were obtained using a LMS procedure, similar to those applied by Cole[15]. The differing methods of smoothing BMI percentile curves have both advantages and disadvantages that should be taken into account when interpreting the results[16–18].

Results

A total of 3534 subjects participated in the study, which represented 64.3% of the theoretical sample and 68.0% of the obtained sample. The total number of individuals for which various anthropometric measurements were correctly obtained was 3475 for weight (98.3%), 3482 for height (98.5%), 3484 for waist circumference (98.6%), 3482 for hip circumference (98.5%), 3481 for arm circumference (98.5%), 3237 for head circumference (91.6%), 3241 for wrist circumference (91.7%) and 3386 for elbow width (95.8%).

Table 1 shows the different cutoff points used to define overweight and obesity according to the various tables included in the analysis. If we focus on the 18-year-old cohort, it is interesting to observe that values are similar for males, whereas in females, EnKid values were lower than those for the American and International data. These variations can be seen in Figs. 1, 2, 3 and 4. In general, the differences were smaller in the definition of overweight and very important when defining obesity. Hernández *et al.*'s[14] data were those that presented with the lowest BMI values.

Using Hernández's tables and the criteria of the 95th percentile, the prevalence of obesity in Spain was 15.3%. The prevalence of overweight (85th percentile) was 26.3%. Obesity prevalence was higher in males (16.8%) than in females (13.8%) as was also observed for overweight. By age group, obesity was found to be higher at younger ages (from 6 to 13 years) (Table 2). Applying the reference values obtained by Cole *et al.*[13] the prevalence of obesity in Spain was 5.8%, and 8.4% when utilising the Centers for Disease Control and Prevention (CDC) data[12]. The prevalence of overweight according to these tables was 23.9% and 21.4%, respectively.

Table 3 shows the degree of agreement between both estimations of adolescent obesity and overweight according to the data from Hernández *et al.*[14] and Cole *et al.*[13] In general, agreement was good when estimating normal weight and overweight ($\kappa = 0.85$) whereas for obesity, poorer agreement was observed ($\kappa = 0.45$).

Discussion

Applying BMI in the estimation of childhood and adolescent obesity is a measure that is employed both in

Table 1 Comparison of differing proposals for cutoff points to define overweight and obesity at various ages

Study	Presentation of reference values		4 years		6 years		10 years		14 years		18 years	
			Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
EnKid (smoothed data)	Age 2–24 yearly	p85	18.8	18.5	19.3	19.2	22.0	21.1	24.5	23.1	26.1	24.3
Spain		p95	20.7	19.9	21.4	21.1	24.7	23.3	27.6	25.7	29.3	27.0
USA NHANES I, II	2–17.9 yearly 18.0–24.9 grouped	p85	16.9	16.9	17.5	17.1	20.3	21.0	23.3	25.1	27.5	27.2
USA[19]		p95	17.8	18.0	19.3	18.7	23.4	24.1	26.4	28.9	31.0	32.1
MUST (WHO)	6–19 yearly 20–24 grouped	p85			16.6	16.2	19.6	20.2	22.8	23.9	25.9	25.6
Blancos USA[20]		p95			18.0	17.5	22.6	23.2	26.9	28.0	30.0	30.2
CDC-US growth charts	2–20 monthly	p85	16.9	16.8	17.2	17.3	19.8	20.4	23.1	23.7	26.0	25.9
USA[12]	Value at age 20 applied to the rest	p95	17.8	18.1	18.8	19.2	22.7	23.6	26.5	27.7	29.3	30.7
Cole *et al.*	2–18 half year	Level 1	17.5	17.2	17.7	17.5	20.2	20.3	23.0	23.7	25.0	25.0
International[13]	Value at age 18 applied to the rest	Level 2	19.3	19.1	20.2	20.1	24.6	24.8	28.0	28.9	30.0	30.0
Ricardin Spain[21]	6–18 yearly	p95			20.8	21.0	23.2	23.9	26.2	27.8	29.5	27.6
Orbegozo	2–18 yearly 19–24 grouped	p85	17.5	17.8	17.5	18.5	19.5	20.5	22.5	23.7	25.0	23.0
Basque Country[14]		p95	18.3	18.8	18.7	19.7	21.0	21.7	24.3	25.5	27.0	24.3

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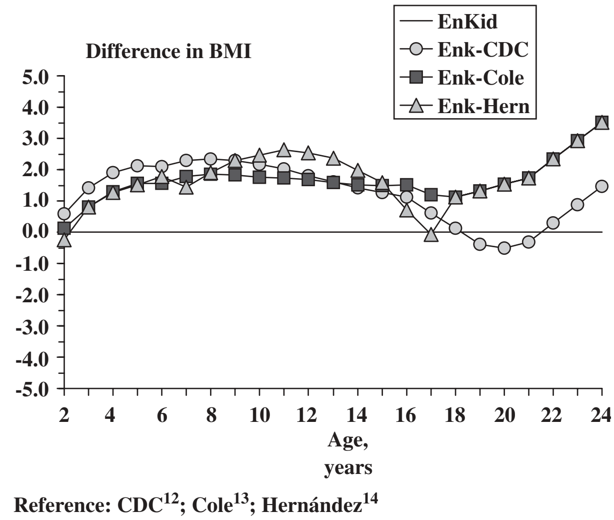

Fig. 1 Difference in body mass index (BMI) units between overweight reference values for the EnKid Study (smoothed data) and reference values for CDC, Cole and Hernández. Males aged 2–24 years

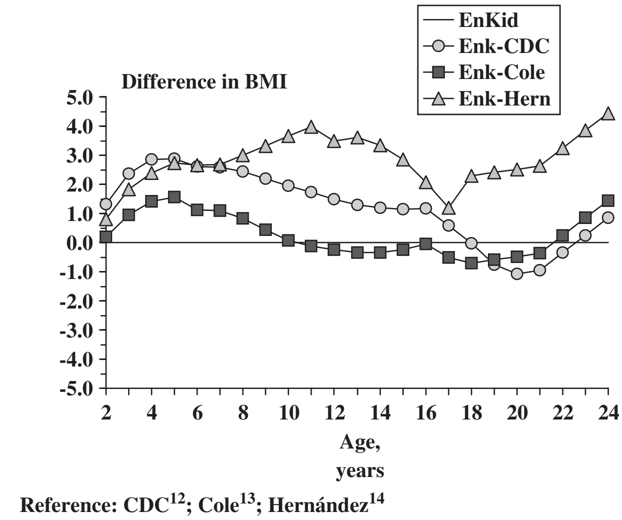

Fig. 3 Difference in body mass index (BMI) units between obesity reference values for the EnKid Study (smoothed data) and reference values for CDC, Cole and Hernández. Males aged 2–24 years

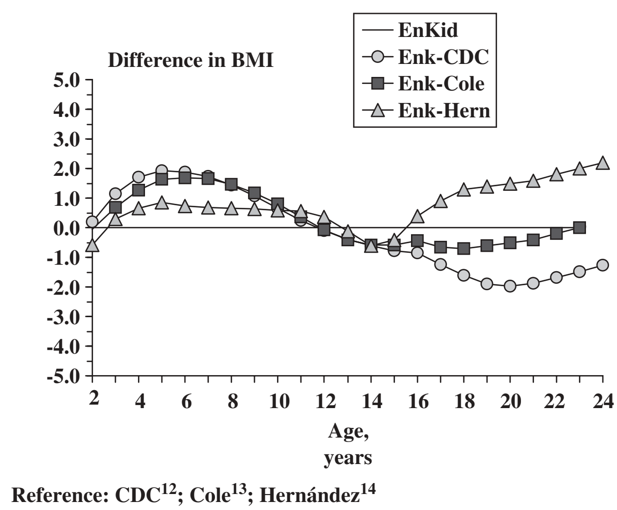

Fig. 2 Difference in body mass index (BMI) units between overweight reference values for the EnKid Study (smoothed data) and reference values for CDC, Cole and Hernández. Females aged 2–24 years

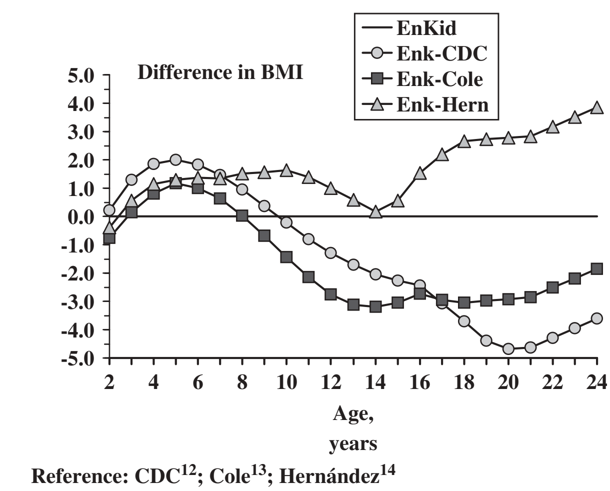

Fig. 4 Difference in body mass index (BMI) units between obesity reference values for the EnKid Study (smoothed data) and reference values for CDC, Cole and Hernández. Females aged 2–24 years

clinical and epidemiological settings[22–24]. When establishing BMI cutoff points that define obesity prevalence in epidemiological studies, a variety of methods have been utilised: applying two standard deviations to the mean, which is equivalent to the 97.5th percentile (in a normal distribution), or the application of the following percentiles (p): p85, p90, p95, p97. Currently, there is widely accepted consensus in using the cutoff p95 for defining obesity and p85 (from p85 to p95) to define overweight, especially in the United States[25–28]. In Europe and Asia, certain authors continue utilising p97[29]. In fact in 1996, a Committee of the European Childhood Obesity Group (ECOG) published a proposal to apply the criteria of relative BMI (adjusted for age) for use in the definition of childhood obesity[30]. As such, p90 was used to define overweight and p97 to identify obesity. In 1997, the World Health Organization (WHO) defined obesity for those aged 18 and over as a BMI $\geq 30\,kg\,m^{-2}$ and overweight as a BMI $\geq 25\,kg\,m^{-2}$. It was this consensus that Cole *et al.*[13] used to base their redefinition of the cutoff points, employing the criteria applied in adults BMI ≥ 25 or BMI $\geq 30\,kg\,m^{-2}$ (≥ 18 years of age) to data obtained for

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Table 2 Prevalence of overweight and obesity in the Spanish population aged 2–24 years according to gender, age and cutoff points

	Overweight			Obesity		
	CDC*	Cole†	Hernández*	CDC‡	Cole§	Hernández‡
Gender	25.2	29.3	29.9	11.4	7.6	16.8
Males	17.3	18.3	22.5	5.2	3.9	13.8
Females	21.4	23.9	26.3	8.4	5.8	15.3
Total						
Age group (years)						
Men						
2–5	29.9	21.9	20.1	16.9	7.6	12.0
6–9	43.0	37.0	37.7	20.7	11.2	23.2
10–13	35.1	33.3	41.9	13.0	6.6	25.2
14–17	26.8	29.2	26.2	12.0	9.2	17.0
18–24	12.9	27.5	27.5	5.3	5.9	13.0
Women						
2–5	40.1	33.7	21.9	15.7	10.6	11.9
6–9	31.8	29.9	22.9	9.7	7.1	14.5
10–13	17.6	18.4	20.0	4.9	2.7	12.3
14–17	12.0	12.8	17.1	2.7	2.4	9.9
18–24	7.5	12.0	26.2	1.7	2.0	16.6

From: US Department of Health and Human Services[12], Cole *et al.*[13], Hernández *et al.*[14].
CDC – centres for disease control; BMI – body mass index.
* 85th percentile.
† BMI ≥ 25 kg m^{-2} at 18 years.
‡ 95th percentile.
§ BMI ≥ 30 kg m^{-2} at 18 years.

the remaining age groups. Despite the fact that in a previous analysis of EnKid data[11] we had maintained the cutoff at p97 as national tables were being utilised, current evidence warrants the application of utilising the 85th and 95th percentiles to define overweight and obesity with local reference tables instead of the 90th and 97th percentiles that are still being used by some to date[5,31].

However, it is obvious that within a single population, percentile 'X' always defines a percentage of this population (100−X). In this manner, p95 delineates 5%, and p85 15% of the reference population. Consequently, this simple definition of obesity and overweight is especially useful for comparing distinct population subgroups in reference to the mean (for example, the percentage of relative obesity in different Spanish regions as compared to the mean). However, this definition is not constructive for quantifying the magnitude of obesity within a country or for comparing obesity prevalence among several countries, unless they use the same reference tables for BMI. And this is where the problem lies, as there are several international reference tables that may be used for this purpose. The most widely accepted reference tables are those elaborated by WHO[32], which until recently[33] were derived from the NHANES I data, elaborated by Must *et al.*[20] and Hammer *et al.*[34] and which include information from age 6 to 19 years for several percentiles. Other reference tables are provided by the CDC that represent the revision of the North American National Center for Health Statistics growth charts[12]. As previously mentioned, Cole *et al.*[13] developed BMI reference tables to facilitate international comparisons, which in contrast to the others, defined obesity not on the basis of specific percentile cutoffs but rather as the values that corresponded to BMI ≥ 30 kg m^{-2} at 18 years (obesity) or BMI ≥ 25 kg m^{-2} (overweight) for the same age.

It is difficult to determine which of the two methods (establishing a specific percentile as the cutoff point for a reference population and comparing populations using this cutoff value or establishing the cutoff value from a defined BMI for 18-year olds) is the most adequate, although it is likely that neither of the two is completely satisfactory. The ideal would be to define childhood obesity comparing BMI values with other reference methods so as to allow for the evaluation of body composition or subcutaneous fat. It must be said, however, that this approach also has its methodological issues. As such, what is perhaps most adequate to define childhood obesity is to combine a value of BMI > p95 derived from appropriate reference tables along with tricep skinfolds that are above normal limits[20,35]. In any case, we are dealing with a complex issue that without a doubt, will be the subject of further debate.

In Table 1, cutoff values are shown that define overweight (level 1: p85 in the majority of studies and BMI ≥ 25 kg m^{-2} at age 18 in an international study) as well as obesity (level 2: p95 and BMI ≥ 30 kg m^{-2}) for the EnKid Study and in some of the other studies analysed. It is difficult to affirm which values are the most adequate, but those from Hernández *et al.*[14] are a great deal lower for the 95th percentile than the rest of the other studies. These differences are not due to the distinct chronology in which the studies were conducted as the data included

Table 3 Concordance (%) in overweight and obesity classification in adolescents (10–17 years) according to definitions by Cole and Hernández

	Hernández (p85) classification[14]		
	Non-overweight	Overweight	Total
Cole[13] classification ($BMI \geq 25\,kg\,m^{-2}$)			
Non-overweight			
Column %	94.6	5.4	100.0
Row %	98.0	16.0	76.7
Total %	72.6	4.1	76.7
Overweight			
Column %	6.5	93.5	100.0
Row %	2.0	84.0	23.3
Total %	1.5	21.8	23.3
Total			
Column %	74.1	25.9	100.0
Row %	100.0	100.0	100.0
Total %	74.1	25.9	100.0
($\kappa = 0.848$)			

	Hernández (p95) classification[14]		
	Non-obese	Obese	Total
Cole[13] classification ($BMI \geq 30\,kg\,m^{-2}$)			
Non-obese			
Column %	88.8	11.2	100.0
Row %	100.0	66.9	94.8
Total %	84.2	10.6	94.8
Obese			
Column %		100.0	100.0
Row %		33.1	5.2
Total %		5.2	5.2
Total			
Column %	84.2	15.8	100.0
Row %	100.0	100.0	100.0
Total %	84.2	15.8	100.0
($\kappa = 0.454$)			

BMI – body mass index.

in reference tables usually precede those that correspond to the more recent increase in obesity occurring in the West at the beginning of the eighties, as most studies were conducted in the seventies or even earlier. This comparison, as also demonstrated in Figs. 1, 2, 3 and 4, shows that the age of onset of puberty may have a decisive effect on the comparability of data from different countries, as this factor changes considerably over time and from one country to another[27,32]. This explains why the greatest divergence is found in those age groups undergoing peak pubertal growth. On the other hand, differences are lower for overweight, and this may warrant the recommendation to use overweight rather than obesity to make international comparisons.

When choosing the reference tables to be used in the EnKid study (Table 1), there were two tables[20,21] that did not include the age group from 2 to 5 years, and those elaborated by Ricardin lacked information for the 20–24-year-old cohort. As such, they were not considered useful reference tables for the purposes of our study. Thus, the decision was made to utilise the tables elaborated by CDC[12] and Cole *et al.*[13] for international comparisons, on the basis that the three American tables[12,19,20] were very comparable and homogenous[36]. To analyse national comparisons or time trends, it was decided to use the growth chart tables elaborated by Hernández *et al.*[14], even though the representativeness of the data may be doubtful for individuals with pathology. Moreover, we carried out comparisons with the studies PAIDOS'84[37] and RICARDIN[21] as well as with other data published in Spain[38,39].

Another point to consider is that it didn't seem logical to periodically modify and update the reference tables if our objective was to analyse the secular trends of obesity prevalence in a certain country. Another very different issue is whether the tables would be utilised as reference values in the clinical setting, which would therefore require periodic revision. All this brings to light the

Table 4 Trends in the 95th percentile for BMI in Spain

Gender Age (years)	1980 Hernández[14] 95th percentile BMI	1992 Ricardin[21] 95th percentile BMI	1998–2000 EnKid 95th percentile BMI	1980–2000 %Δ	1992–2000 %Δ
Males					
2	19.2		20.0	4.0	
6	18.7	20.7	21.4	12.6	3.3
10	21.0	23.2	24.6	14.6	5.7
14	24.3	26.1	27.6	12.0	5.4
18	27.0	29.5	29.3	7.8	−0.7
Females					
2	19.2		18.8	−2.1	
6	19.7	21.0	21.1	6.6	0.5
10	21.7	23.9	23.3	6.9	−2.5
14	25.5	27.8	25.7	0.8	−8.2
18	24.3	27.6	27.0	10.0	−2.2

BMI – body mass index.

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complex task of evaluating childhood overweight and obesity and the challenging task for finding concrete solutions that would be suitable for all goals[40].

It is important to distinguish between this more clinical definition, which is adequate for criteria in clinical interventions dealing with the treatment of childhood and adolescent obesity and that defines the magnitude of the pathology treated in health care settings, vs. the more ecological definition. The latter provides better comparability of the problem at an international scale. In Spain, reference tables used in the clinical setting are primarily derived from data provided by Hernández *et al.*[14] or those from the EnKid Study itself[41], and secondly those by Cole *et al.*[13] This analysis has demonstrated that greater concordance exists for childhood and adolescent overweight, in contrast with the discrepancies seen for obesity. For this reason, it seems reasonable to work with data for overweight and to direct prevention programmes in these age groups towards overweight instead of obesity. This would avoid unresolved issues about definition, which may delay or protract the intervention needed to address the problem. Moreover, using the framework of overweight may have less stigma for individuals involved and address the issue from a more population based, rather than high-risk, perspective.

Trends in overweight and obesity have been analysed for the first time in Spain, which could only be done after having assumed the methodological limitations inherent in secular comparisons. According to the last three epidemiological studies on obesity carried out in Spain – Paidos (1984)[37], Ricardin (1992)[21] and EnKid (1998–2000), BMI in boys aged 10 has gone from 18.1 in 1984, to 18.5 in 1992 and 18.8 in 1998–2000, and at 13 years, from 18.4 (1984) to 20.4 (1992) and to 21.1 (1998–2000) (Fig. 5). Girls experienced lower increases. Comparing the evolution of p95 for ages with data provided by Hernández *et al.*[14] and the EnKid Study (1998–2000) (Table 4), an increase of 14.6% was observed as a function of age. This was seen to be higher in boys from ages 6 to 10 and in girls aged 10 to 18, with lower values detected for under 2 year olds, which in the latter case, even diminished. When the same comparison was realised with Ricardin's study (1992)[21], we observed (Table 4) a significant increase in values for males at ages 6 and 14, which was less pronounced in females and in this group, even diminished at age 14.

An interesting study was conducted by Marco Hernández *et al.*[42] that analysed the secular trends in height in Spain based on a study carried out in almost 12 million military recruits from 1956 to 1998. During this period, the height in males increased by almost 10 cm. Growth was lower within the last decade, and regional differences in height were reduced that had existed in Spain at the middle of the 20th century (regions with individuals of taller stature were Catalonia and the Basque Country). This is of particular importance when we interpret

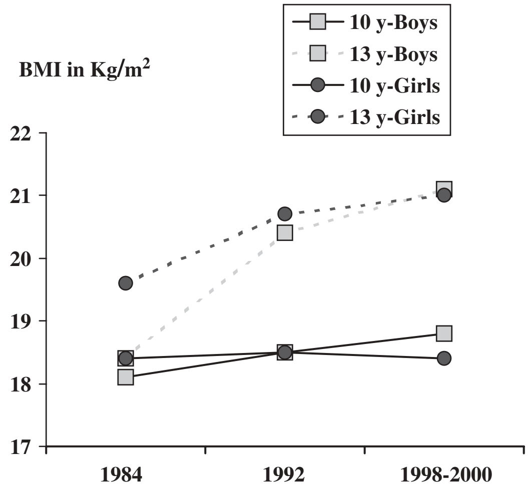

Fig. 5 Evolution of body mass index (BMI) at 10 and 13 years in Spanish schoolchildren, 1984–2000

epidemiological studies on obesity based on BMI, as its evaluation is very distinct during stages of elevated secular growth vs. periods of levelling off or slower growth.

Whatever the case may be, it is important to highlight the increasing trends of childhood obesity in boys, in contrast with the stabilisation seen in girls, which has also been observed in the adult population[43].

A European review ($n = 37$)[44] on epidemiology of childhood and adolescent obesity showed that of all the studies included in the analysis, the most utilised cutoff points were relative weight >120% (obesity) with a total of 15/37 studies, and/or relative weight >110% (overweight) in a total of 6/37 studies. BMI > p70 (1/37), BMI > p85 (1/37), BMI > p90 (2/37), BMI > p95 (4/37), and/or BMI > p97 (2/37), BMI ≥ 25 (3/37) and/or BMI ≥ 30 (1/37), BMI ≥ 20 (1/37), BMI ≥ 120% (1/37) and/or BMI ≥ 140% (1/37), triceps skinfolds >p90 (2/37) or triceps skinfold >25 mm (2/37) and one study utilised the % of body fat >30%. The three studies of larger sample size[45–47] utilised p95 of BMI (two studies) or relative weight >120%. A total of 120% of relative weight for age and sex corresponds quite well with p95 and 110% with p85 of the reference tables[44]. This analysis was conducted before the Cole *et al.*[13] proposal.

More recently, criteria established by Cole *et al.* have been utilised quite often, albeit universal acceptance has by no means been unanimous[5,6]. Since the publication of the definition established by the International Obesity Task Force (IOTF), less than half of the published studies have applied it, whereas the majority utilised the 95th percentile of a national distribution[6].

According to our study, reference tables by Cole *et al.* underestimate obesity prevalence and therefore hide the magnitude of the obesity epidemic. This has also been observed in other countries such as England, Switzerland

and the USA[48–50]. However, it is possible that Hernandez's tables[14] overestimate obesity, particularly in adolescent and young girls.

Obesity is an important and growing public health problem during childhood and adolescence and is the object of numerous studies that still suffer from a lack of clear and consensus-based comparative criteria. Without a doubt, reaching an international agreement on the definition of obesity or overweight would facilitate the development of adequate prevention programmes tailored to the necessities of each country or region. But this should not act as an obstacle for taking the immediate necessary action needed to combat the issue. In any case, it is essential to highlight that based on our experience, the tables by Cole *et al.*[13] underestimate the prevalence of obesity as evaluated, diagnosed and treated by Spanish paediatricians. As such, in clinical settings, to address childhood obesity issues or to estimate the burden of disease at the national level, it is necessary to utilise comparisons of BMI with local reference tables such as those by Hernández *et al.*[14] or the EnKid Study[41]. It is also recommended to refer to overweight instead of obesity in and of itself, which may then facilitate the task of reaching consensus.

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