

# Parental Perception of Their Child's Weight Status in Portugal: An Observational Study

## Perceção do Peso dos Filhos em Portugal: Um Estudo Observacional

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### ABSTRACT

**Introduction:** Parental perceptions of a child's weight status may influence family readiness to foster healthy behaviors. Our aim was to observe parental perceptions of their child's weight status in two time periods and in multiple population subgroups.

**Methods:** Data were collected in two national projects, 2009 - 2010 (n = 6577) and 2016 - 2017 (n = 7594), in public and private kindergartens and primary schools in Portugal (children aged three to 10 years old). Parents filled out a questionnaire regarding their perception of their child's weight status, namely: 1) too thin, 2) thin, 3) normal weight, 4) with some excess weight, or 5) with a lot of excess weight. Children's height and weight were objectively collected, and the International Obesity Task Force cut-offs were used to classify overweight and obesity. Accurate and misclassification levels were calculated for children according to their sex, age, as well as child and parental weight status, while considering differences within and between the two time periods.

**Results:** Overall, accuracy in parental perception of their child's weight was higher in 2016 - 2017 than in 2009 - 2010, regardless of children's sex, age, parental weight status, and education (65.7% and 60.5%, respectively). However, the ability of parents to detect obesity was ~ 50% lower in 2016 - 2017 compared with 2009 - 2010.

**Conclusion:** Even though parental perception of their child's weight was better in 2016 - 2017 than in 2009 - 2010, the inverse result was found among children with obesity. Strategies are needed to encourage parents to improve their perception of the appropriate weight for their child.

**Keywords:** Child; Overweight; Parents; Pediatric Obesity

### RESUMO

**Introdução:** A perceção que os pais têm do peso dos filhos pode influenciar a adoção de comportamentos saudáveis. O objetivo deste trabalho foi observar a perceção que os pais têm do peso dos filhos em dois períodos (2009 - 2010 e 2016 - 2017) e em vários subgrupos da população.

**Métodos:** Os dados foram recolhidos no âmbito de dois projetos nacionais (2009 - 2010: n = 6577; 2016 - 2017: n = 7594), em infantários e escolas primárias, públicas e privadas, em Portugal continental (crianças entre os três e os 10 anos). Através de um questionário, os pais descreveram os filhos em relação ao peso atual: 1) muito magro, 2) magro, 3) normal, 4) com algum peso a mais, ou 5) com muito peso em excesso. A altura e o peso das crianças foram recolhidos objetivamente e os pontos de corte da *International Obesity Task Force* foram usados para classificar o estado nutricional da criança. A acuidade da perceção parental foi calculada de acordo com o sexo, a idade, e o peso da criança, assim como com o peso dos pais; as diferenças entre os dois períodos foram registadas.

**Resultados:** No geral, a acuidade da perceção que os pais têm do peso dos filhos foi maior em 2016 - 2017 do que em 2009 - 2010, independentemente do sexo e idade da criança, e do estado nutricional e nível educacional dos pais (65,7% e 60,5%, respetivamente). No entanto, a perceção de obesidade nas crianças foi cerca de 50% mais baixa em 2016 - 2017 do que em 2009 - 2010.

**Conclusão:** Este estudo mostrou uma acuidade da perceção do peso maior em 2016 - 2017 do que em 2009 - 2010, contudo, o contrário verificou-se em crianças com obesidade. São necessárias estratégias para ajudar os pais a melhorarem a perceção do peso adequado para os seus filhos.

**Palavras-chave:** Criança; Excesso de Peso; Obesidade Pediátrica; Pais

### INTRODUCTION

Childhood obesity remains a global public health issue, including in Portugal, where one in three children is overweight or obese.<sup>1</sup> A declining trend has been found, but it is not consistent in all the population [e.g., individuals with lower socio-economic status (SES)].<sup>2</sup> Although identified as a global health priority, tremendous challenges remain in connecting the dots between when and where to intervene.<sup>3</sup> This is of concern since childhood obesity is associated with multiple poor physical and psychological outcomes.<sup>4</sup>

The causes of childhood obesity are complex and include the interplay of individual, social, and environmental factors. Effective strategies to tackle child obesity have been on the public agenda in many countries throughout the last few decades, including the promotion of a healthy lifestyle. However, while raising awareness among parents regarding

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childhood obesity, those public health strategies do not appear to have had an impact on the identification of excess weight by parents in their own children.<sup>5</sup> High rates of parental underestimation of children's weight have been reported in many international studies.<sup>6,7</sup> This underestimation is somewhat consistent in children with excess weight, but varying results have been found to be associated with children's sex, age, and family socioeconomic status.<sup>5,8</sup>

Parental perception of their children's weight plays an important role in obesity prevention and treatment since the family needs to be willing, able, and ready to make the necessary lifestyle changes (e.g., healthy eating habits, higher physical activity levels) and ultimately seek treatment for obesity.<sup>9</sup> The aim of this study was to observe and compare the accuracy of parental perceptions of their child's weight status in 2009 and 2016 and to identify possible shifts in parental misperception in different subpopulation groups.

## METHODS

### Study design and sampling

Repeated cross-sectional studies were conducted in 2009 - 2010 and in 2016 - 2017, using a nationally representative sample of Portuguese children. More details are available elsewhere.<sup>2</sup> Briefly, in 2009 - 2010 the sampling was based on a stratified random design that accounted for the number of children by age (three to 10 years) and sex. Schools were randomly selected in the Porto, Coimbra and Lisbon districts, and all the students were invited to participate. In 2016 - 2017, three to 10-year-old children from the 118 schools participating in the 2009 - 2010 study were included. The participation rate was 57.4% and 61.4% in 2009 - 2010 and 2016 - 2017, respectively.

### Ethics approval

The 2009 - 2010 study protocol was approved by the Portuguese Committee for Data Protection, which requires anonymity and non-transmissibility of data, as corroborated by the Direção-Geral de Inovação e Desenvolvimento Curricular (DGIDC). In 2016 - 2017, the study was approved by Direção Geral do Ensino (Portuguese Ministry of Education) and Comissão Nacional de Proteção de Dados (CNPd, the Portuguese Data Protection Authority; authorization number 745/2017). All procedures were in accordance with the guidelines laid down in the Declaration of Helsinki of 1975, revised in Hong Kong 1989. Prior to data collection, written informed consent was obtained from the children's parents.

### Inclusion criteria

Children between the ages of 3.0 and 10.9 years from the three aforementioned Portuguese districts, with complete information on height, weight, and parental perception of their child's weight.

### Measures

Paternal education, with the scoring based on the Portuguese Education system and categorized as low (nine or less years of completed schooling), medium (10 - 12 years), and high (university degree), was used as a proxy measure of SES. Parental self-reported weight and height were used to calculate body mass index (BMI); the WHO definitions were used to classify parental weight categories.

Parents were also asked about their child's weight status ("Do you consider (the child) now to be too thin, thin, normal weight, with some excess weight, or with a lot of excess weight?"). Staff trained in standard anthropometric methods measured children's height and weight at school using calibrated equipment. BMI was calculated and categorized according to the International Obesity Task Force (IOTF).<sup>10</sup> The perceived classification of children's weight status was classified as accurate if: underweight children were correctly classified as 'too thin' or 'thin'; normal weight children were classified as 'normal weight'; overweight children were classified as 'with some excess weight'; and children with obesity were classified as 'with a lot of excess weight'.

Parental underestimation of their child's weight status was observed in the following cases: children with normal weight were perceived as 'too thin' or 'thin'; overweight children were perceived as 'too thin', 'thin' or 'normal weight'; and children with obesity were perceived as 'too thin', 'thin', 'normal weight' or 'with some excess weight'. Parental overestimation of their child's weight status was considered if: children with underweight were perceived as 'normal weight', 'with some excess weight' or 'with a lot of excess weight'; children with normal weight were perceived as 'with some excess weight' or 'with a lot of excess weight'; and overweight children were perceived as 'with a lot of excess weight'.

### Statistical analysis

Children's weight status and parental perceived weight status were estimated for each time period. The agreement

between the parental perception and the real weight of the child was assessed by the Cohen kappa coefficient. Accurate and misclassification levels were calculated according to children's sex, age, and weight status, as well as parental weight status, and family SES. The Chi-squared ( $\chi^2$ ) distribution was used to determine differences within and between the time periods. Analyses were performed in SPSS Statistics® for Windows®, v.27.

## RESULTS

The final sample was made up of 14 171 children (7043, 49.7% boys); 6577 in 2009 - 2010 and 7594 children in 2016 - 2017 (Table 1). Children's weight status differed significantly between periods, with a lower prevalence rate of overweight and obesity in 2016 - 2017 than in 2009 - 2010, while more underweight children were observed in 2016 - 2017 than in 2009 - 2010 ( $p < 0.001$ ).

There were statistically significant differences between children's weight status (IOTF classification) and parental perception. In 2009 - 2010, there was a slight agreement between the two measures,  $K = 0.19$  (95% CI: 0.17 to 0.21),  $p < 0.001$ ; in 2016 - 2017, the agreement between the two categorizations was fair, with  $K = 0.24$  (95% CI: 0.22 to 0.26),  $p < 0.001$ . In both periods, the lowest agreement was found in children with obesity, followed by overweight children (Table 1 and Fig. 1).

There were no statistically significant differences in parental weight perception according to the children's sex. However, in 2016 - 2017, underestimation was significantly more prevalent in older children than in younger children. Underestimation was also significantly more common in children of lower SES and among children of overweight or obese parents. Moreover, parental underestimation of their child's weight was more common if the child was overweight or obese (Table 1).

Most parents (75.8% in 2009 - 2010; 78.9% in 2016 - 2017) were able to accurately assess their child's weight if the child fell in the normal weight category; however, that number decreased to 26.9% (2009 - 2010) and 28.6% (2016 - 2017) in children with overweight, and to 8.5% (2009 - 2010) and 4.3% (2016 - 2017) in children with obesity. Parental report of their children having 'a lot of excess weight' (i.e., obesity) was more prevalent in children with the most severe form of obesity (i.e., IOTF BMI  $\geq 35$ ) compared with children with obesity but whose BMI was between 30 and 35, both in 2009 - 2010 (20.4% vs 3.8%) and in 2016 - 2017 (9.8% vs 2.5%) (Fig. 1).

The overall accuracy to estimate children's weight status was higher in 2016 - 2017, particularly among mothers with obesity (+ 11.4%) followed by fathers with obesity (+ 7.8%). However, the inverse result was found considering parental ability to accurately perceive obesity among their children (Table 1).

## DISCUSSION

This study highlights two different results, namely: 1) while the incidence of childhood obesity declined between the samples, the inability of parents to detect obesity declined, and 2) although the accuracy in the parental perception of their child's weight was better in 2016 - 2017 than in 2009 - 2010, this was not true for children with obesity. This is worrying since underestimating obesity is more detrimental than underestimating normal weight or overweight, theoretically and practically.

The results point to a plateau in overweight and obesity prevalence, similar to what has been reported before in Portugal<sup>2</sup> and other developed countries.<sup>1</sup> Our findings also show that the majority of parents considered their child to be of average weight (71.2%), and few parents rated their child as having overweight or obesity (10.6%), even though almost one in four children were classified as having overweight or obesity for their age and sex. Underestimation was particularly high in children with obesity (95.7%). These findings support previous research which found that many parents are incapable of recognizing their child's weight status.<sup>6,8,11</sup> A study considering 22 European countries found parental underestimation levels of 82.3% and 93.8% in the overweight and obesity categories, respectively.<sup>7</sup> In Portugal, previous data shows that one in three parents misperceive their child's weight, of which 93% underestimate it.<sup>12</sup>

This is perhaps not surprising given that many adults are unable to recognize overweight in themselves,<sup>13</sup> but the reasons for the lack of recognition of childhood overweight and obesity remain unclear. It may be difficult for parents to understand what obesity is because children are continuously experiencing changes in body composition and size. Moreover, the definition of overweight and obesity may be confusing to parents because it has shifted over time and is different among various healthcare professional organizations.<sup>14</sup> Parents may also be reluctant to admit that their child had 'a lot of excess weight' because of social pressure to maintain a lower weight and/or the stigma often attached to obesity. Furthermore, parents who live with their children daily normally do not notice or have the perception of real body changes as they are used to seeing them every day. The social comparison hypothesis or societal forces might also help explain our findings:

1) parents will compare their child to peers or friends of their child; hence, with childhood obesity becoming increasingly common, some excess weight may go unnoticed by many parents, or the socially accepted ideal body weight may also be shifting accordingly; 2) parents will experience external pressures such as the ones conveyed by the media, which may be focusing on the severely obese only and consequently may distort the parents' understanding of what qualifies as 'obesity'.

We found that children with obesity were less likely to be correctly identified in the recent survey compared with peers of similar weight who were surveyed six to seven years earlier. Similar results were reported for children in the USA for data collected in 1988 - 1994 and 2005 - 2010.<sup>15,16</sup> Inversely, another study carried out among North American children observed that parental perceptions of children with overweight and obesity remained stable between 2005 and 2014.<sup>14</sup> In the Netherlands, 3.7% of parents improved (without statistical significance) their perception of their overweight child between 2009 and 2013.<sup>17</sup> Cultural models and standards of beauty that can vary among different cultures, or gender differences such as social expectations of boys' and girls' body size and shape, may also explain the different results across studies. Samples may also vary in age. Moreover, the use of different cut-off values can lead to different obesity classifications and may cause confusion.<sup>7</sup>

Although growing global awareness of childhood obesity and a larger focus on weight in general, many parents are still unable to identify when their own child is overweight or obese.<sup>5</sup> Preventive strategies to avoid excess weight gain are more likely if parents are concerned their child will be overweight as an adolescent or as an adult, and are not related to parental concern about the current weight of their child.<sup>18</sup> This suggests that many parents may not see overweight during childhood as particularly harmful or may see the excess weight as something that children will 'grow out of'.

Curiously, in the 2016 - 2017 sample, parental perception of their child's weight was significantly more accurate in younger than in older children, which is the inverse of what has been previously reported, including in Portugal.<sup>17,19</sup> This finding is important since overweight and obesity can be prevented and treated more easily in younger children. Conversely, our results followed the same tendency in other characteristics commonly associated with underestimation of the overweight status, namely: parental weight status (higher BMI)<sup>12,20</sup> and parental education levels (lower).<sup>21,22</sup> Qualitative work by McPherson *et al*<sup>23</sup> suggests that parents with a high BMI have been subjected to social stigma and, therefore, are more likely than underweight and healthy weight parents to avoid labels associated with overweight status. Other qualitative studies suggest that low-income mothers often equate being plump (i.e., slightly fat) with being healthy.<sup>24</sup> Interestingly, the child's sex was not associated with underestimating excess weight in our study. A similar result was found in Spain for children aged two to 14 years,<sup>25</sup> while other studies reported an association.<sup>17,19</sup>

Methods to help parents accurately perceive their child's weight and associated health risks are needed. However, many parents tend to classify their child as overweight only when the child is already within the obesity range, when it is more difficult to implement effective weight-related actions. Parental underestimation was found to be a major determinant of childhood obesity in Portugal,<sup>12</sup> which highlights the importance of this study. Schools and healthcare professionals are in an ideal position to take steps to remedy the self- and parental misperceptions concerning children's weight status, to educate and support parents and children about the complexity of obesity, and to address the modifiable risk factors, such as dietary habits and physical activity. But these actions should be implemented early to avoid children becoming overweight.

Several factors limit our analysis. First, the repeated cross-sectional study design was observational and therefore did not allow causal direction assessment. While observations from different survey years are instructive for overall trends, more than two assessments may be necessary to evaluate generational shifting. Second, the wording of the question and variables on the questionnaire (e.g., 'with some excess weight'; 'with a lot of excess weight') may have led some parents to misperceive their child's weight status due to subjective interpretations and internalized weight bias. Moreover, the interpretation of 'normal weight' may be influenced by parents' weight status, peers' weight status, and media exposure. Third, a single question about perceived child weight was used rather than a silhouette rating scale, which may increase misperception rates. Studies using pictorial assessment methods for parents to visualize result in a slightly less underestimation of overweight/obesity.<sup>19</sup> However, the question allowed parents to classify children as being only mildly different from normal weight, thus increasing the likelihood of correct classification. Fourth, the study may have limited generalizability because of the sampling method used. Our findings cannot represent children and families from outside those three districts or living in rural areas. And last, we did not specify the relationship between proxies and children. Mothers may have a stronger influence on a child's lifestyle. However, a recent study showed no differences between fathers and mothers' perceptions of their child's body weight status.<sup>8</sup> Significant strengths include the large sample size (including preschool and school-aged children) and the spectrum of participants (including different socioeconomic levels), which gave us the ability to examine the issue among a diverse range of children. The assessment of transitions in perceptions in different population subgroups

consists of interesting findings with important implications. Also, the data on children's height and weight were objectively collected by trained professionals following a standardized protocol. Besides, while child BMI is not the most accurate measure of adiposity, it is highly correlated with more direct measures of adiposity.

## CONCLUSION

Overall, parental accuracy in the perception of their children's weight was higher in 2016 - 2017 than in 2009 - 2010; however, weight underestimation remains high (~ 30%) and the ability of parents to detect obesity declined. Strategies should be developed to target parental recognition of their child's weight status, particularly among those with obesity. Given their personal interaction with parents and children, schools and frontline clinical care providers can play a crucial role in promoting and encouraging parental healthy weight perceptions.

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## AUTHOR CONTRIBUTIONS

DR: Data analysis and interpretation, writing, review, and approval of the manuscript.

AMMR, AG, HN, MRGS: Data collection, manuscript review and approval.

CP: Obtention of funding, data collection, manuscript review and approval.

## PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association updated in 2013.

## DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

## COMPETING INTERESTS

The authors have declared that no competing interests exist.

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Table 1 – Parental perceptions of the weight status of their child, according to sex, age, SES and weight status (defined by the International Obesity Task Force criteria) in 2009 - 2010 and 2016 - 2017

	2009 - 2010 – Parental Perception			2016 - 2017 – Parental Perception			$\chi^2$ , p-value <sup>a</sup>
	n (%)	Accurate	Overestimate Underestimate	n (%)	Accurate	Overestimate Underestimate	
<b>Sex</b>							
Boys	3217 (48.9)	59.8	38.2	3826 (50.4)	66.6	2.5	40.62 (2), p < 0.001
Girls	3360 (51.1)	61.1	36.6	3768 (49.6)	64.9	2.8	15.46 (2), p < 0.001
$\chi^2$ , p-value <sup>b</sup>			2.27 (2), p = 0.32			2.95 (2), p = 0.23	
<b>Age</b>							
3 - 5 years	2060 (31.3)	62.0	35.7	2177 (28.7)	69.3	3.0	32.93 (2), p < 0.001
6 - 10 years	4517 (68.7)	59.8	38.1	5417 (71.3)	64.3	2.5	26.06 (2), p < 0.001
$\chi^2$ , p-value <sup>b</sup>			3.42 (2), p = 0.18			22.97 (2), p < 0.001	
<b>SES</b>							
Low	1734 (26.6)	55.6	42.2	905 (12.0)	62.2	2.8	13.04 (2), p = 0.00
Medium	1878 (28.8)	60.8	37.2	2564 (34.0)	63.8	2.9	9.17 (2), p = 0.01
High	2898 (44.5)	63.5	34.3	4066 (54.0)	67.7	2.5	16.36 (2), p = 0.00
$\chi^2$ , p-value <sup>b</sup>			29.34 (4), p < 0.001			16.44 (4), p = 0.00	
<b>Child Weight Status</b>							
Underweight	211 (3.2)	62.1	37.9	415 (5.5)	64.6	35.4	NA
Normal weight	4547 (69.1)	75.8	22.9	5510 (72.6)	78.9	0.9	20.2
Overweight	1336 (20.3)	26.9	72.8	1246 (16.4)	28.6	0.3	71.1
Obesity	483 (7.3)	8.5	91.5	423 (5.6)	4.3	NA	95.7
$\chi^2$ , p-value <sup>b</sup>			3107.68 (6), p < 0.001			3959.00 (6), p < 0.001	
<b>Father Weight Status</b>							
Normal weight	2345 (42.9)	64.0	33.2	2553 (40.6)	69.5	2.6	17.14 (2), p < 0.001
Overweight	2486 (45.5)	59.8	38.3	2899 (46.1)	64.4	2.8	20.85 (2), p < 0.001
Obesity	637 (11.6)	54.5	44.3	843 (13.4)	62.3	1.5	9.45 (2), p = 0.01
$\chi^2$ , p-value <sup>b</sup>			35.37 (4), p < 0.001			29.90 (4), p < 0.001	
<b>Mother Weight Status</b>							
Normal weight	4202 (69.5)	63.9	33.9	4559 (65.6)	68.8	2.9	33.58 (2), p < 0.001
Overweight	1342 (22.2)	55.8	42.0	1716 (24.7)	62.8	2.5	17.04 (2), p < 0.001
Obesity	500 (8.3)	44.8	53.0	678 (9.8)	56.2	1.3	15.35 (2), p < 0.001
$\chi^2$ , p-value <sup>b</sup>			86.87 (4), p < 0.001			69.45 (4), p < 0.001	
<b>Total</b>	6577 (100.0)	60.5	37.4	7594 (100.0)	65.7	2.6	52.61 (2), p < 0.001

<sup>a</sup>: Differences between 2009 - 2010 and 2016 - 2017; <sup>b</sup>: Differences between subgroup categories within each period; SES: socioeconomic status defined by parental education level; Child weight status calculated by the IOTF cut-off points

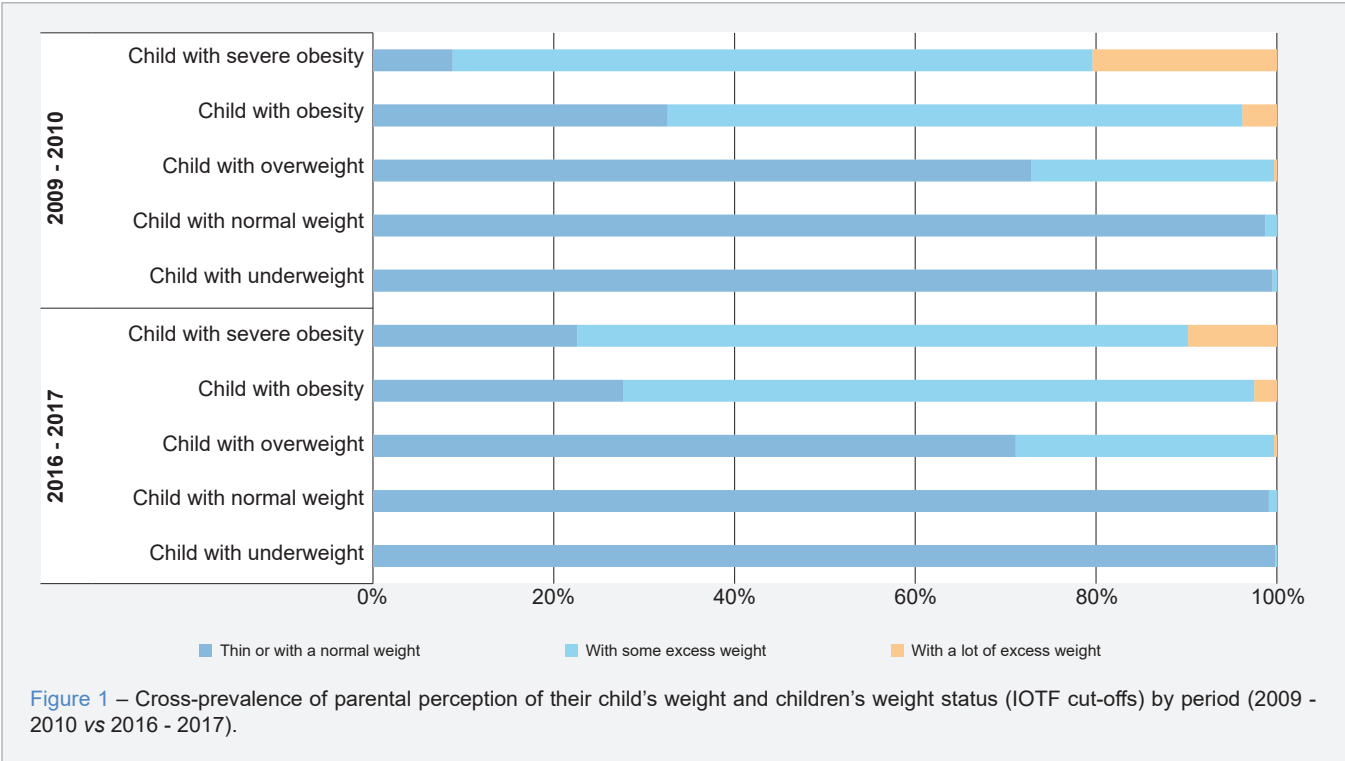


Figure 1 – Cross-prevalence of parental perception of their child's weight and children's weight status (IOTF cut-offs) by period (2009 - 2010 vs 2016 - 2017).