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Risk factors of overweight and obesity among preschool children with different ethnic background

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Abstract:	In this study we evaluated the risk factors associated with overweight and obesity in 2640 preschool children in Italy taking into account the ethnic background of the parents. Height and weight were measured and BMI calculated. Personal and lifestyle data for the children (birth weight, type of breastfeeding, sleep duration, skipping breakfast, snacking, physical activity) and parents (ethnicity, educational level, occupation, weight, height) were collected by means of a questionnaire. Italian and other European children generally showed the highest percentage of normal weight, while the other ethnic groups presented a greater imbalance. Overweight and obesity were high in African males, who also presented high birth weight. Breastfeeding was most common, although formula feeding was significantly higher in Italians than in immigrants. Immigrants, particularly males, tended to skip breakfast more than Italians. Physical activity was significantly higher in Italians than in immigrants. In the parents, underweight was particularly high in Italian and Other mothers. African parents had high rates of overweight and obesity and a low educational level. The most common profession was worker for the fathers and housewife for the mothers, with the exception of Italians in which clerical work prevailed. Multiple linear regression analysis showed that the BMI of children was closely related to the BMI of the parents and the birth weight. Hence these are the most informative parameters in preventing obesity.
Response to Reviewers:	Author's response to reviews MS: ENDO-D-14-00712 Title: "Risk factors of overweight and obesity among preschool children with different ethnic background" Answer to the Reviewer #1:

	The aim of this study was to assess differences in BMI and weight status in pre-schoolchildren of Emilia-Romagna region (Italy) with different ethnic background and to assess the possible risk factors associated with these conditions. I believe the manuscript has value because of the paucity of the data however some aspects need revision: 1. Authors mentioned that children Migrant Status (MS) was defined on the basis of their parents origin. Authors may like to explain how exactly this was done in case of children with mixed origin e.g. Italian father and migrant mother or vice versa. In what category were they included? Authors: According to Ebenegger et al. (2011) and Muckelbauer et al. (2010), a child was identified to be Italian if both parents were born in Italy, otherwise to have an immigrational background if at least one parent was born in a foreign country. The mixed children were included into the “Others” category. 2. The study did not describe the sampling technique Authors: reference for sampling techniques are now reported in the text. 3. The study did not describe how the survey was conducted with the parents; by phone, by mail, in person? What was done in case of immigrants not understanding Italian language? Was there someone like cultural mediator translating the interview questions? More details about the process of the interview will be of value to the reader Authors: No interviewer translated the questionnaire. Information on how the questionnaire was administered are included in the methods. 4. While taking the weight and height of children, more details about the process (light clothing, shoes presence or absence and if any adjustments were made for the clothing). This information was not provided in the manuscript and should be included. Authors: done. 5. Response rate was not provided. Authors: done. 6. While in favor of reporting minimum in results for multiple regression a bare minimum will be standardized betas and their significance value, some general statistics about the model (such as R2) will be important to add. In the table it will be very useful to include the constant, the betas value, standard errors and their significance. Authors: done.

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Risk factors of overweight and obesity among preschool children with different ethnic background.

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Abstract

In this study we evaluated the risk factors associated with overweight and obesity in 2640 preschool children in Italy taking into account the ethnic background of the parents. Height and weight were measured and BMI calculated. Personal and lifestyle data for the children (birth weight, type of breastfeeding, sleep duration, skipping breakfast, snacking, physical activity) and parents (ethnicity, educational level, occupation, weight, height) were collected by means of a questionnaire. Italian and other European children generally showed the highest percentage of normal weight, while the other ethnic groups presented a greater imbalance. Overweight and obesity were high in African males, who also presented high birth weight. Breastfeeding was most common, although formula feeding was significantly higher in Italians than in immigrants. Immigrants, particularly males, tended to skip breakfast more than Italians. Physical activity was significantly higher in Italians than in immigrants. In the parents, underweight was particularly high in Italian and Other mothers. African parents had high rates of overweight and obesity and a low educational level. The most common profession was worker for the fathers and housewife for the mothers, with the exception of Italians in which clerical work prevailed. Multiple linear regression analysis showed that the BMI of children was closely related to the BMI of the parents and the birth weight. Hence these are the most informative parameters in preventing obesity.

Keywords anthropometry, nutritional status, childhood obesity, immigrants, preschool children, ethnicity.

Introduction

In the past 25 years, the prevalence of overweight and obese children quadrupled, from roughly four to sixteen percent [1]. It is important to document both the prevalence of overweight and the timing of weight gain in children because those who experience early onset weight gain are more likely to be heavier in adulthood than children with later onset [2]. Overweight children are more likely to become obese adults [1,3].

The worldwide increase in childhood obesity can be attributed to various factors. The prevalence of overweight and obesity is associated with the parents' BMI: children with weight disorders are more frequently observed in obese families [4,5]. The relationship between birth weight and obesity has often been called into question in this regard and previous investigations have produced conflicting results: low birth weight (LBW, i.e. birth weight <2,500 g) or high birth weight (HBW, i.e. birth weight >4,000 g) are both at increased risk [6-8]. The positive association of HBW with childhood obesity has been confirmed in some studies [9, 10], but others have found that LBW is not associated with overweight/obesity in children [11, 12]. Another factor associated with increased risk of obesity is short sleep duration: children who slept for 8 hours or less were 2.2 times more likely to be overweight/obese [4, 13, 14].

However the main causes of obesity seem to be decreased physical activity, increased media use and unfavorable changes in eating habits [15].

Several systematic reviews and observational studies have suggested an effect of breastfeeding on the risk of childhood overweight/obesity and adiposity [16-25]. Many prospective studies have found a positive association between poor childhood dietary habits and body weight in later life [26, 27]. A high BMI has been associated with an increased intake of high-calorie foods such as high-energy snacks, sweets and sugary beverages [28, 29]. The risk of being overweight or obese is also higher among children who skip breakfast [30]. Watching television and/or eating and snacking during TV time can contribute to overweight and obesity through an increase in caloric intake (decrease in satiety and/or influence of advertised foods on food choices), inactivity and possibly a decrease in physical activity [25, 31- 33].

The socioeconomic and immigrant status also affects the onset of obesity [34]. The prevalence of overweight and obesity is increased in children of immigrant parents and/or of parents with a low educational level (EL) [35-36]. Children of recently arrived immigrant parents, particularly boys, tend to weight more and are at greater risk of overweight than native children [37-39]. Conversely a recent study on children living in Italy [40] found that the BMI was lower in children of immigrant mothers than in those of Italian mothers (significantly lower in daughters).

Accordingly, some unhealthy eating habits and sedentary behaviors were more frequently observed in children of immigrants [35, 41]. However it remains unclear if parental migrant status (MS) and EL contribute independently to such habits and if this relationship is only observed for some selected eating habits related to childhood obesity. Further gaps include the paucity of data in young children and possible differences according to maternal or paternal MS and EL.

Findings such as these provide insights about the kinds of social and economic contexts that might raise or lower the risk of overweight among children [42].

However it is unclear at what age children become at-risk for overweight or when the at-risk groups become overweight. For example, if at-risk children tend to be overweight at kindergarten, interventions should focus on the preschool environments (families and childcare facilities) rather than on elementary schools [1].

It is now argued that the prevention of weight gain beginning in the formative preschool years is the most effective means of achieving healthy weight in the population [7, 43]. Hence, a better understanding of the risk factors for obesity during the preschool years is urgently needed to inform prevention strategies.

Our objectives were to assess the differences in adiposity, lifestyle habits and parents' features in preschool children according to their parental MS and to evaluate the influence of behavioral/lifestyle factors on the children's BMI.

Materials and Methods

This cross-sectional study was conducted on 2640 children aged 5-6 years (1350 males and 1290 females) attending kindergartens in Emilia-Romagna region (northern Italy) and on 4874 parents (2396 fathers and 2478 mothers). Only children who received parental written consent and agreed to participate were allowed to take part in the study. The response rate was 74.4%; detailed sampling methodology has been described in a previous publication [44].

The present survey was part of a larger research project (SoNIA – Sorveglianza Nutrizionale Infanzia e Adolescenza) on the nutritional status of children and adolescents [45]. The study was approved by the Italian Ministry of Health and was scientifically supported by the National Institute of Nutrition.

The children's MS was defined on the basis of the origin of their parents [27, 46]. They were classified as Italians (N=2337) or Immigrants (N=263), with the latter subdivided into the following groups: Other Europeans (45.2%), Africans (27.4%), Others (27.4%).

We measured height and body weight of the children with a stadiometer and an electronic scale (Seca, Basel, Switzerland) in order to calculate BMI (weight/height^2) [kg/m^2]. During the

measurements the children were dressed in light clothes without shoes. No adjustments were made for clothing. Weight status was defined according to the BMI cutoff values by sex and age established by the International Obesity Task Force (IOTF) in 2000 [47] and by Cole *et al.* [48].

The parents completed at home a self-administered questionnaire to provide data on the children (birth weight, breastfeeding, sleep duration, breakfast, after dinner snacking, physical activity) and on the family (ethnic group, parents' education, parents' work, weight, height). BMI was calculated from the parents' self-reported height and weight and categorized as underweight (<18.5), normal weight (18.5-24.9) overweight (25-29.9) and obese (≥30) [49, 50]).

The differences between the Italian and Immigrant children were analyzed by considering the latter group as a whole and divided into the ethnic groups.

To compare the groups we used Student's t-test, ANOVA (with Tukey's HSD *post hoc* test), and chi-square (χ^2) test (with Fisher's exact text and Bonferroni correction pairwise comparison when appropriate). A stepwise regression analysis used the children's BMI as the dependent variable and the questionnaire data as independent variables. The probability level was set at 0.05. Statistical analyses were performed using the Package "Statistica" version 8.8 (StatSoft, Vigonza, PD).

Results

Children

Table 1 reports the physical characteristics of the children grouped by sex and origin. There were no significant differences between the Italian and Immigrant children as a whole.

The comparison among children divided into their belonging ethnic groups showed that African males were heavier and taller than children of the other groups. Significant sex differences (t-test) were observed in Italians for height ($p<0.001$) and in Africans for weight ($p<0.05$).

Table 2 presents the prevalence (%) of weight status in the children grouped by sex and origin. Normal weight was most common for both sexes in all ethnic groups. African males had a significantly lower prevalence of normal weight than Italian and Other European males, as well as the highest frequency of overweight and obesity. The Italians showed a significant sex difference in the prevalence of normal weight and overweight children.

The ethnic groups did not differ significantly in birth weight. Males generally weighed more at birth than females (Table 3), with a significant difference in Italians ($p<0.001$).

Sleep duration (Table 3) was lower in African males than in the other groups, with significant differences in comparison with Italians ($p<0.05$) and Other Europeans ($p<0.001$).

Physical activity (Table 4) was significantly higher in Italian children than in Immigrant children. In all groups, it was generally more frequent in females than in males, with a significant difference in

Italians. In those who practiced physical activity, the weekly hours dedicated to it (Table 3) did not differ significantly between males and females.

Breastfeeding (Table 4) was more frequent than formula feeding in all groups. Italian children had the highest percentage of formula feeding (20,9%), differing significantly from Immigrants and Africans.

Daily breakfast ("every day") (Table 4) was most common in Italians and Other Europeans, with significant differences between Italians and Immigrants of both sexes and between Italian and African females. The "never" response also differed significantly between Italians and Africans and between Italian males and those of the Immigrant and Others groups.

Regarding snacking (Table 4), the percentages of children who never or sometimes consumed food after dinner were generally high. Nevertheless, in males, “never” snacking after dinner was significantly higher in Immigrants than in Italians while, in females, “sometimes” snacking after dinner was significantly higher in Africans than in Others.

Parents

ANOVA revealed significant differences in mother’s BMI by origin ($p<0.001$). Tukey's HSD test showed that African mothers differed significantly from Italian or Other European ones (Table 5).

In the Immigrant groups, the mothers were most commonly normal weight while overweight was generally prevalent in the fathers (Table 6). Mothers showed a higher prevalence of underweight than fathers. Underweight was not present in African parents.

The prevalence of underweight was significantly higher in male Others than in the other groups. Normal weight parents were more frequent in Italians than in Immigrants; moreover, Italian mothers presented a significantly higher prevalence of normal weight than African ones. African mothers and fathers had high rates of overweight and obesity (Table 6) and the difference between Italian and African mothers was significant. Italian mothers showed significantly lower values of overweight than Immigrant mothers.

The number of children and of family members differed significantly between Italians and Immigrants. ANOVA revealed a significant difference between Italians and Other Europeans in the number of family members. Africans had a slightly higher number of children than the other groups (Table 5).

Middle school and high school diploma were the most common ELs (Table 6). Italian parents showed a significant difference with Immigrants in terms of the total absence of education and elementary school diploma. These groups also differed for middle school diploma in the fathers and for high school diploma in the mothers. The African parents had the lowest level of education, with

the highest frequency of individuals with a total absence of education or only an elementary school diploma; the difference was significant with respect to Italians and Other Europeans (mothers only). African mothers also differed significantly from Italian ones for high school diploma.

Laborer was the most common profession of the fathers and housewife of the mothers, with the exception of Italian parents for whom clerical work was predominant (Table 6). Italian mothers were significantly more engaged in clerical work than Immigrant ones, the difference being significant for all three subgroups (Other Europeans, Africans and Others). The Italian mothers showed significantly lower values for housewife than the above-mentioned groups. Merchant activity was significantly higher in Italian mothers than in Immigrant ones. Italian mothers showed significantly lower frequencies of laborer than Immigrant mothers (particularly than Africans), while the opposite situation was found for mothers seeking employment.

Among the fathers, Italians showed significantly higher values of entrepreneur than Immigrants (particularly than Africans). Immigrants presented significantly lower values for clerical worker than Italians, with Africans having a significantly lower percentage than all the other groups. African employees was significantly lower than all the other groups. The Italian fathers had a lower frequency of laborer than the other groups, with significant differences with Immigrants and particularly Africans. The latter presented the highest frequency, also differing significantly from Other Europeans and Others. There were significantly less household fathers in Italians than in Immigrants (especially Other Europeans and Africans).

The stepwise regression analysis using the children's BMI as the dependent variable and type of breastfeeding, mother's BMI, father's BMI, skipping breakfast, number of family members, mother's education, father's education, ethnicity, hours of physical activity per week, birth weight, mother's occupation, father's occupation, gender, sleep duration, practice of physical activity and after dinner snacking as independent variables yielded a model with the variables reported in Table 7. Children's BMI varied according to birth weight and parents' BMI, which are thus the most informative predictors.

Discussion

The purposes of this study were to assess differences in BMI and weight status in preschool children of Emilia-Romagna region (Italy) with different ethnic background and to assess the possible risk factors associated with these conditions.

The main limitation of the study is the use of self-reported data for the parents. In fact, some incorrect answers might result from recall bias, for example regarding characteristics of the child at birth, or from possible confusion between the actual and desired physical characteristics with regard

to parental height and weight [40]. Another limitation is the small immigrant samples, with a probable reduction in the power of the statistical tests. Finally this is a cross-sectional study.

However, with regard to the children's anthropometric characteristics, our study considered only data measured by specialized personnel with standardized training.

Although the differences were significant only in some cases, the results indicate noteworthy trends. The most pronounced differences among the groups regarded African children, particularly males, with the prevalence of overweight and obesity being remarkably high in this group. Italian and Other European children generally showed the highest percentage of normal weight subjects, while the other ethnic groups presented a greater imbalance.

African children had the highest incidence of risk factors related to obesity: African males had higher birth weight and shorter sleep than the other groups.

There was a significantly higher frequency of Italian children engaged in physical activity than Immigrant children.

There were no notable differences in the type of feeding, even though formula feeding was a more common practice in Italians than in the other groups.

Africans and male Others Immigrants showed a tendency to skip breakfast with respect to Italians and Other European Immigrants.

The weight status of the children partly reflected what was observed in the parents. Indeed the African parents had a high frequency of overweight and obesity.

Moreover the data on parental education showed a particularly low EL in Africans. This confirms literature reports showing that MS, along with a low EL, is a risk factor for overweight/obesity [35, 36, 39].

The stepwise regression analysis revealed three potentially modifiable factors associated with BMI in preschool children. In particular our study confirmed that HBW is an important predictor of overweight or obesity in children [5, 8]. Infant birth weight is related to the mother's nutrition and body weight during pregnancy, becoming an important indicator of nutritional and developmental status of the child. The other two risk factors with a significant association with children's BMI were the mother's and father's BMI. According to Ebenegger *et al*. [27], certain maternal factors, such as maternal obesity, are associated with severe kindergarten obesity. In our study, weight disorders were higher among Immigrants, both children and parents. Particularly promising prevention and treatment components for severely obese immigrant children include integration of traditional dietary customs and preferences, family-centered approaches to physical activity and healthy meals [51].

The effects of ethnicity can be partly explained by cultural beliefs and behavioral norms. There may be a need for culturally appropriate health promotion interventions targeted at high-risk minority ethnic groups [52, 53].

As parents are mainly responsible for the purchase and preparation of food, low-income families tend to buy more energy-dense foods since they provide low-cost calories [27, 36, 54].

According to Potter and Ulijazek [55] the prediction of adult obesity from the obesity risk in childhood depends on an ecological multifactor framework that spans multiple phases of the life course. Numerous studies [4, 7, 8, 14, 15, 25, 27, 56] have sought to highlight the factors playing a major role in this relationship. Understanding these factors will help to devise and implement focused preventive measures. Unfortunately there are still very few studies on immigrant children, especially in countries such as Italy where immigration is a recent, albeit very important, phenomenon. Our study shows that there are different risks for overweight in 5/6-year-old children according to their ethnic background. Monitoring the health status and associated risk factors in these groups and supporting the parents, particularly in the promotion of healthy behaviors, will allow better protection and integration of these immigrants. In order to reduce health inequalities, culturally specific efforts are required to promote a healthy lifestyle among high-risk ethnic groups.

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Table 1. Anthropometric characteristics of the children (mean, SD) by sex and ethnic background

	Italians (M 1185, F 1152)		Immigrants (M 125 , F 138)		Other Europeans (M 63, F 56)		Africans (M 36, F 36)		Others (M 26, F 46)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Males										
Weight (kg)	22.7	4.3	22.8	4.3	22.2	3.8	24.5	4.9	22.1	4.0
Height (cm)	117.1	5.3	117.3	5.4	116.9	4.9	118.4	6.0	116.7	5.5
BMI (kg/m^2)	16.5	2.3	16.5	2.3	16.2	2.0	17.4	2.8	16.1	2.1
Females										
Weight (kg)	22.4	4.1	22.4	4.1	22.3	3.8	21.9	4.3	22.7	4.3
Height (cm)	115.9	5.5	116.5	5.3	116.8	4.7	115.8	5.8	116.6	5.7
BMI (kg/m^2)	16.6	2.2	16.4	2.2	16.3	2.1	16.2	2.1	16.6	2.3

Table 2. Prevalence (%) of weight status in children by sex and ethnic background

	1-Italians	2-Immigrants	3-Other Europeans	4-Africans	5-Others
Males					
Underweight	7.5	4.0	1.6	5.5	7.7
Normal weight	70.9 [4]	68.8	81.0 [4]	50.0 [1,3]	65.4
Overweight	13.0	16.8	11.1	25.0	19.2
Obesity	8.6	10.4	6.3	19.4	7.7
Females					
Underweight	5.4	8.1	5.5	13.9	6.7
Normal weight	65.7	64.0	70.9	58.3	60.0
Overweight	19.7	19.9	16.4	22.2	22.2
Obesity	9.3	8.1	7.3	5.6	11.1

[1] significant difference with Italians
[3] significant difference with Other Europeans
[4] significant difference with Africans

Table 3. Birth weight and lifestyle factors of the children by sex and ethnic background

	1-Italians		2-Immigrants		3-Other Europeans		4-Africans		5-Others	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Males										
Birth weight (kg)	3.44	0.46	3.42	0.53	3.37	0.55	3.54	0.56	3.40	0.44
Sleep duration (h/d)	9.8 [4]	0.9	9.6	1.1	9.9 [4]	1.0	9.1 [1,3]	1.1	9.7	1.2
PA (h/w)	2.2	1.1	2.6	1.1	2.7	1.3	2.9	1.1	2.3	0.8
Females										
Birth weight (kg)	3.27	0.48	3.33	0.49	3.31	0.55	3.29	0.48	3.40	0.42
Sleep duration (h/d)	9.8	0.9	9.7	1.0	9.8	0.8	9.6	1.1	9.6	1.2
PA (h/w)	2.1	1.0	2.2	1.0	2.3	0.9	2.1	1.0	2.2	1.1

[1] significant difference with Italians
[3] significant difference with Other Europeans
[4] significant difference with Africans

Table 4

Table 4. Prevalence (%) of lifestyle factors of the children by sex and ethnic background

	1-Italians	2-Immigrants	3-Other Europeans	4-Africans	5-Others
Types of feeding					
Breast-feeding	54.6	61.1	57.0	66.7	62.7
Formula feeding	20.9 [2,4]	14.8 [1]	18.4	7.9 [1]	14.9
Mixed feeding	24.5	24.2	24.6	25.4	22.4
Breakfast					
Males					
Never	0.3 [2,4,5]	1.7 [1]	0.0	3.1 [1]	3.8 [1]
Sometimes	4.5	6.6	7.9	3.1	7.7
Almost every day	10.5	14.9	11.1	18.8	19.2
Every day	84.7 [2]	76.9 [1]	81.0	75.0	69.2
Females					
Never	0.3 [4]	0.7	0.0	2.9 [1]	0.0
Sometimes	6.1	10.3	7.3	14.3	10.9
Almost every day	10.3	13.2	10.9	20.0	10.9
Every day	83.3 [2,4]	75.7 [1]	81.8	62.9 [1]	78.3
After dinner snacking					
Males					
Never	26.9 [2]	38.2 [1]	32.1	44.8	44.0
Sometimes	42.3	39.1	41.1	34.5	40.0
Almost every day	12.7	7.3	8.9	3.4	8.0
Every day	18.2	15.5	17.9	17.2	8.0
Females					
Never	31.7	36.7	41.2	20.7	42.5
Sometimes	38.6	38.3	37.3	62.1 [5]	22.5 [4]
Almost every day	11.8	9.2	13.7	3.4	7.5
Every day	17.9	15.8	7.8	13.8	27.5
Physical activity					
Males	38.6 [2]	29.0 [1]	29.0	19.4	42.3
Females	50.2 [2]	40.6 [1]	46.4	30.6	41.3

[1] significant difference with Italians
[2] significant difference with Immigrants
[4] significant difference with Africans
[5] significant difference with Others

Table 5. Anthropometric characteristics of the parents and family composition by ethnic background

	1-Italians		2-Immigrants		3-Other Europeans		4-Africans		5-Others	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Mother's height (cm)	163.9	5.8	164.5	6.2	165.1	6.0	165.4 [5]	6.3	162.7 [4]	6.1
Mother's weight (kg)	61.2 [4]	10.6	63.8	10.6	62.1 [4]	10.3	68.2 [1,3,5]	10.8	62.1 [4]	9.6
Mother's BMI (kg/m^2)	22.8 [4]	3.6	23.6	3.7	22.8 [4]	3.6	24.9 [1,3]	3.6	23.5	3.7
Father's height (cm)	176.6 [4]	6.5	175.2	7.6	177.3 [4,5]	6.5	173.3 [1,3]	7.8	173.6 [3]	8.3
Father's weight (kg)	79.9	11.7	79.4	10.8	80.6	11.2	77.9	9.8	78.7	11.0
Father's BMI (kg/m^2)	25.6	3.3	25.9	3.2	25.6	3.2	26.1	3.0	26.1	3.3
Number of children	1.9 [2]	0.8	2.1 [1]	0.8	2.0	0.8	2.2	0.9	2.0	0.7
Number of family members	3.9 [2,3]	0.9	4.3 [1]	1.1	4.4 [1]	1.1	4.3	1.2	4.0	0.8

[1] significant difference with Italians
[2] significant difference with Immigrants
[3] significant difference with Other Europeans
[4] significant difference with Africans
[5] significant difference with Others

Table 6. Prevalence of parents' characteristics by ethnic background

	1-Italians	2-Immigrants	3-Other Europeans	4-Africans	5-Others
Mother's weight status					
Underweight	5.5	2.9	3.6	0.0	4.5
Normal weight	74.2 [2,4]	67.1 [1]	71.8	59.1 [1]	67.2
Overweight	15.8 [2,4]	23.5 [1]	20.9	28.8 [1]	22.4
Obesity	4.5 [4]	6.6	3.6	12.1 [1]	6.0
Father's weight status					
Underweight	0.2 [5]	0.8	0.9 [5]	0.0 [5]	1.5 [1,3,4]
Normal weight	48.4 [2]	41.5 [1]	46.3	34.9	40.0
Overweight	42.5	48.3	44.4	52.4	50.8
Obesity	8.9	9.3	8.3	12.7	7.7
Mother's educational level					
None	0.2 [2,4]	3.6 [1]	0.0 [4]	11.6 [1,3]	1.4
Primary school	1.5 [2,4,5]	9.1 [1]	3.5 [4]	18.8 [1,3]	8.6 [1]
Middle school	32.0	32.9	39.8	30.4	24.3
High school	52.5 [2,4]	43.3 [1]	46.0	33.3 [1]	48.6
University	13.9	11.1	10.6	5.8	17.1
Father's educational level					
None	0.2 [2,4]	2.8 [1]	0.0 [4]	9.0 [1,3]	1.5
Primary school	3.4 [2,4]	9.8 [1]	8.0	14.9 [1]	7.5
Middle school	41.6 [2]	34.6 [1]	32.1	35.8	37.3
High school	41.4	39.8	45.5	31.3	38.8
University	13.4	13.0	14.3	9.0	14.9
Mother's occupation					
Entrepreneur	8.0	5.6	6.2	0.0	9.9
Clerical worker	40.4 [2,3,4,5]	15.1 [1]	18.6 [1]	7.5 [1]	16.9 [1]
Merchant	8.3 [2]	4.4 [1]	6.2	3.0	2.8
Laborer	17.7 [2,4]	24.7 [1]	23.9	31.3[1]	19.7
Housewife	17.4 [2,3,4,5]	39.4 [1]	36.3 [1]	38.8 [1]	45.1 [1]
Seeking employment	2.3 [2,4]	5.2 [1]	2.7	11.9 [1]	2.8
Other	5.9	5.6	6.2	7.5	2.8
Father's occupation					
Entrepreneur	22.3 [2,4]	15.3 [1]	14.9	10.4 [1]	20.6
Clerical worker	28.8 [2,4]	16.9 [1]	19.3 [4]	4.5 [1,3,5]	25.0 [4]
Merchant	16.7	14.9	15.8	11.9	16.2
Laborer	26.2 [2,4]	42.2 [1]	36.8 [4]	64.2 [1,3,5]	29.4 [4]
Household	0.7 [2,3,4]	3.6 [1]	3.5 [1]	4.5 [1]	2.9
Seeking employment	0.6	1.6	0.0	3.0	2.9
Other	4.6	5.6	9.6	1.5	2.9

[1] significant difference with Italians
[2] significant difference with Immigrants
[3] significant difference with Other Europeans
[4] significant difference with Africans
[5] significant difference with Others

Table 7. Regression model of child's BMI ($R^2 = 0.12$)

	Estimate	Std. Error	p
(Intercept)	7.92	0.51	0.0002
Mother's BMI	0.15	0.09	<0.0001
Father's BMI	0.12	0.01	<0.0001
Birth weight	0.49	0.01	<0.0001