

# “OKKIO alla salute 2014” results from the Tuscan sample

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## Abstract

**Background.** The prevalence of overweight and obesity among children is rapidly increasing in many countries. For this reason we decided to investigate the eating habits of 8-9 years old Tuscany children, by paying attention to the frequency of their meals per day and to their food choices, also in relation to children's Body Mass Index (BMI) classes. In addition, we considered some environmental factors that could affect children eating behaviors, such as parents' BMI.

**Methods.** Data from the 2014 Tuscany nutritional surveillance system (part of the national periodical survey) and collected from children, parents and teachers, have been linked to study of children's eating habits. Logistic regression analyses were used to investigate the association between incorrect dietary habits and the potential predictors of overweight and obesity.

**Results.** More than half of the 2,163 children (68.64% overall, 67.61% females, 69.56% males) reported to have eaten an appropriate breakfast in the morning, while 5.9% skipped breakfast and only 33.5% of children ate an appropriate mid-morning snack. Logistic regression showed that having breakfast and especially an adequate breakfast are protective factors against obesity (OR 0.57,  $p < 0.01$ ; OR 0.84;  $p = 0.03$  respectively).

**Conclusion.** In Tuscany Region, unhealthy dietary habits are common among children. The identified deficiencies may be a harbinger of future public health problems.

## Introduction

Overweight and obesity in all age groups have widely increased in the last decades and have been recognized as a serious public health concern. Data estimate that about 13% of the world's adult population were obese and that 41 million of children under 5 years old were overweight or obese in 2014 (1-3).

The World Health Organization (WHO) defines overweight and obesity as “abnormal or excessive fat accumulation that may impair health” (2). Body mass index (BMI) is a simple index of weight for height usually used for classification of overweight and obesity and an increase in BMI represents a significant risk factor for non-communicable diseases such as cardiovascular diseases,

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diabetes, musculoskeletal disorders and some cancers. Moreover, obesity in childhood is correlated with a higher risk of obesity, premature death and disability in adulthood and once established is difficult to reverse (3, 4). Lifestyles, in particular sedentary habits and inadequate diet (5), play an important role in population's excess weight of all age groups. Overweight and obesity in childhood predispose to cardiovascular and metabolic disorders, due to risk factors such as an increase in arterial pressure, the modification of the lipid profile and of the glucidic metabolism. Awareness of the problem represented by excess weight and sedentary behaviors in childhood led to the proposal of evidence-based intervention strategies. In Italy, although we noticed an overall reduction of the children obesity over the years, the prevalence of overweight and obesity in the central regions (21.0% and 8.5%, respectively) and in the South (25.3% and 15.5% respectively) is still high, especially if compared with the regions of the North (18.0% and 6.7% respectively). In particular, the range of variability of the prevalence of overweight was 13.4% (Bolzano) - 28.6% (Campania); while obesity is 4.4% (Bolzano) - 19.9% (Campania) (6).

Dietary habits may also contribute to the incidence and severity of overweight/obesity in children and adolescents. Skipping breakfast, low intake of fruit and vegetables, high consumption of both sugar-sweetened beverages (SSBs) and energy-dense snacks may be dietary determinants of obesity (7). Breakfast is considered as one of the most important meals of the day, since it is involved in maintaining cognitive function, in activating metabolism and in supplying the body with energy and important nutrients (8-10). The habit of skipping breakfast in childhood or adolescence may persist into adulthood and has been associated with higher adiposity measures in both cross-sectional and longitudinal studies (11,

12). Despite the importance of breakfast consumption, the prevalence of breakfast skipping among children and adolescents has increased in the past few decades (13), and about 20-30% of children and adolescents skip breakfast in industrialized countries (14). Many persons have a nutritionally unhealthy breakfast; the lack of time or of appetite upon awakening are the main given explanations (15). In Italy the prevalence of regular breakfast consumption tends to decrease as children grow older (15, 16). In addition, other nutritional surveys have displayed how children's eating habits can be influenced by some home environments such as eating patterns, BMI and educational level of parents, especially of the mothers, who, more than fathers, determine children's behaviors (17, 18).

A national surveillance system to evaluate the nutritional status and key modifiable behaviors associated with childhood overweight and obesity in Italy was promoted by the Ministry of Health in 2007. It is called "OKkio alla SALUTE" ("Pay Attention to Health") and the responsibility for its coordination was given to the Centre for Epidemiology, Surveillance and Health Promotion within the Istituto Superiore di Sanità (National Institute of Health) (3). It is part of the Childhood Obesity Surveillance Initiative (COSI) of the WHO Regional Office for Europe (2, 3). Details of the methodology are provided elsewhere (2, 3). Tuscany participated in this project with a representative sample at regional level. In this study we describe the eating habits of a sample of 8-9 years old Tuscany children, at breakfast and at mid-morning lunch, and the association between the frequency of these meals and children's BMI class, gender, as well as their mothers' BMI class.

The main objective of our study is to describe the nutritional status, dietary habits of Tuscan children and school activities that favor healthy nutrition, in order to guide the implementation of useful and effective

initiatives for the improvement of living conditions and health of children in primary schools.

## Methods

In this study we report data regarding the 2014 Tuscany regional survey “Okkio alla salute”. In our region, to guarantee the maximum level of territorial coverage, all 12 Local Health Units (LHUs) were invited to participate by the regional coordination center, and all agreed to join, and to collaborate in the project. Once enrolled, all 12 LHUs met for an explanation of the protocol and to arrange the operational formalities of the activities in Tuscany. Cluster sampling was performed according to the WHO cluster survey methodology, with classes as the units of sampling. Systematic cluster sampling (schools), stratified by administrative district, was applied. The number of children to be studied was calculated on the basis of an expected prevalence of overweight/obesity of 30%, a desired precision of 1% using a 95% confidence interval, and a design effect of 2 (i.e. the number was doubled, as required by cluster sampling). A total of 2.302 children aged between 7,5 and 9,5 years participated in the 2014 Tuscan survey (1.210 boys and 1.092 girls). The surveys had a response rate of 96%.

The survey was conducted by the staff of the LHUs (30 operators) who were trained in survey methods and height and weight measuring technique. Each LHU was provided with new Seca 872 scales and with Seca 214 stadiometers for use during the survey. Only trained sanitary personnel measured the children’s height and weight, using appropriate, standardized instruments. Every child was weighed under standard conditions: without shoes and wearing only underclothes. We used electronic scales with a liquid crystal display that measured

weight down to 100 g. Height was measured by means of a fixed or portable stadiometer with a precision of 0.1 cm; exact decimal age was calculated from the date of birth. More information on this protocol is available elsewhere (2, 3). Criteria for childhood overweight and obesity BMI is used internationally to classify childhood as overweight or obese

BMI was then calculated from weight and height, using the following formula: weight (kg)/height (m<sup>2</sup>). Nutritional status was estimated through the BMI for age, according to Cole’s cut-offs (19) for overweight and obesity, which cover the 2-18-year age-range and are based on the adult cut-offs of 25 and 30 at 18 years. We chose this reference because it has several advantages for international use. First, it is now a widely accepted BMI based reference used for both childhood and adolescence overweight and obesity and is recommended for use in international comparisons. Second, this method provides specific cut-off points for boys and girls, according to their exact age at measurement, expressed in decimal years.

The data were obtained measuring and getting information through a self-compiled questionnaire by children aged 8-9 years (attending the third grade of primary school) and another self-compiled questionnaire for their parents.

Approval of the protocol was obtained from the institutional review board of the National Institute of Health, including the use of opt-out consent; parents could refuse participation but the lack of a returned form was taken to imply consent to their child’s participation. All data were gathered anonymously, so that individual participants could not be identified. The above mentioned “parental” questionnaire was distributed with an introductory letter and the consent form, and included questions about the respondents (mother, father or other), and about their

education. A different questionnaire, distributed with the help of teachers in the selected classes, was aimed specifically at children. The children were asked to write if they had had breakfast on the morning of the survey and, if yes, they were asked to check a list of aliments or add what they ate. The same questions were asked about the mid-morning snack. The foods that children said to have eaten at breakfast were grouped, according to the methodological protocol of Okkio alla salute (20), in: foods with predominant protein content (milk, yogurt, cheese, eggs) or predominant glucidic content (bread, cereals, bakery products, fruits etc.). Breakfast was considered “adequate” if it envisaged the consumption of foods belonging to the first and the second groups. The collected data were organized in a database and analyzed using STATA, version 12. From the answers means, percentages and standard deviations were calculated. Logistic regression was used to explore factors associated with the outcome variables. Significance level was set at  $p < 0.05$ .

## Results

From the 121 classes (2,540 children) selected for the survey, 96.6% (2,303 children) expressed their willingness to participate in this study. A total 2,163 children (including 1,091 males and 1,018 females) presented enough data to be included in our analysis.

Parents who refused their authorization for the participation of their children were only 4% of the total. Data were analyzed only for those children who were at school on the day of the interview and who filled their questionnaires (2,303 children). The pattern of missing values had the effect of reducing the total number of subjects available for the logistic regression models from 2,303 to 2,163 (85.2%): 52.6% were males, 47.4% females. Looking at the

nutritional status using the BMI we can see that in 2014 the mean BMI was 17.58 Kg/m<sup>2</sup> (SD 2.96), the mean BMI for females was 17.43 (SD 2.90), the mean BMI for males was 17.72 (SD 3.01), the difference between males and females was statistically significant ( $p < 0.05$ ).

Looking at different classes of nutritional status we can see that the prevalence of underweight is 1.62% (0.83% in males vs 2.49% in females), the prevalence of overweight is 19.66% (19.0% in males vs 20.4% in females), and the prevalence of obesity is 7.6% (8.5% in males vs 6.6% in females) (Table 1). All the differences between males e females are statistically significant.

### *Dietary habits*

In Table 2 a,b,c,d and 3 a,b,c,d, are reported the prevalences of the dietary habits. More than half of the children (68.64% overall: 67.61% of females, 69.56% of males) reported to have eaten an appropriate breakfast in the morning, while 5.9% skipped breakfast, and only 33.5% of the children ate an appropriate mid-morning snack.

### *Type of food consumed for breakfast and mid-morning snack*

Table 2 a,b,c,d lists the types of food more frequently consumed by children for the morning breakfast by gender. Milk with or without cocoa was the most frequently consumed food at breakfast (75.6%), followed by biscuits (46.3%) and cereals (18%). About 15.7% of children consumed industrial sweet snacks and 3% consumed croissants. Only 7.2% of children consumed fruits or freshly prepared fruit juices and 4.5% consumed yogurt. In general males and females show similar percentages; only for tea and biscuits we observed a significant difference in favour of females and only for twinkies and corn flakes we observed a significant difference in favour of males.

### *Dietary habits regarding the mid-morning snack*

Fruit was consumed by 20.9% of children, ranging from about 19% in males to 23% in females ( $p < 0.05$ ). Moreover, fruit represents the most offered mid-morning snack by schools (86.6%) (Table 4). A similar percentage of children (18.5%) consumed “focaccia” (a sort of pizza bread). Males consumed significantly more juice than females (20.4% vs. 15.2%) (Table 3a).

### *Dietary habits and BMI*

Analyzing the breakfast and the mid-morning snack frequency in relation to children’s BMI classes, we observed that normal-weight children generally tend to consume these meals more frequently than overweight and obese children. This tendency is evident, in particular, for breakfast ( $p < 0.01$ ), while it is not significant, for mid-morning snack. Furthermore, it appears that, though the consumption frequency of these two meals is elevated, breakfast is the meal less consumed by overweight and obese children.

### *Multivariate analyses*

The results of the logistic regression models applied to the dietary habits reported in Tables, showed a positive correlation between the overweight/obesity of parents with overweight/obesity of sons (OR 1.94 mother, OR 1.75 father, all  $p < 0.01$ ). This is particularly evident for females: the odds ratios for overweight/obesity of their parents (1.98 father, 2.19 mother) were

higher than those of males (1.79 father, 2.03 mother).

Logistic regression showed also that having breakfast and especially an adequate breakfast are protective factors against obesity (OR 0.84;  $p = 0.03$ ; OR 0.57,  $p < 0.01$  respectively).

## **Discussion and conclusions**

Among Tuscan children 27.22% resulted to be overweight/obese/heavy obese according to Cole’s criteria. The obtained information provided some indications about the eating habits of 3rd-grade children in Tuscany region, but didn’t provide any information about the quantities of eaten foods. To obtain that, a nutrition diary is suggested. 94% of children reported to have had breakfast, while only 3% declared to have skipped it. Nutrition experts agree upon the importance of a breakfast that should cover at least 25% of the necessary caloric intake and should supply a quantity of balanced nutrients; it has also been observed that eating breakfast may influence children’s cognitive abilities, especially the memory (21). Moreover, eating an adequate breakfast may help control body weight because of a reduced dietary fat intake and a minimized impulsive snacking (22, 23).

Having breakfast in the early morning may be a good way to control the body weight; it has been suggested that individuals who do not eat breakfast have a greater overall daily energy intake (24-27).

Table 1 - Percentages of children, classified according to Cole’s criteria (all  $p < 0.05$ ).

Cole’s category	Total %	Males	Females
Underweight	1.62	0.83	2.49
Normal weight	71.17	71.70	70.57
Overweight	19.65	19.00	20.39
Obesity	6.16	6.73	5.54
Severe obesity	1.40	1.74	1.01

Table 2a – Percentages of children who ate specific foods for breakfast (in the day of the interview).

Breakfast	Total %	Males	Females	P value
Frequency of breakfast consumption	94.08	93.96	94.22	n/s
Milk	61.26	63.03	59.30	n/s
Milk chocolate	14.29	14.00	14.61	n/s
Tea	6.89	5.72	8.18	<b>0.02</b>
Juice	6.06	6.95	5.06	n/s
Orange fresh juice	3.24	3.08	3.41	n/s
Croissant	3.01	2.99	3.02	n/s
Brioche	3.98	4.31	3.60	n/s
Twinkie	11.70	13.03	10.22	<b>0.04</b>
Biscuits	46.32	43.31	49.66	<b>&lt;0.01</b>
Sandwiches	1.62	1.94	1.27	n/s
Bread with jam	3.33	3.61	3.02	n/s
Bread with Nutella®	5.22	5.11	5.36	n/s
Pizza	0.92	1.14	0.68	n/s
Crackers	0.92	0.88	0.97	n/s
Rusks	5.18	5.37	4.97	n/s
Cake	2.40	2.29	2.53	n/s
Yogurt	4.48	4.05	4.97	n/s
Corn flakes	16.55	18.31	14.61	<b>0.02</b>
Fruit	4.07	4.58	3.51	n/s
Egg	0.51	0.62	0.39	n/s
Right carbs intake <sup>1</sup>	93.39	92.52	94.35	n/s
Right protein intake <sup>1</sup>	79.38	81.16	77.41	<b>0.03</b>

(1 = calculated on the basis of the given answers and on the basis of “Okkio alla salute” protocol; n/s= not statistically significant)

Table 2b – Percentages of children who ate specific foods for breakfast (in the day of the interview) divided per BMI class.

TOTAL	Underweight (N = 37)	Normal weight (N = 1628)	Overweight (N = 450)	Obesity (N = 141)	Severe obesity (N = 31)
Frequency of breakfast consumption	97.30	94.96	92.67	87.23	96.77
Milk	70.27	58.05	57.78	48.94	58.06
Milk chocolate	13.51	13.08	15.56	11.35	12.90
Tea	8.11	6.51	5.11	7.80	12.90
Juice	5.41	5.59	5.33	7.80	9.68
Orange fresh juice	0.00	3.26	2.00	5.67	0.00
Croissant	2.70	2.70	2.89	4.26	3.23
Brioche	5.41	4.18	2.44	2.13	3.23
Twinkie	10.81	12.04	8.00	9.93	6.45
Biscuits	48.65	44.72	41.56	34.75	41.94
Sandwiches	0.00	1.54	1.56	1.42	3.23
Bread with jam	0.00	3.26	3.33	2.84	0.00
Bread with Nutella®	5.41	4.73	5.78	2.84	9.68

Pizza	5.41	0.80	0.89	0.71	0.00
Crackers	0.00	0.98	0.67	0.71	0.00
Rusks	0.00	4.67	6.44	2.13	9.68
Cake	5.41	2.21	2.44	2.13	0.00
Yogurt	0.00	3.93	5.33	5.67	3.23
Corn flakes	10.81	15.23	17.11	16.31	9.68
Fruit	0.00	4.05	2.89	4.26	0.00
Eggs	2.70	0.43	0.22	1.42	0.00
Adequate Breakfast	67.57	69.41	70.22	58.16	54.84

Table 2c – Percentages of males who ate specific foods for breakfast, divided per BMI class.

MALES	Underweight (N = 10)	Normal weight (N = 863)	Overweight (N = 229)	Obesity (N = 81)	Severe obesity (N = 20)
Frequency of breakfast consumption	90	95.02	92.58	87.65	95
Milk	44.44	63.78	61.79	60.56	63.16
Milk chocolate	11.11	12.93	17.92	15.49	15.79
Tea	11.11	5.37	4.72	9.86	10.53
Juice	11.11	6.71	7.55	8.45	5.26
Orange fresh juice	0	3.66	1.42	2.82	0
Croissant	0	2.93	2.36	5.63	5.26
Brioche	0	5	2.83	2.82	0
Twinkie	44.44	13.90	8.96	11.27	10.53
Biscuits	33.33	43.66	43.40	39.44	47.37
Sandwiches	0	1.95	1.42	2.82	5.26
Bread with jam	0	3.54	4.72	2.82	0
Bread with Nutella®	11.11	5	5.66	4.23	5.26
Pizza	11.11	0.98	1.42	1.41	0
Crackers	0	0.98	0.94	0	0
Rusks	0	5	6.13	4.23	15.79
Cake	0	2.56	1.89	1.41	0
Yogurt	0	3.54	6.13	5.63	0
Corn flakes	0	17.20	23.11	19.72	10.53
Fruit	0	4.51	3.77	7.04	0
Egg	0	0.61	0	2.82	0
Adequate Breakfast	20	70.68	70.74	65.43	55

Table 2d – Percentages of females who ate specific foods for breakfast (in the day of the interview) divided per BMI class.

FEMALES	Underweight (N = 27)	Normal weight (N = 765)	Overweight (N = 221)	Obesity (N = 60)	Severe obesity (N = 11)
Frequency of breakfast consumption	100	94.90	92.76	86.67	100
Milk	81.48	58.13	62.93	50	54.55
Milk chocolate	14.81	14.74	15.61	9.62	9.09
Tea	7.41	8.54	6.34	7.69	18,18

Juice	3.70	4.96	3.90	9.62	18.18
Orange fresh juice	0	3.17	2.93	11.54	0
Croissant	3.70	2.75	3.90	3.85	0
Brioche	7.41	3.72	2.44	1.92	9.09
Twinkie	0	11.29	8.29	11.54	0
Biscuits	55.56	50.96	46.34	40.38	36.36
Sandwiches	0	1.24	1.95	0	0
Bread with jam	0	3.31	2.44	3.85	0
Bread with Nutella®	3.70	4.96	6.83	1.92	18.18
Pizza	3.70	0.69	0.49	0	0
Crackers	0	1.10	0.49	1.92	0
Rusks	0	4.82	7.80	0	0
Cake	7.41	2.07	3.41	3.85	0
Yogurt	0	4.82	5.37	7.69	9.09
Corn flakes	14.81	14.74	13.66	17.31	9.09
Fruit	0	3.99	2.44	1.92	0
Eggs	3.70	0.28	0.49	0	0
Adequate Breakfast	85.19	67.97	69.68	48.33	54.55

Table 3a – Percentages of children who ate specific foods for mid morning (in the day of the interview).

Mid morning lunch		Males	Females	P value
Frequency of mid-morning lunch consumption	97.91	97.52	98.35	n/s
Juice	17.96	20.42	15.23	<0.01
Drink	0.76	0.93	0.56	n/s
Tea	4.71	4.75	4.67	n/s
Snack	4.22	4.58	3.83	n/s
Yogurt	6.18	4.83	7.66	<0.01
Twinkie	14.13	14.07	14.21	n/s
Biscuits	11.02	11.86	10.09	n/s
Sandwiches	16.22	17.12	15.23	n/s
Crackers	10.09	8.73	11.59	0.02
Rusks	0.93	0.93	0.93	n/s
Focaccia	18.53	18.56	18.50	n/s
Croissant	1.91	2.12	1.68	n/s
Brioche	2.22	2.54	1.87	n/s
Fruit	20.89	18.98	22.99	0.01

Table 3b – Percentages of children who ate specific foods for mid morning (in the day of the interview), divided per BMI class.

TOTAL	Under-weight (N = 37)	Normal weight (N = 1628)	Over-weight (N = 450)	Obesity (N = 141)	Severe obesity (N = 31)
Frequency of mid-morning lunch consumption	97.30	97.97	97.56	97.87	100
Juice	10.81	18.73	14.89	16.31	12.90
Drink	0.00	0.86	0.22	1.42	0.00



Tea	2.70	4.55	4.00	7.09	9.68
Snack	8.11	4.30	4.44	0.71	3.23
Yogurt	0.00	5.16	8.89	7.09	12.90
Twinkie	18.92	14.74	12.44	7.80	9.68
Biscuits	16.22	10.69	9.78	13.48	12.90
Sandwiches	13.51	15.85	17.11	12.06	16.13
Crackers	8.11	9.95	8.44	14.18	3.23
Rusks	0.00	0.80	0.44	2.13	6.45
Focaccia	27.03	18.12	16.89	21.99	16.13
Croissant	0.00	1.72	2.67	2.13	0.00
Brioches	0.00	2.27	0.89	4.26	6.45
Fruit	13.51	20.33	20.89	21.28	19.35
Adequate mid morning lunch	21.62	32.92	35.56	36.17	38.71

Table 3c – Percentages of females who ate specific foods for mid morning (in the day of the interview), divided per BMI class.

Females	Underweight (n = 27)	Normal weight (n = 765)	Overweight (n = 221)	Obesity (n = 60)	Severe obesity (n = 11)
Frequency of mid-morning lunch consumption	100	98.95	96.38	96.67	100
Juice	11.11	16.82	10.33	15.52	9.09
Drink	0	0.66	0.47	0	0
Tea	3.70	4.24	5.63	6.90	9.09
Snack	11.11	3.84	4.23	0	0
Yogurt	0	7.15	9.39	8.62	27.27
Twinkie	11.11	15.50	12.21	6.90	9.09
Biscuits	18.52	9.93	10.33	6.90	18.18
Sandwich	14.81	15.89	13.62	12.07	18.18
Crackers	11.11	11.66	9.39	17.24	0
Rusks	0	0.93	0.47	3.45	0
Focaccia	29.63	18.54	17.37	18.97	18.18
Croissant	0	1.46	2.82	1.72	0
Brioches	0	1.72	0.94	5.17	9.09
Fruit	14.81	22.91	24.41	24.14	9.09
Adequate mid morning lunch	30.43	37.15	40.47	43.64	18.18

Table 3d – Percentages of males who ate specific foods for mid morning (in the day of the interview), divided per BMI class.

Males	Underweight (N = 10)	Normal weight (N = 863)	Overweight (N = 229)	Obesity (N = 81)	Severe obesity (N = 20)
Frequency of mid-morning lunch consumption	90	97.33	98.69	98.77	95.24
Juice	11.11	21.19	19.91	17.50	15
Drink	0	1.07	0	2.50	0
Tea	0	5	2.65	7.50	10
Snack	0	4.88	4.87	1.25	5
Yogurt	0	3.57	8.85	6.25	5

Twinkie	44.44	14.64	13.27	8.75	10
Biscuits	11.11	11.79	9.73	18.75	10
Sandwiches	11.11	16.43	21.24	12.50	15
Crackers	0	8.81	7.96	12.50	5
Rusks	0	0.71	0.44	1.25	10
Focaccia	22.22	18.45	17.26	25	15
Croissant	0	2.02	2.65	2.50	0
Brioches	0	2.86	0.88	3.75	5
Fruit	11.11	18.81	18.58	20	25
Adequate mid morning lunch	11.11	33.42	33.95	37.50	50

Table 4 – Types of mid morning snacks offered by schools.

Mid morning lunch (offered by school) n=709	
Fruit	86.60
Yogurt	10.58
Juice	5.22
Sandwiches	1.97
Pizza	3.24
Biscuits	2.82
Other	9.31

The favorite breakfast by Tuscan children, even considering the slight differences between BMI classes, was milk and biscuits. Milk consumption is important for calcium intake, and its role is well-known for bone growth and for child's overall health. An inverse association between frequency of milk consumption and body mass in children has been shown by a recent Italian study (28).

Cereals are the third most consumed food: they represent a positive eating behavior, because the consumption of cereals at breakfast could promote the maintenance of a healthy body weight and nutrient intakes in children (8). Instead, we may underline an insufficient tendency to consume yogurt, fresh fruit and fresh-squeezed fruit juice at breakfast.

The percentage of children who skip breakfast in our study is lower compared

with other European countries, which show percentages ranging from 10 to 30% (29, 30). A study conducted in England shows that 14% of children aged 5-15 skip breakfast with considerable variation in the age subgroups; in particular, among the 7-10 years old children, the percentage skipping breakfast is 6% (31). Compared with those who have breakfast, breakfast skippers have reduced intakes of many nutrients, including vitamins A, E, C, B6 and B12, folate, iron, calcium, phosphorus, magnesium, potassium and dietary fibres (32, 33). Breakfast skippers are also less likely to meet the daily recommendations for food groups such as vegetables and fruits (34). Conversely, eating breakfast may prevent energy dense snacking and the consumption of energy-rich foods (35). Moreover, regular breakfast consumption has been associated with improved cognitive performance and with overall dietary quality and nutritional profiles in school-aged children and adolescents (36, 37).

Breakfast has an essential role for a healthy diet and may be considered the most important meal of the day for its association with overall nutritional quality of the diets of children, but also with academic performance and psychosocial functioning; efforts should be made to promote regular consumption of a nutritious breakfast (38). In Italy over 30% of children eat a nutritionally unbalanced breakfast

and about 65% an abundant mid-morning snack. Healthy food, like fruit, fruit juice and yogurt, are infrequent. Approximately 98% of children reported having had mid-morning snack. It is important for children to consume mid-morning snack, as too much time may pass between breakfast and lunch, which may cause metabolic imbalances with a consequential drop in blood sugar level. Eating multiple, small meals may suppress hunger and overall serum insulin concentrations (39).

About the mid-morning snack, we can highlight that fruit juice and tea, which are sugar sweetened beverages, are the most frequently consumed liquid foods, while fruit, focaccia, sandwiches and pre-packaged snacks are the most frequently consumed solid foods. As reported in a previous study (40), this may be partly due to the insufficient availability of healthy foods at the distribution centers in the schools, as well as a certain standardization of preferred eating behaviors in the school setting, which includes a tendency to imitate. Contrariwise, a positive result comes from the evidence that fresh fruit consumption has increased compared to the previous edition of the Tuscan survey (40): this is especially due to school initiatives (86.6% of the Tuscan schools offered fruit for mid morning snack). As demonstrated in a previous study (40), assuming that, at school, children are inclined to imitate each other, we expected that the percentages of the consumption frequency of each eaten food would have been very close for all BMI classes at mid-morning snack. Conversely we didn't observe this phenomenon.

Consumption of breakfast was associated with child's BMI class. Obese children resulted to frequently skip breakfast: this datum may indicate that these children have a more incorrect distribution of daily caloric intake than normal-weight children. This is in line with Ma Y's study (41). Moreover, many nutritional surveys report that adolescents

with a consistent meal pattern were leaner than those with an inconsistent meal pattern (42). This observation is in agreement with studies showing a link between obesity and skipping meals (43, 44).

The attitude of skipping breakfast may be due to several factors. In a lot of families both parents work, and the lack of time represents an important factor in determining whether to have breakfast and what types of foods to consume in the morning (40). In addition, it is very important the role of the environment, and especially family's and mother's incorrect eating habits, that are transferred to the child (40). We found a positive correlation between the overweight/obesity of parents with overweight-obesity of sons. Parents' weight status is a well-known risk factor for obesity-overweight in children. A recently published study showed important similarities between children's and parental dietary behavior (45). Maternal consumption of some foods has been shown to be associated with a child's higher intake of the same foods (17, 46).

The 86.60% of mid-morning lunches offered by schools enrolled in our study, was represented by fruit, probably as a consequence of the European initiatives. The European program "Fruit at School" was introduced in 2007 with the aim to increase fruit and vegetables consumption by children and to implement initiatives that could support healthier eating habits and a more balanced nutrition. Beneficiaries of the program were children of school age from six to eleven years or, as used in the national school system, children who attended primary/elementary school (47). However fruit consumption during mid-morning snack still remains low (20.89%) although higher than 2006 edition of the Tuscan survey (7.8%) (40).

Our study, analyzing certain aspects of the eating behaviors of children ages 8-9 in Tuscany, showed that some habits need an appropriate intervention vs both parents and

children. Children of normal weight had a greater tendency to consume meals more regularly; this may lead us to believe that obese children tend to eat more frequently between meals, or that they have a habit of “munching” throughout the day (40). In order to confirm these data, further studies must be conducted specifically for this purpose.

The lifestyles are strictly connected with chronic non-communicable diseases and have a strong impact on health. Through national programs Italy has stepped up its actions to the promotion of healthy lifestyles, developing interventions aimed at changing individual behavior and creating healthy environmental conditions that promote healthy lifestyles. Overweight and obesity, particularly among children, represent a major challenge for public health. “OKkio alla salute” is a valuable tool to identify problems, plan interventions and evaluate the effectiveness of those implemented incentives.

This study has various limits that need to be taken into account in the interpretation of the results. The most important was represented by the questionnaire: children reported what they ate the day of the survey, so we could have only a picture of a specific day. A food diary of a week would be certainly more reliable to have a real description of children’s eating habits. Data collected through self-report may signify that some errors could be introduced attenuating the statistical relationships, this suggests that the actual relationships between the variables considered in the study might be even stronger. Our study analyzed the dietary behaviors of Tuscan children and found a significant association between the nutritional status of parents and overweight and obesity in school-aged children. There is a need to enhance physical activity, sports, and recreational opportunities at school as well as at home to prevent overweight and obesity in children. It is also necessary to go

on with health-promoting campaigns in order to increase the assumption of healthier foods, such as fruits and vegetables. These will be important primary prevention measures to combat the epidemic of non-communicable diseases.

## Riassunto

### “OKKIO alla salute 2014” risultati dal campione toscano

**Introduzione.** La prevalenza del sovrappeso e dell’obesità nei bambini è in rapida crescita in molti paesi. Per questo motivo è stato interessante studiare le abitudini alimentari di bambini di 8-9 anni in Toscana, prestando attenzione alla frequenza giornaliera dei pasti e alle loro scelte alimentari, anche in relazione alle classi di BMI (Body Mass Index) dei bambini. Inoltre abbiamo considerato alcuni fattori ambientali che potrebbero influenzare i comportamenti alimentari dei bambini, come il BMI dei genitori.

**Metodi.** I dati del sistema di sorveglianza nutrizionale regionale del 2014 e raccolti da bambini, genitori e insegnanti, sono stati messi insieme per determinare le abitudini alimentari dei bambini. La regressione logistica è stata usata per indagare l’associazione tra abitudini alimentari erranee e i loro potenziali predittori.

**Risultati.** Più della metà dei 2.163 bambini (68,64%) (67,61% delle femmine, 69,56% dei maschi) hanno riferito di aver mangiato una colazione adeguata al mattino, mentre il 5,9% ha saltato la colazione, solo il 33,5% dei bambini ha mangiato un’adeguata merenda di metà mattina. La regressione logistica ha dimostrato che fare la prima colazione e soprattutto una colazione adeguata sono fattori protettivi contro l’obesità (OR 0,57,  $p < 0,01$ ; OR 0,84;  $p = 0,03$  rispettivamente).

**Conclusioni.** Nella regione Toscana, le abitudini alimentari scorrette sono comuni tra i bambini. Le carenze identificate potrebbero essere un segno di futuri problemi di sanità pubblica.

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