Dietary habits among children aged 8-9 years in Italy

Laura Lauria[1], Angela Spinelli[1], Giulia Cairella[2], Laura Censi[3], Paola Nardone[1], Marta Buoncristiano[1] and 2012 Group OKkio alla SALUTE*

[1]*Centro Nazionale di Epidemiologia, Sorveglianza e Promozione della Salute, Istituto Superiore di Sanità, Rome, Italy*
[2]*Servizio Igiene Alimenti e della Nutrizione, Asl RM B, Rome, Italy*
[3]*Consiglio per la Ricerca in Agricoltura e l'Analisi dell'Economia Agraria, Centro di Ricerca per gli Alimenti e la Nutrizione, Rome, Italy*
*Components of the 2012 OKkio alla SALUTE Group are listed before the References

ORIGINAL ARTICLES AND REVIEWS

Abstract

Objective. To describe dietary habits and related geographic and socio-demographic characteristics among children aged 8-9 years in Italy.
Materials and methods. Data from the 2012 national nutritional surveillance system collected from children, parents and teachers, have been linked to determine the children's eating habits. Logistic regression analyses were used to investigate the association between incorrect dietary habits and their potential predictors.
Results. Of the 46 307 children, 8.6% skipped breakfast, 48.8% did not eat vegetables and 28.7% did not eat fruit daily, 64.8% ate an abundant mid-morning snack, 41.4% drank sugary beverages and 12.5% drank carbonated beverages at least once a day. Three or more incorrect habits were found in 43.9% of the children. Incorrect dietary habits were more common among children with lower socio-economic conditions, who were resident in the South of the country and who spent more time watching TV.
Conclusion. In Italy, unhealthy dietary habits are common among children. The deficiencies identified may well be a harbinger of future public health problems.

Key words
• breakfast
• fruit
• vegetables
• beverage
• snack

INTRODUCTION

Unhealthy diet is related to increased susceptibility to diabetes and cardiovascular diseases, reduced immunity and increased likelihood of developing obesity. In fact, although the causal mechanisms of obesity remain unclear, it is well established that dietary factors, together with physical activity, play an important role in regulating overall energy balance, thereby influencing body weight. 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 [1].

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 [2-4]. Despite the importance of breakfast consumption, the prevalence of breakfast skipping among children and adolescents has increased in the past few decades [5], and about 20-30% of children and adolescents skip breakfast in industrialised countries [6]. Many individuals eat a nutritionally unhealthy breakfast; not enough time and lack of appetite upon awakening are the main reasons given [7]. In Italy the prevalence of regular breakfast consumption tends to decrease as children grow older [8].

The health benefits of eating fruit and vegetables are well known. Nevertheless, national health surveys indicate that both children and adolescents are eating fewer fruits and vegetables than is recommended [9-11]. The majority of children do not meet the Dietary Guidelines that emphasize the importance of whole food sources of fruit and vegetables (rather than juice) and recommend that people eat a variety of fruit and vegetables five or more times a day [1].

Recently SSBs have received a great deal of attention in the United States, because they are the largest source of calories and added sugars in both children and adults [12, 13]. Several medical and scientific societies currently recommend reducing the consumption of SSBs [14]. Additionally, SSBs have been identified as a suitable target for public health interventions, not only because consumption of SSBs could be one of the

factors associated with obesity [15, 16], but also because they offer only "empty" calories and have almost no nutritional value [17], contributing to poor eating habits [18]. Sweetened beverages may also replace healthier and/or more nutrient-dense beverages such as milk, 100% fruit juice and water [12, 16].

Relatively few studies have considered snacking, and its association with body weight. Snacking should contribute an estimated 10-15% of energy intake and some authors have shown that it may influence diet quality positively and lead to a regular meal pattern [10, 19]. Conversely, snacking may contribute to energy-dense, nutrient-poor diets, and frequent snacking has been associated with increased energy intake [20]. This may also be due to the portion sizes of many foods and beverages consumed as snacks [21]. Nevertheless, the majority of studies either found no evidence of a relationship between snacking and weight status or found evidence indicating that young people who consumed more snacks were less likely to be obese [20, 22, 23].

The aim of this study is to describe dietary habits (breakfast, snack, fruit, vegetables and SSB consumption) and related geographical and socio-demographic characteristics in a large nationally representative sample of children aged 8-9 years in Italy.

MATERIALS AND METHODS

A national surveillance system to evaluate the nutritional status and key modifiable behaviours associated with childhood overweight and obesity in Italy was promoted by the Ministry of Health in 2007. It is called "OKkio alla SALUTE" 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). It is the first Italian population-based, national and regional representative nutrition survey and involves more than 45 000 third grade students every 2 years. It is part of the Childhood Obesity Surveillance Initiative (COSI) of the WHO Regional Office for Europe [24]. Details of the methodology are provided elsewhere [25]. This study uses the third round of data collection which occurred between April and June 2012. All the 21 regions of the country participated and the study population was children attending the third grade of primary school (aged 8 or 9 years). A stratified cluster sample design, with class as the primary sampling unit, was used. Approval of the protocol was obtained from the institutional review board of the National Institute of Health, including the use of opt-out consent; that is, parents could refuse participation but the lack of a returned form was taken to imply consent to their child's participation. The survey was conducted by the staff of local health units who were trained in survey methods and height and weight measuring techniques. A two-page parental questionnaire was distributed along with the introductory letter and consent form, and it included questions on the respondent (mother, father or other), their level of educational attainment and dietary behaviours of their child. In particular, questions were asked on how often their child consumed fruit, vegetables, sugary beverages and carbonated beverages. Possible

answers were: two or more per day, once per day, some times a week, less than once a week, never. In the analyses the variables were categorized as <1 and ≥1 per day. Parents were asked about the number of hours the child spends daily watching television and if the television is in the child's room. Also there was a question on the parent's opinion about the child's weight. A different questionnaire, distributed with the help of teachers in the selected classes, was aimed specifically at children. Children were asked if they had had breakfast in the morning 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. A third questionnaire completed by the health care worker with the help of the teacher sought information on the provision of a mid-morning snack by the school and information on the geographic characteristics of the municipality. For the purpose of this study, records of the questionnaires by parents, children and health care workers were linked and the dietary habits of children are described in relation to geographic area of residence adjusting for potential confounding factors. The dietary habits were: 1) breakfast, classified as no, yes/inadequate, yes/adequate; 2) mid-morning snack, classified as no, yes/inadequate, yes/adequate; 3) daily consumption of vegetables (yes/no); 4) daily consumption of fruit (yes/no); 5) daily drinks of sugary beverages, (yes/no); 6) daily drinks of carbonated beverages (yes/no). Breakfast was defined as adequate if, among the aliments consumed, there were both food with predominant protein content and food with predominant carbohydrate content according to the national nutrition guidelines [26]. Using the same guidelines, the mid-morning snack was defined adequate if based on fruit or yogurt or fruit juice without added sugar and containing about 100 calories. By default, a mid-morning snack distributed by the school was classified as adequate. Considering the above 6 dietary indicators, a global score was created by counting the number of incorrect habits, ranging from 0 to 6. This score was then dichotomised for the logistic regression analysis, in two classes, <3 incorrect habits, ≥3 incorrect habits (bad diet). A further four logistic regression analyses were conducted to analyse breakfast, mid-morning snack and the combined consumption of fruit and vegetables and of carbonated and sugary drinks. The dietary indicators for each geographical area of residence, North, Center, South, were analysed in relation to a set of variables for which evidence of association exists or which were considered potentially confounding. Because of the cross-sectional study design and the consequent explorative nature of the multivariable analysis, the same set of independent variables was used for all the outcome indicators. The independent variables were: gender, mother's citizenship (Italian, foreign), mother's education (≤middle school, high school, university degree), mother's employment (none, part time, full time), mother's self-reported height and weight which were used to calculate the body mass index (BMI) (under/normal weight, overweight, obese), parents' opinion of child's weight (underweight, normal weight, overweight), television in child's room (no/yes), daily time spent by the child watching television (≤2,

>2 hours) and the municipality's population (<10 000 inhabitants, 10 000-50 000 inhabitants, >50 000 inhabitants, metropolis).

The socio-demographic characteristics of the sample and the prevalence of the main outcomes were compared by geographic area of residence using the Rao-Scott adjusted Pearson χ^2 test. Logistic regression models for complex surveys were used to explore factors associated with the outcome variables. Interaction terms between the independent variables and the geographical area of residence were tested when analysing the score of incorrect habits. All the analyses were performed using STATA, version 11.

RESULTS

A total of 2622 classes were involved in the survey providing a total of 51 145 children. Parents who refused their authorization for the participation of their child were 3%. Data were analysed only for those children who were at school on the day of the interview and who filled their questionnaire (46 307 children).

Data quality in terms of completeness was good; missing values were less than 5% for each of the considered variables except for self-reported weight and height of the mother (7% missing) *(Table 1)*. The pattern of missing values had the effect of reducing the total number of subjects available for the logistic regression models from 46 307 to less than 40 000. In order to avoid this large reduction in the number of subjects analysable, the variable BMI of the mother was used including the category "missing" so increasing the final number of subjects analysable at 42 182. No important differences were found when comparing results obtained from regression models using the variable BMI with and without missing.

The characteristics of the children show large differences among geographic areas of residence, except for the gender of the child *(Table 1)*. Usually it is the South which differs from the North and Center of the country. In the South, mothers were less well educated, less likely to be employed and there were fewer foreign women than in the North and Center. In the Center there is a higher proportion of residents in metropolitan areas. The prevalence of overweight and obese mothers was higher in the South and the parents' opinion that their child was overweight was 20.1%, 22.2% and 27.3% in the North, Center and South respectively. There is a strong North to South gradient in the children's use of television. In particular, 29.8%, 46.9% and 60.2% of children in the North, Center and South respectively, keep the TV set in their room and 11.8%, 14.5% and 22.2% of children, respectively, spend more than two hours per day watching television.

Dietary habits

In *Table 2*, the prevalence of the dietary habits are reported. Overall, more than half of the children (60.4%) reported to have eaten an appropriate breakfast in the morning, while 8.6% skipped breakfast, a habit which was more common in the South. Only 30.5% of the children ate an appropriate mid-morning snack, with a decrease from North to South. Overall, 19.4% of children

had both a correct breakfast and a correct mid-morning snack.

About half of the sample, 48.8%, do not eat vegetables daily, this being more common in the South than the Center and North. Children who never eat vegetables are 7.0% (4.7%, 6.2% and 10.7% in North, Center and South respectively) (data not reported in Table). The intake of fruit is relatively more frequent and with minor differences between areas of residence. Three and a half percent never eat fruit (2.6%, 3.6% and 4.8% in North, Center and South respectively) (data not reported in Table). Overall, 21.8% (19.4%, 20.9% and 25.5% in North, Center and South respectively) do not consume fruit and/or vegetables daily.

Just less than half of the children (41.4%) drink sugary beverages at least once a day and 12.5% carbonated beverages, with higher percentages in the South.

Considering the total number of incorrect dietary habits (based on the 6 analysed indicators), most children of the North and the Center, about 52-53%, had 1 or 2 incorrect habits; in the South, most children, 52.9%, had 3-5 incorrect habits. Overall, 7.1% had no incorrect habits, with more in the North than South, while 0.8% had all the 6 dietary habits incorrect.

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

Table 3a lists the types of food more frequently consumed by children for the morning breakfast by geographic area of residence and gender of the child. Milk with or without cocoa was the more frequently consumed food at breakfast (66-67%), followed by biscuits (38-39%) and cereals (15-16%). About 9-10% of children consumed industrial sweet snacks and 7-8% consumed croissants. Only 5-7% of children consumed fruits or freshly prepared fruit juices and 4% consumed yogurt. In general males and females show similar percentages. There are some differences between geographic areas of residence. Children in the South tend to consume biscuits, cereals and tea less frequently, while children in the North tend to consume milk less frequently.

Dietary habits regarding the mid-morning snack *(Table 3b)* appear much more affected by the geographic area of residence. A sandwich was consumed by 20-22% of children, ranging from about 11-12% in the North to 29-30% in the South. In the North, compared to the South and the Center, children consumed fruit and crackers more frequently. In the Center a higher percentage of children consumed "focaccia" (a sort of pizza bread): about 14% *vs* 4-5%.

Multivariate analyses

The results of the logistic regression models applied to the dietary habits are reported in *Table 4*.

The model referred to the score of incorrect dietary habits shows that children who are more likely to have a better diet are females compared to males (OR = 0.81, p <0.001), have a higher educated mother (high school OR = 0.62, p <0.001; University OR = 0.40, p <0.001), are perceived by their parents as normal weight or overweight (reference=underweight: normal weight OR =

Table 1
Sample characteristics by geographic area of residence. Italy, 2012

Sample characteristics*	North N = 19685 %	Center N = 9831 %	South N = 16791 %	P value	Italy N = 46307 %
Child's gender					
male	51.0	50.5	51.0	0.767	50.9
female	49.0	49.5	49.0		49.1
missing	-	-	-		-
Mother's citizenship					
Italian	82.9	87.5	95.7	<0.001	88.2
foreign	17.1	12.5	4.3		11.8
missing	*3.9*	*4.5*	*5.6*		*4.6*
Mother's education					
<high school	31.4	29.7	43.5	<0.001	35.1
high school	49.4	49.0	42.1		46.9
university	19.3	21.3	14.4		18.1
missing	*4.1*	*5.0*	*6.0*		*5.0*
Mother's employment					
not employed	25.6	29.3	51.5	<0.001	35.1
part time	32.7	30.4	22.6		28.8
fulltime	41.8	40.3	25.9		36.1
missing	*2.8*	*3.8*	*4.5*		*3.6*
Mother's weight status					
≤normoweight	77.1	77.0	67.9	<0.001	74.0
overweight	17.4	17.8	24.1		19.7
obese	5.5	5.2	8.0		6.3
missing	6.1	6.9	8.2		7.0
Parent's opinion of child's weight					
underweight	7.5	8.0	7.2	<0.001	7.5
normoweight	72.4	69.8	65.5		69.5
overweight	20.1	22.2	27.3		23.0
missing	2.3	3.1	3.4		3.0
TV in child's bedroom					
no	70.2	53.1	39.8	<0.001	56.4
yes	29.8	46.9	60.2		43.6
missing	2.6	3.4	4.2		3.3
Hours watching TV daily					
≤2	88.2	85.5	77.8	<0.001	84.1
>2	11.8	14.5	22.2		15.9
missing	*1.8*	*2.4*	*3.1*		*2.3*
Municipality size (residents)					
<10 000	36.7	21.2	23.0	<0.001	28.9
50 000	26.2	21.9	29.8		26.5
50 000+	14.6	16.5	19.3		16.6
metropolis	22.4	40.4	27.8		28.0
missing	*0.3*	*1.4*	*1.7*		*1.0*

*For each variable, percentages are calculated on the total of subjects excluding missing. Percentage of missings are calculated on the total.

0.70, p <0.001; overweight OR = 0.59, p <0.001), live in a big city (metropolis OR = 0.78, p <0.001); on the contrary, children who are more likely to have a bad diet (>3 incorrect dietary habits) have a foreign mother (OR = 1.29, p <0.001), have an overweight mother (overweight OR = 1.08, p = 0.02; obese OR = 1.16, p = 0.014), have the TV in their bedroom (OR = 1.46, p <0.001), spend daily more than 2 hours watching TV

(OR = 1.57, p <0.001) and are residents in the South or in the Center (South OR = 1.74, p <0.001; Center OR = 1.11, p = 0.052).

Significant interaction terms were found between geographic area of residence and two of the independent variables: mother's citizenship and time spent daily watching TV. The results of the stratified analysis by geographic area of residence are reported in *Table 5*.

Table 2
Dietary indicators by geographic area of residence. Italy, 2012

Dietary indicators*	North %	Center %	South %	P value	Italy %
Breakfast					
adequate	62.9	63.9	55.1	<0.001	60.4
inadequate	31.3	28.0	32.3		31.0
no	5.8	8.0	12.6		8.6
Mid-morning snack					
adequate	37.1	29.4	21.9	<0.001	30.5
inadequate	57.0	67.1	74.9		64.8
no	5. 9	3.5	3.8		4.7
Fruits/vegetables					
less than once a day	19.4	20.9	25.5	<0.001	21.8
Fruits					
less than once a day	27.8	29.0	29.7	0.016	28.7
Vegetables					
less than once a day	38.9	44.1	65.2	<0.001	48.8
Carbonated/sugary drinks					
at least once a day	43.6	39.9	46.8	<0.001	43.9
Carbonated drinks					
at least once a day	9.9	9.5	17.7	<0.001	12.5
Sugary drinks					
at least once a day	41.8	37.9	43.0	<0.001	41.4
Number of incorrect dietary habits					
0	9.5	7.7	3.5	<0.001	7.1
1-2	52.6	52.1	42.4		49.0
3-5	37.5	39.6	52.9		43.1
6	0.5	0.6	1.3		0.8

*Missing values for all variables ranging from 0.1 to 3.7%.

Mother's citizenship is significantly associated with the number of incorrect dietary habits in the North and in the Center, but not in the South where the prevalences of a bad diet by the categories of the independent variables are higher but more similar to each other (North – IT: 36.5%, FO: 48.1%, OR = 1.31; Center – IT: 39.5%, FO: 50.8%, OR = 1.42; South – IT: 55.9%, FO: 54.2%, OR = 0.93). The hours spent by the children watching TV daily is associated with a bad diet in all the 3 geographic areas, although with less strength going from the North to the South.

In *Table 4*, the results of the logistic regression models applied to the specific outcome indicators are also shown. The consumption of fruit and vegetables were combined as well as was the consumption of carbonated and sugar-sweetened drinks.

Females are less likely than males to have incorrect behaviours for all the outcomes except for breakfast. Children of foreign mothers have similar behaviours to children of Italian mothers with respect to breakfast and mid-morning snack, but they are less likely to have a low consumption of fruit/vegetables and more likely to have a high consumption of carbonated/sugar-sweetened drinks. A low level of mother's education, to have

the TV in the bedroom and to spend more than two hours watching TV are factors strongly associated with an inadequate breakfast and mid-morning snack, with a low consumption of fruit/vegetables and with a high consumption of carbonated/sugar-sweetened drinks. Children whose mother is not employed are more likely to have no/inadequate breakfast and no/inadequate mid-morning snack but they are also more likely to consume fruit/vegetables.

Children with an overweight mother are more likely to drink SSBs at least once a day. Those who are perceived by their mother as overweight are more likely to consume fruit/vegetables and less likely to consume carbonated/sugar-sweetened drinks at least once a day but they also are more likely to have a no/inadequate breakfast. To live in a metropolis with respect to small towns or to live in the North respect to the South, are associated with best performances of all the outcomes except the carbonated/sugar-sweetened drinks.

DISCUSSION

The surveillance system OKkio alla SALUTE periodically investigates the eating habits of a large sample of primary school children in Italy. This monitoring in the

Table 3
List of most popular food/beverages at breakfast and mid-morning snack by sex and geographic area of residence. Italy, 2012

	North		Center		South		Italy	
	Males	**Females**	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**
a. Top eleven foods/beverages more consumed for breakfast								
Milk/milk-cocoa	65.1	63.9	69.9	66.8	68.1	68.3	67.2	66
Biscuits	39.4	39.5	42.6	38.8	35.4	34.5	38.7	37.8
Cereals	18.7	16.3	17.4	15.9	12.1	12.2	16.3	14.9
Sweet snack	9.3	8.2	12.2	9.9	10.5	8.1	10.3	8.6
Croissant	11	9.1	3.7	3.4	7.8	6.6	8.5	7.1
Tea	11	11.6	6.2	6	4	3.3	7.7	7.7
Fruit drinks	7.4	6.8	6.3	6.1	7.2	7.4	7.1	6.9
Bread and chocolate	6	6.4	4.7	5.4	4.6	4.9	5.3	5.7
Fruit/fruit juice	5.9	7.6	4.7	5.6	4.8	6	5.3	6.6
Toast	4.3	4.5	5.1	5.5	5.7	5.9	4.9	5.1
Yogurt	4.5	4.7	4	4.5	3.8	3.7	4.1	4.3
b. Top ten foods/beverages more consumed for mid-morning snack								
Sandwich	12.4	11.8	28.3	25.5	30.1	29	21.8	20.5
Fruit drinks	22.5	17.5	22	18.1	21.3	18	22	17.8
Crackers	16.8	19.4	9	12.5	12.4	14.1	13.7	16.1
Sweet snack	13.8	12.2	15.4	14.4	12.3	11.2	13.6	12.3
Fruit	19.6	20.8	9.2	10.5	6.8	8.8	13	14.5
Biscuits	8.4	9.3	12.7	12.2	10.6	11	10	10.5
Croissant	10.7	8.3	3.5	3.2	9.9	9.6	8.9	7.7
Focaccia (sort of pizza)	4.1	4.4	14.1	14.2	5.3	4.8	6.6	6.6
Tea	8.3	7.3	6.2	6.2	3.6	3.5	6.2	5.8
Sweet snack	5.5	5.3	3.9	3.4	4	3.3	4.7	4.2

school setting plays an important role in the development and assessment the effectiveness of the nutrition programs and other lifestyle interventions for the prevention of obesity [27]. The data do not allow us to make a simple judgment on the overall dietary pattern, but to measure dietary risk indicators in order to highlight trends over time and identify subgroups at risk of dietary vulnerability. This methodology is appropriate for planning preventive public health interventions to modify nutritional habits. The results presented here show that dietary habits in some Italian children are not in line with the Dietary Guidelines: 1 in 10 children skips breakfast; 3 out of 5 consume an inadequate mid-morning snack; 1 child in 2 does not consume vegetables daily and 1 child in 5 does not consume both fruits and vegetables daily. Only 1 in 13 consumes fruits and vegetables at least 5 times a day as recommended (not reported in Table). Overall, only 1 in 5 children eats an adequate breakfast and snack.

Milk, biscuits and breakfast-cereals are the most popular foods for breakfast, regardless of gender and geographical location; sandwich and fruit drinks are the favourite foods for mid-morning snack in all the Italian regions and the virtuous habit to consume fruit as a snack is more common in Northern Italy.

In Southern Italy, the most deprived area of the country, the diet tends to be worst. In fact, the risk of 3 or more incorrect eating habits is almost double among the children living in Southern Italy in comparison to those of the North and the Center. Besides, having a more educated mother is associated with better eating habits. In the Southern Italian regions it is also more common to have TV in the bedroom and to watch it for longer than the recommended limits [28]. Regarding this specific topic, some authors report the association between use of TV and habit to consume sugar-sweetened beverages [29].

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% [30, 31]. 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% [32].

Compared with those who eat breakfast, those who

Table 4
Logistic regression models for dietary habits outcomes

Variables	N	Incorrect dietary habits ≥3 out of 6 (bad diet)* N = 42182			Breakfast none/inadequate N = 42148			Mid-morning snack none/inadequate N = 40670			Fruits/vegetables less than once a day N = 41712			Carbonated/sugary drinks at least once a day N = 41870		
	42182	prev^	OR	P	prev^	OR	P	prev^	OR	P	prev^	OR	P	prev^	OR	P
Child's gender																
males	21349	47.1	1		38.3	1		70.6	1		22.9	1		46.5	1	
females	20833	42.3	0.81	<0.001	39.8	1.07	0.005	68.6	0.91	0.001	20.7	0.88	<0.001	40.2	0.77	<0.001
Mother's citizenship																
Italian	37551	44.1	1		39.1	1		69.8	1		22.6	1		40.6	1	
foreign	4631	49.4	1.29	<0.001	38.3	0.97	0.523	68.3	1.07	0.277	16.1	0.64	<0.001	64.5	2.56	<0.001
Mother's education																
< high school	14558	57.1	1		44.5	1		72.9	1		26.1	1		55.0	1	
high school	19919	41.5	0.62	<0.001	38.3	0.84	<0.001	68.7	0.90	0.006	21.0	0.81	<0.001	39.7	0.60	<0.001
university	7705	29.6	0.40	<0.001	30.6	0.64	<0.001	65.9	0.85	0.007	15.9	0.60	<0.001	31.1	0.44	<0.001
Mother's employment																
full time	15296	41.1	1		37.0	1		67.3	1		21.3	1		40.7	1	
part time	12170	41.6	0.94	0.069	37.2	0.98	0.572	68.1	1.02	0.658	20.6	0.91	0.02	41.4	0.96	0.245
not employed	14716	51.0	1.00	0.927	42.7	1.08	0.023	73.4	1.09	0.037	23.4	0.92	0.032	47.8	1.01	0.738
Mother's weight status																
≤normoweight	30488	42.6	1		37.6	1		69.2	1		21.4	1		41.3	1	
overweight	8089	49.2	1.08	0.02	42.3	1.09	0.011	70.7	0.97	0.456	22.6	1.01	0.849	47.5	1.09	0.007
obese	2519	53.0	1.16	0.014	44.0	1.09	0.1	69.8	0.89	0.083	24.1	1.04	0.481	51.9	1.22	<0.001
missing	1086	50.7	1.18	0.038	42.9	1.14	0.102	71.9	1.04	0.709	22.9	1.04	0.636	51.2	1.28	0.002
Parent's opinion of child's weight																
underweight	3146	53.2	1		38.6	1		71.1	1		30.7	1		47.3	1	
normoweight	29419	44.1	0.70	<0.001	37.8	0.98	0.605	69.2	0.93	0.18	21.2	0.60	<0.001	43.9	0.91	0.067
overweight	9617	44.0	0.59	<0.001	43.1	1.14	0.014	70.3	0.92	0.159	20.8	0.53	<0.001	40.8	0.71	<0.001
TV in child's bedroom																
no	24185	38.2	1		35.9	1		67.2	1		19.1	1		38.5	1	
yes	17997	53.3	1.46	<0.001	43.2	1.21	<0.001	72.8	1.10	0.011	25.3	1.27	<0.001	49.8	1.41	<0.001
Hours watching TV daily																
≤2	35553	42.0	1		38.1	1		68.8	1		20.5	1		41.1	1	
>2	6629	59.5	1.57	<0.001	44.1	1.11	0.002	74.2	1.12	0.008	28.7	1.43	<0.001	55.5	1.46	<0.001
Municipality's size (residents)																
<10000	13672	46.6	1		39.5	1		72.7	1		22.7	1		44.2	1	
10000-50000	11994	46.7	0.98	0.735	40.7	1.05	0.196	70.5	0.83	0.151	22.7	0.99	0.78	43.7	1.03	0.48
>50000	8818	43.6	0.91	0.092	38.5	1.00	0.936	73.1	0.93	0.626	20.8	0.91	0.034	41.3	1.00	0.949
metropolis	7698	41.5	0.78	<0.001	37.3	0.92	0.039	63.4	0.58	<0.001	20.7	0.86	0.001	43.7	1.05	0.285
Geographic area																
north	18255	38.4	1		36.9	1		62.9	1		19.5	1		43.2	1	
center	8972	40.8	1.11	0.052	35.5	0.92	0.044	71.2	1.59	<0.001	20.9	1.06	0.203	39.2	0.82	<0.001
south	14955	55.9	1.74	<0.001	44.3	1.18	<0.001	78.5	2.11	<0.001	25.7	1.21	<0.001	46.3	1.02	0.483

*For missing indicators the added value is 0. ^prevalence.

skip breakfast have reduced intakes of many nutrients, including vitamins A, E, C, B6 and B12, folate, iron, calcium, phosphorus, magnesium, potassium and dietary fibres [33, 34]. Breakfast skippers are also less likely to meet the daily recommendations for food groups such as vegetables and fruits [35].

Conversely, eating breakfast may prevent energy dense snacking and the consumption of energy-rich foods [36]. 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 [9, 10].

Table 5
Stratified logistic regression models of 3 or more incorrect habits (bad diet) by geographic area of residence

Variables		North			Center			South		
		prev^	OR	P	prev^	OR	P	prev^	OR	P
Mother's citizenship	Italian	36.5	1		39.5	1		55.9	1	
	foreign	48.1	1.31	<0.001	50.8	1.42	<0.001	54.2	0.93	0.411
Hours watching TV per day	≤2	36.2	1		38.7	1		53.5	1	
	>2	56.0	1.78	<0.001	53.7	1.53	<0.001	64.3	1.41	<0.001

OR adjusted for all variables listed in *Table 4*. ^prevalence.

A study conducted among children 11-years old in nine European countries [37] shows rates of daily intake of fruit ranging from 30.2% (Norway) to 48.8% (Austria), and rates of daily intake of vegetables ranging from 33.6% (Spain) to 60.9% (Netherlands). In comparison, our study shows a higher rate of daily intake of fruit (71.3%) and a rate of daily intake of vegetable (51.2%) which is lower than Netherlands and Belgium (57.8%). An Australian study [38], based on information collected by parents, reports a rate of daily intake of soft drinks (carbonated drinks) among 8-14 aged children of 13.3%, similar to our result (12.5%). The authors recognise a possible underestimation due to the method of collecting data. In fact, previous Australian studies based on information collected directly by children using 24 hour dietary recall methods, found that around one-third of them had consumed soft drinks on the day before the surveys [39, 40]. A Spanish study [41] reports that 9.1% of children aged 6-9 consume SSBs 4 days or more per week; but the same authors argue that it is difficult to compare this low value with that of other studies because of different definition of SSB and the consumption of these drinks.

The results of our study are in line with other Italian studies [42, 43] and confirm that the diets of disadvantaged children are less likely to comply with the Italian Dietary Guidelines [26]. Parental education is one of the main socio-economic indicators related to childhood obesity and dietary habits. Several studies have also shown a lower consumption of fruit and vegetables and a higher intake of energy-dense foods in children with parental low socio economic level [44].

Thus, special attention should be given to parents and their children with lower socio economic status when developing school and community based strategies of promoting healthy eating to decrease childhood overweight (1).

Fruit and vegetables are an excellent source of important nutrients, including potassium, folate, fiber, vitamin A, vitamin C, vitamin K, and many phytochemicals. There is compelling evidence that diets rich in fruit and vegetables have health-protective effects. In addition, replacing energy-dense foods with fruit and vegetables may help healthy weight management. Most research on the associations between fruit and vegetable consumption and health has focused on adults, but there is also growing evidence that fruit and vegetable consumption may prevent obesity and protect health in children [45]. Targeting young people is also important

because evidence suggests that dietary behaviours track from childhood to adolescence and into adulthood [46]. Our data show that only 7.4% of children eat fruit and/or vegetables 5 times a day whereas 21.9% do not eat them daily; the consumption of these foods is lower in the South.

Some studies addressing the relationship between meal frequency and obesity risk in children and adolescents reported a consistent association between skipping meals and obesity. Our data show that 8.6% of children skip breakfast and 4.7% skip mid-morning snack. It would appear prudent to promote a regular meal pattern with 5 balanced meals per day for children and their families [19]. 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 [7]. 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.

The cumulative evidence from observational studies and experimental trials is sufficient to conclude that regular consumption of SSBs causes excess weight gain [47]. A meta-analysis of cohort studies found that high intake of SSBs among children was associated with 55% (95% CI 32-82%) higher risk of being overweight or obese compared with those with lower intake [48]. Two large randomized trials with a high degree of compliance provide convincing evidence that reducing consumption of SSBs significantly decreased weight gain and adiposity in children and adolescents [49, 50]. On the other hand, more recently, a systematic review concluded that the association between SSBs and obesity is not clear and is inconsistent when corrected for energy balance [13]. A nutritional policy to reduce the consumption of SSBs could have an important impact on the prevalence of obesity [51], especially in countries like Italy with a high prevalence of childhood overweight and obesity [24] and a high consumption of SSB.

Long hours of TV viewing have been associated with high intake of soft drinks and high fat consumption in school-aged children [52]. In Italy, many children have a TV in their bedroom and watch it for more than 2 hours per day. These two variables are independently associated with all the incorrect dietary habits. They are more frequent in the more deprived groups. The strat-

egies aiming at improving food preferences and food habits in children should, therefore consider TV viewing as a potential important influencing factor, and recommendations of restrictions in TV viewing time may be beneficial for the development of healthy food preferences and food habits.

CONCLUSIONS

Healthy diet and control of body weight during childhood is reported to be the key to a healthy adulthood and old age. The deficiencies identified in this study may well be a harbinger of public health problems which will be experienced for many decades in the future.

Conflict of interest statement

There are no potential conflicts of interest or any financial or personal relationships with other people or organizations that could inappropriately bias conduct and findings of this study.

Components of the 2012 OKkio alla SALUTE Group

National Coordinators and Regional Representatives

Angela Spinelli, Anna Lamberti, Paola Nardone, Marta Buoncristiano, Laura Lauria, Mauro Bucciarelli, Silvia Andreozzi, Marina Pediconi, Sonia Rubimarca (Gruppo di coordinamento nazionale, Centro Nazionale di Epidemiologia, Sorveglianza e Promozione della Salute, CNESPS, Istituto Superiore di Sanità), Daniela Galeone, Maria Teresa Menzano (Ministero della Salute), Alessandro Vienna (Ministero dell'Istruzione, dell'Università e della Ricarca); Laura Censi (Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione), Manuela Di Giacomo, Claudia Colleluori e Ercole Ranalli (Regione Abruzzo), Giuseppina Ammirati, Mariangela Mininni e Gerardina Sorrentino (Regione Basilicata), Caterina Azzarito e Marina La Rocca (Regione Calabria), Gianfranco Mazzarella e Renato Pizzuti (Regione Campania), Paola Angelini e Marina Fridel (Regione Emilia Romagna), Claudia Carletti, Paola Pani e Loris Zanier (Regione Friuli Venezia Giulia), Giulia Cairella e Esmeralda Castronuovo (Regione Lazio), Federica Pascali e Sergio Schiaffino (Regione Liguria), Marina Bonfanti (Regione Lombardia), Elisabetta Benedetti, Simona De Introna e Giordano Giostra (Regione Marche), Concetta Di Nucci, Teresa Manfredi Selvaggi e Ornella Valentini (Regione Molise), Marcello Caputo, Paolo Ferrari (Regione Piemonte), Savino Anelli, Maria Teresa Balducci e Giovanna Rosa (Regione Puglia), Serena Meloni e Maria Letizia Senis (Regione Sardegna), Achille Cernigliaro, Maria Paola Ferro e Salvatore Scondotto (Regione Sicilia), Mariano Giacchi, Giacomo Lazzeri e Rita Simi (Regione Toscana), Marco Cristofori, Maria Donata Giaimo e Stefania Prandini (Regione Umbria), Anna Maria Covarino e Giovanni D'Alessandro (Regione Valle D'Aosta), Riccardo Galesso (Regione Veneto), Antonio Fanolla, Lucio Lucchin e Sabine Weiss (Provincia Autonoma Bolzano), Marino Migazzi e Maria Grazia Zuccali (Provincia Autonoma Trento).

Technical Committee

Marta Buoncristiano, Giulia Cairella, Marcello Caputo, Margherita Caroli, Chiara Cattaneo, Laura Censi, Barbara De Mei, Daniela Galeone, Mariano Giacchi, Giordano Giostra, Anna Lamberti, Laura Lauria, Gianfranco Mazzarella, Paola Nardone, Giuseppe Perri, Anna Rita Silvestri, Angela Spinelli, Lorenzo Spizzichino, Alessandro Vienna.

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