Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity (2020) 25:107–116
https://doi.org/10.1007/s40519-018-0524-z

ORIGINAL ARTICLE

# Improving the overall sustainability of the school meal chain: the role of portion sizes

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Received: 13 March 2018 / Accepted: 31 May 2018 / Published online: 12 June 2018


## Abstract

**Purpose** This work analyses the meal supply in primary schools in Italy to highlight new areas of inefficiency upstream of the food chain, regarding the size of the food portions specified in public tenders. A lack of conformity of food portions can potentially lead to a double negative externality affecting the sustainability of school meals: overweight children and food waste.

**Method** Based on the data contained in the contract between municipalities and school catering services, the analysis was performed on the portion sizes (in grams) of the main food products included in the school menu for each regional capital (RC) in Italy. Data analysis regarded two main aspects: consistency of food portions within regions and adherence to national standards for childrens.

**Results** The results revealed great discrepancies amongst regions and in several cases, portion sizes significantly larger than the reference values of standard portions for school catering. The study also profiles RC on the basis of portion sizes, school meal attendance, and childhood obesity rates.

**Conclusions** School meals have the potential to educate the next generation regarding healthy eating habits, and thus play a leading role in obesity prevention in children. Similarly, the educational role of eating at school can contribute to raising children's awareness about one of the most urgent environmental challenges—food waste—by introducing the best strategies for waste reduction, reuse, and recycling. Results have economic, social, health, and environmental implications and highlight the need to revisit policies to introduce new solutions for more sustainable and healthy school canteens in Italy.

**Level of evidence** Level V, descriptive studies.

**Keywords** Childhood obesity · Portion size · Food waste · Sustainable public procurement · School meals

## Introduction

### School catering services

Food and nutrition play a crucial role in health promotion and disease prevention. At the global level, the development of school menus is based on specific dietary guidelines that reflect the current body of nutrition science, to help health professionals and policy makers to set up healthy and balanced food programs for school meals. With regard to public food procurement in Italy, the national guidelines for school catering were released in 2010 by the Italian Ministry of Health [1]. These guidelines outline how to organize and manage the catering services, to define the contracts with caterers, and provide appropriate meals to meet the needs of different age groups. More specifically, the National Reference Energy and Nutrient Intake Levels (hereafter LARN, the Italian acronym meaning reference levels of nutrient and energy intake for the Italian population), developed by the Italian Society of Human Nutrition is the official source for nutritional standard [2]. The provisions for primary school meals state that lunch must contribute to approximately 35% of the daily energy requirements. The daily menu should provide about 15% of protein, 30% of fat, and 55% of carbohydrates.

School catering is a significant part of the procurement budget for local governments in Italy. On average,

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440 million meals are provided each year, with an annual value of approximately 2 billion euros [3], although with differing school meal attendance rates from region to region.

In some municipalities measures aimed at making catering services, more sustainable have already been implemented with the dual aim of reducing food waste and increasing the nutritional profile of school meals. These include purchasing energy-efficient appliances for schools, the use of tap water, transportation using vehicles with a low environmental impact, and a significant reduction in packaging. Additional criteria used to lessen other sustainability impacts associated with the catering contract include the use of ecological cleaning products and awarding points for bidders that offer a wider range of organic or fair trade products [4, 5]. Nevertheless, these measures cannot be considered to be sufficient for the achievement of an increased global sustainability in school meals chain, since a great number of variables can contribute to create more sustainable school settings. Amongst them, this work analyses the role of food portion size for its relationship with the issue of children overweight as part of the social sustainability of school meals, and with the topic of food waste for its implication in the environmental sustainability of food chains.

## The sustainability of school meals: tackling children overweight

The improvement of the sustainability of school meals is strictly associated with the acquirement of healthier communities, through the access to fresh and nutritious food. Growing concerns about the social implications of sustainability derive from the fact that food systems are faced with the challenge of finding innovative solutions to the increasing overweight/obesity rates in children [6].

Within the EU around one in three 11-year-old children are overweight or obese, according to country data Italy is at the top of the list for obesity and overweight rates (9.3 and 21.3%, respectively) in 8–9-year-old children [6, 7]. Childhood obesity in Italy is not-equally distributed across the country, with a high prevalence in regions in the south [8]. Amongst the wide range of possible interventions, nutritional education at school appears to be one of the most important strategies to prevent obesity [9, 10]. Due to the specific features of the environment, schools provide an unparalleled opportunity to reach the vast majority of children and positively influence their behaviour through specific interventions: the promotion of physical activity [11], the positive change in attitude towards fruit and vegetable consumption [12], and more generally, the increased awareness of the importance of a healthy lifestyle [13].

Several studies have demonstrated that healthy school meals can effectively contribute to improve children's well-being [14] and educational outcomes [15], and portion size is one of the key element for a balanced diet, since increasing the portion size of food meals results in increased consumption, which may contribute to weight gain [9, 16–18]. Consequently, the provision of larger portion sizes of school meals can also play a role in generating over nutrition and obesity in children.

## The sustainability of school meals: reducing food waste

Food loss and waste have negative environmental impacts because of the water, land, energy, and other natural resources used to produce the wasted food. Thus, reducing food waste will help increase sustainability and reduce the environmental impact of the food system.

Studies commissioned by the European Commission have estimated that annual food waste in the EU is around 88 million tonnes (EU 28) [19], with the food services sector contributing 12% (10.5 million tonnes), corresponding to 21 kg of per capita waste production.

Public institutions and governments have financed studies on the strategies needed to tackle food waste reduction and, in some cases, have implemented policies. In March 2017, the European Parliament voted to introduce farm-to-fork targets to reduce the EU's food waste by 30% by 2025 and 50% by 2030, and prevention has been recognized as the first strategic tool to tackle the challenge of food chain efficiencies [20].

In parallel with the institutional interventions, scholars have been investigating the causes of food waste, the methodologies for its quantification, and the actions needed to reduce it [21–25].

Most studies have focused on household food waste, while school meals have been scarcely investigated despite the fact that schools play a special role in providing nutritious, well-balanced meals for students and in educating the next generation about environmental issues through the reduction and recycling of waste [26–29]. Among the few data available, a French report [30] estimates the average quantity of per capita food waste in primary schools as 70 g/per day.

Moreover, the UK Wrap study [31] suggests that over a school year, a total of 55,408 tonnes of food waste is generated by primary schools in England and 24,974 tonnes by secondary schools, with a total food waste weight of 80,382 tonnes: more specifically, producing 72 g per pupil per day and secondary schools 42 g per pupil per day. Within the food categories, fruit and vegetables accounted for almost half of the food waste (by weight) [31].

In Italy, Falasconi et al. [32] estimated that unserved food amounts to 15–16% of the total amount of food processed in the school meals considered in their study. A further study in Italy [33] quantified an average of 107 g of avoidable plate waste produced daily by each participant.

An additional issue is that irrespective of the food environment considered (household/school), investigations into the causes of food waste frequently focus on the final step in the food chain, namely, when the food is consumed [34–36]. A more comprehensive evaluation needs to take into account the whole food supply chain and reduce inefficiencies at each point at which the waste arises. In that regard, the formulation of the food portion sizes to be served in school catering can have a relevant role in food waste prevention [24, 28, 37, 38], based on the assumption that school meals, when not completely consumed, generate food waste.

The aim of this work is to evaluate the meal supply in primary schools in Italy to analyse possible points of inefficiency upstream of the food chain, originating in the provisions contained in the contract between municipalities and catering services. More specifically, the analysis focuses on food meal portions in primary schools and their compliance with the standard portions established by National Reference Energy and Nutrient Intake Levels (LARNs) [2]. Compliance with food portions in school canteens is key in terms of its main impact, namely, the potential modification in the nutritional and caloric intake of the menu consumed during lunch at school. A secondary impact regards the generation of food waste at the end of the chain due to inadequate food portions, ending in unconsumed food and consequently increased waste.

## Methods

Data on food portion sizes contained in the public tenders for school catering were collected between April and June 2017 from the municipality website of each regional capital (hereafter RC) of the 20 Italian regions (Appendix 1), representing a sample of roughly 500.000 primary school students. Note that Italy is divided into 20 administrative 'regions' each with a regional capital (hereafter RC, e.g., Rome in Lazio, Florence in Tuscany), which are further subdivided into 'provinces' and 'municipalities'. Municipalities (i.e., local councils) are responsible for contracting out school meals to caterers.

In practical terms, each municipality selects a catering company (via a tender) with whom it signs a public contract. The information on the catering tender is public and available on the website of each municipality. This document contains specific provisions on the food product characteristics, portion sizes and frequency of consumption. From the information available in the documents regarding the tendering process for primary school meal provision, data on the portions (in grams) of the most representative categories were extracted and classified. The following food categories were included in the analysis:

- *Cereals*: pasta, rice, and bread;
- *Pulses*: dried pulses;
- *Food of animal origin*: meat, fish, cooked, and raw ham;
- *Food of plant origin*: cooked and raw vegetables and fruit.

In terms of food of animal origin, the analysis did not consider eggs because of its standard portion (one egg, 50 g average) or cheese due to the great variety available with high differences in terms of caloric intake and relative portion size.

To evaluate the degree of homogeneity amongst different regions, the average, minimum and maximum values, standard deviations, and relative standard deviations of each individual food category were estimated.

Second, the estimation of the adequacy of food portions dispositions retrieved in tender documents has been performed by comparing them with standard food portions. The specific benchmarks for the evaluation of meal portion sizes were calculated based on the National Reference Energy and Nutrient Intake Levels (LARNs). The official document of the Italian Society of Human Nutrition (SINU) contains the reference tables for the average daily energy intake for adults and children, and standard portions for adults only. Standard portions are defined as the quantity assumed as reference value by operators and consumers, consistent with cultural tradition and reasonable in size, in line with consumers' expectations. Though the size of standard portion cannot be considered a measure of nutritional adequacy, it has been used as reference, since tender documents do not contain specific information on caloric intake of the recipes proposed in school menus (see Table 1).

Due to the lack of data on reference food portions for primary school, their estimation was based on the difference in energy intake for adults (1550 Kcal/die on average) and children (aged 6–10 years: 1100 Kcal/die on average), which resulted in a 30% reduction. Thus, the standard food portions for children was established by reducing the adult food portions proposed by SINU by 30% (Table 2). To test the adherence to standard portions, a one-way analysis of variance (ANOVA) was performed for multiple comparisons combined with Duncan's multiple range test, with significance set at a $p$ value $< 0.05$.

In addition, for each RC, the total size (in grams) was calculated as the sum of all food categories, as well as the total std size portion (in grams), as the sum of the reference children's portion of all food categories. The delta portion size variable was then estimated from the difference between total size and total std size.

To profile RCs and to verify the existence of different groups based on the variables total size, delta portion size, school meal attendance and obesity rate, a k-means cluster analysis [39] was estimated. All reported analyses were conducted using IBM SPSS Statistics. The occurrence of obesity in children for each Italian region was provided by the National Institute of Health (ISS) [7].

**Table 1** Food Portion. Source: National Reference Energy and Nutrient Intake Levels

| Food category | Standard Portion Adult (g) | Standard Portion Children 6–10 years (g) (− 30% standard portion adult) |
|---|---|---|
| Cereals | | |
| Pasta, rice | 80 | 56 |
| Bread | 50 | 35 |
| Pulses | | |
| Dried pulses | 50 | 35 |
| Food of animal origin | | |
| Red meat | 100 | 70 |
| Poultry meat | 100 | 70 |
| Fish | 150 | 105 |
| Cured meat (Ham) | 50 | 35 |
| Food of plant origin | | |
| Cooked vegetables | 200 | 140 |
| Raw vegetables | 200 | 140 |
| Fresh fruits | 150 | 105 |

**Table 2** Descriptive statistics of variables

| Food category | Mean (g) | Std dev | RSD[a] (relative standard deviation) | Min | Max | STD portion (g) | Av. delta portion[b] |
|---|---|---|---|---|---|---|---|
| Pasta | 70 | 6.7 | 0.10 | 50 | 80 | 56 | 14 |
| Rice | 69.5 | 8.9 | 0.13 | 50 | 80 | 56 | 13.5 |
| Bread | 55.8 | 14.1 | 0.25 | 40 | 100 | 35 | 20.8 |
| Dried pulses | 34.3 | 9.9 | 0.29 | 21 | 60 | 35 | − 0.7 |
| Meat | 84.5 | 18.1 | 0.21 | 60 | 120 | 70 | 14.5 |
| Fish | 98.5 | 22.2 | 0.23 | 60 | 120 | 115 | − 16.5 |
| Cooked / raw ham | 52.3 | 10.1 | 0.19 | 35 | 75 | 35 | 17.3 |
| Cooked vegetables | 127.9 | 37.5 | 0.29 | 75 | 235 | 140 | − 12.1 |
| Raw vegetables | 101 | 35.5 | 0.35 | 35 | 150 | 140 | − 39 |
| Fresh fruit | 150.5 | 18.5 | 0.12 | 130 | 200 | 105 | 45.5 |

[a]RSD (relative standard deviation) = Std Dev/Mean

[b]Av.Delta Portion= Mean – std portion.

Data on the attendance rate of school meals were retrieved from of the Italian Ministry of Education, Universities and Research [40].

## Results

### Food portion sizes

Table 3 presents the descriptive statistics (means, min and max values and standard deviation) of data regarding the portion sizes of each food category. The results show a great variability of food portions amongst the RCs analysed.

Food categories with the highest RSD values (relative standard deviations) were cooked and raw vegetables (0.29 and 0.35, respectively) indicating great levels of heterogeneity in food portions amongst Italian regions. Conversely, pasta and rice portions were more uniform (0.1 and 0.13), although on average bigger than the standard portion. The only food categories characterized by a smaller mean portion are fish, raw vegetables and cooked vegetables, the food categories that mostly contribute to healthy food consumption, whereas calorie-dense food categories (carbohydrates) often exceed the reference portion size.

#### Cereals and pulses

Figure 1 shows the results for the cereals: pasta (a), rice (b) bread (c), and pulses (d) for each RC. Regarding pasta, the results highlighted statistically significant differences ($F = 2.18$, $P < 0.05$) amongst the RCs and the std portion (adults and children). In 16 cases (IDs: 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 17, 18, 19, and 20), the average portion of pasta showed values that outweighed the children's

**Table 3** Output of cluster analysis

| | Cluster | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| Total size (g) (sum of all food categories) | 1063 | 876 | 759 |
| Delta total (Total size–Total reference portions size) | 276 | 89 | – 28 |
| Attendance rate (%) | 42.3 | 51.7 | 58.2 |
| RC obesity rate (%) | 10.6 | 9.8 | 8.5 |
| Pasta portion size | 73 | 68 | 71 |
| Rice portion size | 73 | 70 | 68 |
| Bread portion size | 70 | 52 | 56 |
| Dried pulses portion size | 30 | 30 | 36 |
| Meat portion size | 120 | 83 | 77 |
| Fish portion size | 130 | 102 | 88 |
| Ham portion size | 60 | 55 | 48 |
| Cooked vegetables portion size | 193 | 143 | 98 |
| Raw vegetables portion size | 150 | 118 | 73 |
| Fruit portion size | 165 | 154 | 143 |

std portion ranging from 70 g (ID 2, 3, 4, 7, 9, 10 13, 18, and 20) to 80 g (IDs 4 and 12), which corresponds to adult standard. Similar values were found for rice portions, which showed statistically significant differences ($F = 3.40$, $P < 0.001$) between the data collected and the reference std portion (both adult and children). Only in five RCs (IDs: 1, 8, 15, 16, and 20), the average values were in line with the children's std portion (56 g). The remaining RCs showed higher average values with a minimum of 70 g (ID 2, 3, 7, 10, 11, 14, 17, and 18) to a maximum of 80 g (IDs 4, 8, 12, and 13), which corresponds to the adult std portion (80 g). Finally, with respect to bread, the cities with the IDs: 1, 3, 7, 17, and 20 had higher average values than children's std portion, with a minimum value of 60 g (IDs 1, 3, 7, and 17) and a maximum value of 100 g (ID 20), which was twofold higher than the adult portion (50 g). In addition, also in this case, the differences between the RCs and the LARNs were statistically significant ($F = 7.99$, $P < 0.001$).

As regards dried pulses ($F = 100.563$, $P < 0.001$), only six RCs (IDs: 8, 9, 16, 18, 19, and 20) were in line with the children's portion size (35 g), and most RCs (IDs 1, 2, 3, 7, 10, 13, 14, and 18) remained below the reference value, with only one region (ID 11) highlighted by having far exceeded even the adult std portion (50 g).

### Food of animal origin

Figure 2 shows the results for food of animal origin: meat (a), fish (b), and cooked/raw ham (c) for each regional capital. As for meat, the RCs (IDs: 1, 2, 3, 4, 7, 10, 12, 13, 14, 15, 17, and 19) showed higher average values than the children's std portion, ranging from 80 g (IDs 1 and 7) to 120 g (IDs 14 and 19). The RCs with IDs (2, 3, 4, 12, 13,

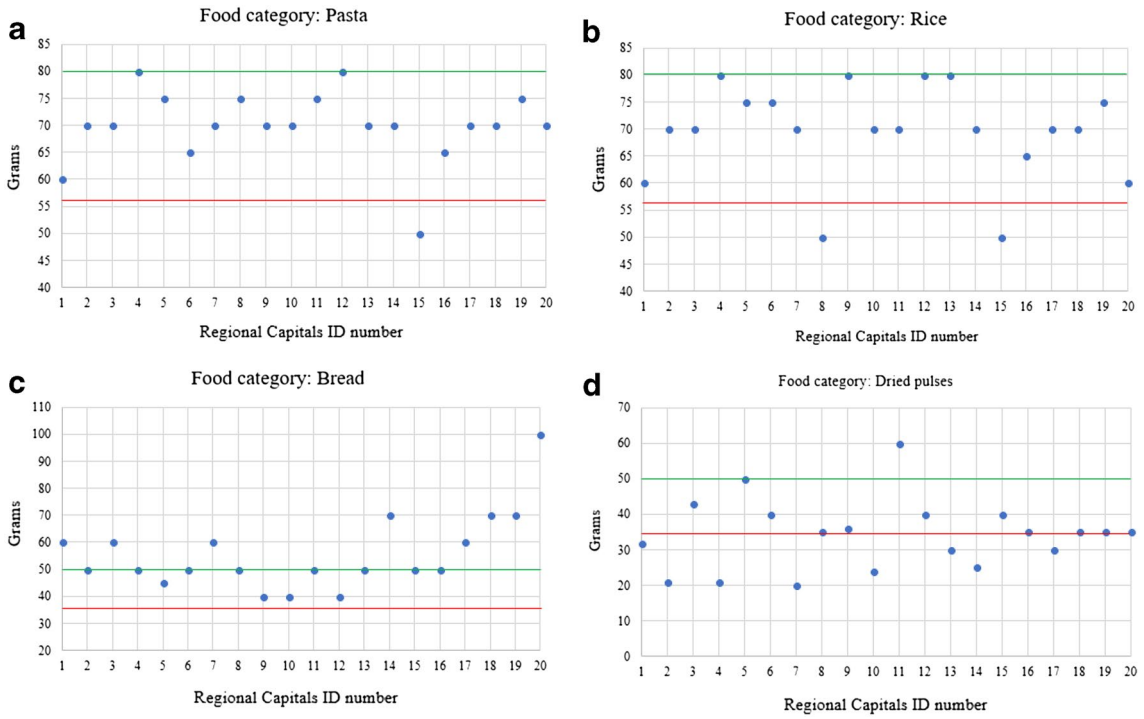


**Fig. 1** **a**–**d** Food category: cereal and pulses, mean values of portion sizes (g) for all RCs. Green line: reference value of adult standard portion; red line: reference value of children standard portion

15, and 17) showed comparable values to adult std portion size (100 g), while the IDs 14 and 19 exceeded the reference adult threshold. The differences were statistically significant ($F = 12.50$, $P < 0.001$).

The fish portions revealed significant differences ($F = 23.26$, $P < 0.001$) between the RCs and the reference level (adults and children). In this context, the mean values of most of the RCs, except for IDs 2, 13, and 14, were lower than the children's std portion (105 g), ranging from 60 g (ID 20) to 149 g (ID 14). In conclusion, regarding cooked/raw ham, there were statistically significant differences ($F = 4.20$ $P < 0.001$) between the RCs and the children's std portion size, with values varying from 50 g (IDs 4, 7, 10, and 11) to 75 g (ID 13), thus higher than the adult std portion (50 g).

### Food of vegetal origin

Figure 3 shows the results for food of vegetable origin: cooked vegetables (a), raw vegetables (b), and fruit (c) for each regional capital. The cooked vegetable portions showed statistically significant differences ($F = 60.44$, $P < 0.001$) between the RCs and the reference portion (adults and children). Specifically, the mean values of most of the RCs (IDs 1, 2, 3, 4, 5, 6, 8, 9, 12, 16, 18, 19, and 20) were lower than the children's standard (140 g) varying from 75 (ID 12) to 123 g (ID 2). As regards the raw vegetables, there were statistically significant differences ($F = 65.66$, $P < 0.001$) between the RCs and the reference portion (adults and children). In this case, the values of almost every regional capital showed a lower average than the children's standard (140 g), varying from a minimum of 35 g (ID 15) to a maximum of 135 g (ID 10).

For all the RCs, except for ID 4, fruit ($F = 16.95$, $P < 0.001$) showed a higher average value than the children's std value (105 g).

## Meal portions and childhood weight problems

Table 3 shows the cluster analysis results that were used to determine the segments of RCs that presented different meal portion sizes. A three-cluster solution grouped the RCs based on their conformity to nutritional recommendations (Delta total variable), the attendance rate of school meal services at the regional level and the obesity rate.

Cluster 1 represents the group of RCs with a higher value for the sum of the portion of all the food categories included (mean total size = 1063 g) and consequently the greatest discrepancy from the reference values (mean Delta total = 276). They were characterized as being the RCs with the lowest percentage of children attending school meal services (mean attendance rate = 42.3%), meaning that the majority of pupils in primary schools have lunch at home, instead of consuming meals at school. They also presented the highest level of childhood obesity (mean value 10.6%).

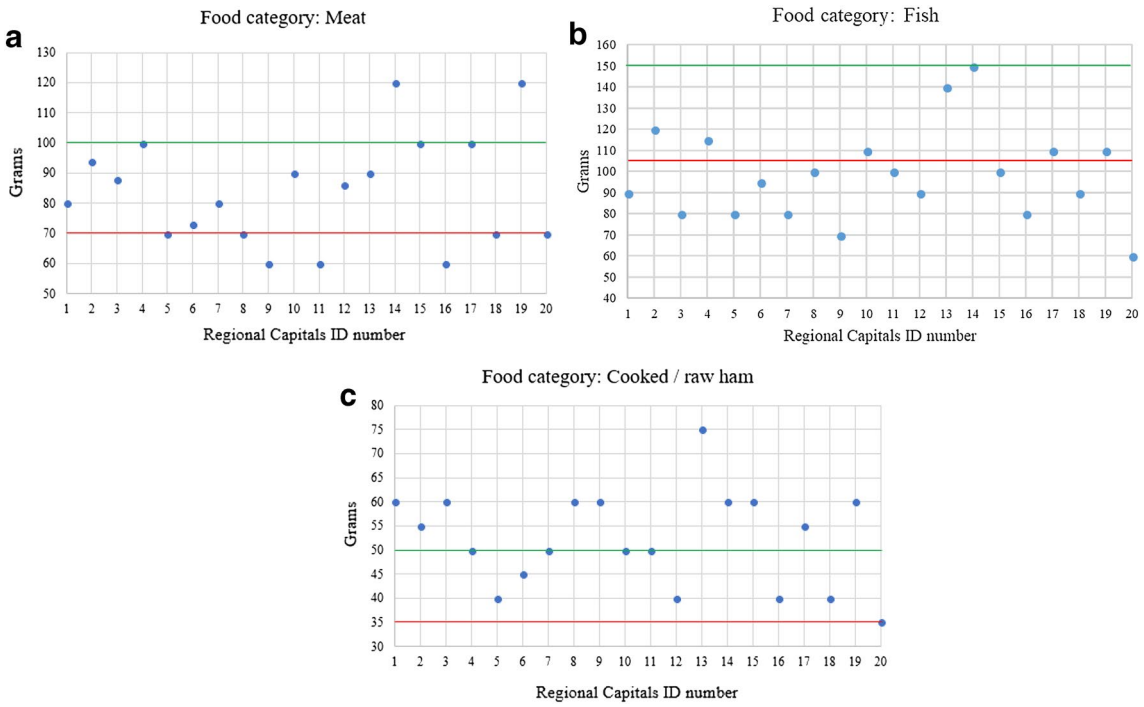


**Fig. 2** **a**–**c** Food category: food of animal origin, mean portion size values (g) for all RCs. Green line: reference value of adult standard portion; red line: reference value of children standard portion

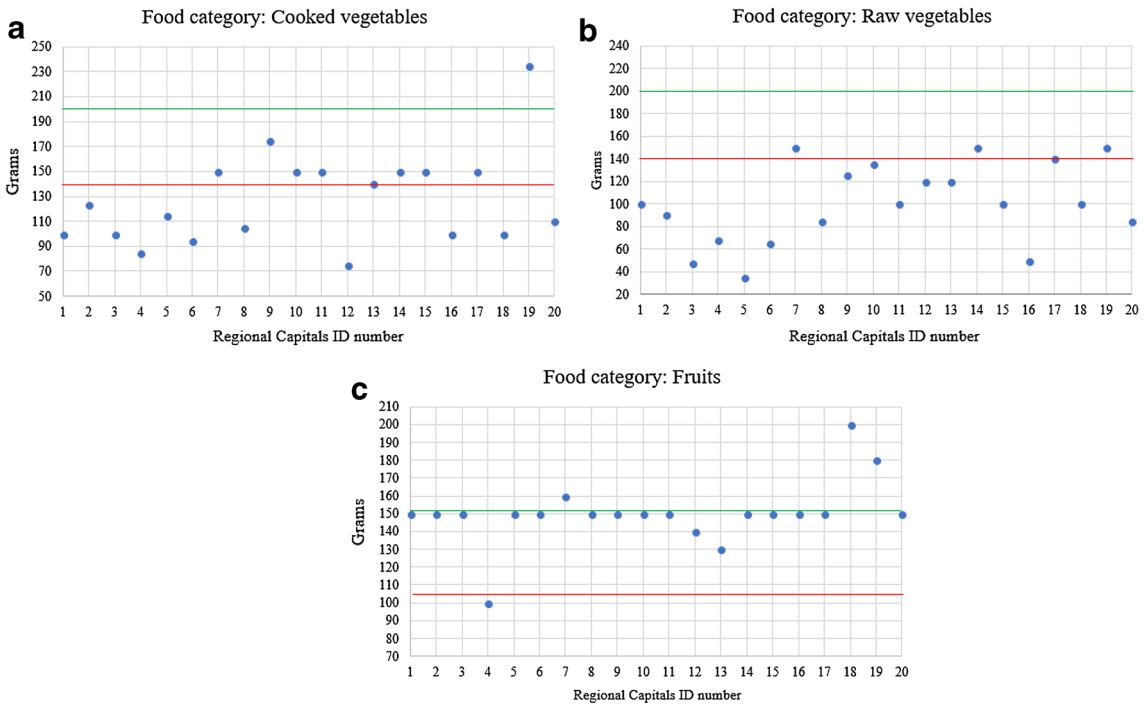


**Fig. 3** **a–c** Food category: food of vegetable origin and fats, mean values of portion sizes (g) for all RC. Green line: reference value of adult standard portion; red line: reference value of children standard portion

Although they were characterized by lower portion sizes (mean total size = 876 g), RCs in Cluster 2 showed a minor but significant discrepancy with reference portions (mean Delta total = 89). Compared to Cluster 1, RCs of Cluster 2 were characterized by higher levels of school meal attendance (mean Attendance rate = 51.7%) and lower levels of childhood obesity (mean value 9.8%).

Cluster 3 was the most likely to identify healthy RCs, with the lowest portion sizes (mean Total size = 759 g) and the lowest difference with reference values (mean delta total = − 28 g). As expected, this high level of compliance with reference portions was coupled with a greater attendance rate of school meal services (mean attendance rate = 58.2%) and the lowest level of childhood obesity (mean value 8.5%).

## Conclusions and discussion

The data outline a significant lack of uniformity in meal portion sizes throughout Italy. Despite the national guidelines containing ad hoc estimations of the most adequate nutritional intake for children, the data depict the Italian school meal provision as being highly fragmented in portion sizes. In addition, this work reveals that the portion sizes for school meals in Italy in several cases significantly differ from the standard values for primary schools. In most cases, this difference in sizes results in bigger portions, some of which are even bigger than the reference portions for adults, such as for bread. In other cases, such as fish and raw vegetables, the portion sizes are smaller than expected, which introduces additional concerns with respect to the nutritional balance of the school menu. In fact, the data reveal that the food categories that mostly contribute to healthy food consumption, such as fish and vegetables (the food categories which are least liked by children) are offered in smaller portions, whereas calorie-dense food categories (carbohydrates) often exceed the reference portion size.

This discrepancy between standard values and school meal portions has some important implications, considering that several studies reveal that the portion size served to people can predict consumption. Consequently, the provision of larger portion sizes may also play a role in generating over nutrition and obesity in children.

In addition, the results of the cluster analysis suggest that in the same regions, where the discrepancy of portions served at school meals was higher, there was a greater incidence of weight problems in children. These results also highlight that in regions, where school catering services are offered more extensively, they are also more efficient in terms of compliance with standard portions. In summary, the data highlight that in some regions, portion sizes are normally more in line with national standard portions: these are also regions, where the school meal attendance is higher and

childhood obesity rates are lower. Thus, the combination of meal portion sizes, school meal attendance rate, and obesity in children, as well as their conjoint analysis, provides useful insights into the identification of factors affecting obesity in children in Italy, and consequently, the best approaches to reduce this social issue.

Furthermore, the fact that obesity in children is associated with the non-attendance of school catering highlights the need to implement educational policies involving parents. This would help in creating more nutritionally conscious households, as the literature confirms that family lifestyle and nutritional habits are crucial in obesity prevention [11, 41, 42] and that, besides portion size issues, in some cases, school meals may be a healthier option than eating at home.

Our results also highlight the second potential effect of food portions, regarding food waste, as the provision of inappropriate food quantities at school can be related to waste generation. In fact, food waste may be influenced by errors in menu planning, an incorrect estimation of the number of meals as well as the food selection (i.e., vegetable and fish are food categories that possibly contribute more to food waste, as they are not well-liked by children) and planning portions.

In summary, there are many different factors that affect the sustainability of school meals and this work highlights that portion size needs to be taken into account. In addition, general food waste may be significantly reduced by reducing portions, adjusting them to children's nutritional needs and at the same time reducing negative social and environmental impacts: excess edible food can be donated to charitable organizations.

Thus, food education programs in schools and the development of new best practices could also contribute to substantial increases in the food donations. In terms of policy implications, strategies to better implement dietary guidelines for nutrition in schools could be included in the food waste reduction action plan. Although national guidelines already exist, this work suggests that they are scarcely adopted or implemented.

**Aknowledgements** The authors would like to thank the Dr. Lino Volpe (President of Elior Italia).

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflicts of interest.

**Ethical approval** This article does not contain any studies with human participants or animals performed by any of the authors.

**Informed consent** For this type of study formal consent is not required.

## Appendix 1

See Table 4.

**Table 4** Italian regions classified according to their geographical position and related variables

| | ID | Region | RC | N. primary school students (public schools) | Total size (g) | Obesity (%) | Attendance rate (%) |
|---|---|---|---|---|---|---|---|
| Northern Italy | 1 | Valle d'Aosta | Aosta | 5.606 | 778 | 4.2 | 68.1 |
| | 2 | Piedmont | Torino | 31.751 | 844 | 6 | 71.2 |
| | 3 | Lombardy | Milano | 43.252 | 769 | 5.6 | 68.4 |
| | 4 | Liguria | Genova | 19.456 | 752 | 6.4 | 70.1 |
| | 5 | South Tyrol | Bolzano | 3.037 | 735 | 5.2 | 100.0 |
| | 6 | Veneto | Venezia | 19.220 | 752 | 5.7 | 58.4 |
| | 7 | Friuli-Venezia Giulia | Trieste | 6.862 | 890 | 5 | 67.6 |
| | 8 | Emilia Romagna | Bologna | 12.051 | 780 | 7.7 | 61.1 |
| Central Italy | 9 | Tuscany | Firenze | 12.961 | 852 | 5.6 | 67.1 |
| | 10 | Lazio | Roma | 204.944 | 886 | 9.6 | 55.6 |
| | 11 | Umbria | Perugia | 7.588 | 865 | 9.2 | 46.2 |
| | 12 | Marche | Ancona | 4.208 | 791 | 10.4 | 42.0 |
| | 13 | Abruzzo | L'Aquila | 2.495 | 925 | 10.4 | 42.4 |
| | 14 | Molise | Campobasso | 2.294 | 1015 | 15.7 | 30.7 |
| Southern Italy | 15 | Basilicata | Potenza | 2.963 | 850 | 13.1 | 51.5 |
| | 16 | Campania | Napoli | 42.605 | 695 | 17.9 | 35.4 |
| | 17 | Apulia | Bari | 13.750 | 926 | 12.6 | 26.9 |
| | 18 | Calabria | Catanzaro | 4.080 | 845 | 16.4 | 36.9 |
| Islands | 19 | Sardinia | Cagliari | 15.711 | 1110 | 5.5 | 53.9 |
| | 20 | Sicily | Palermo | 31.981 | 775 | 13 | 20.0 |

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