THE NEW FOOD SUB-COMPONENT OF THE ABSOLUTE POVERTY BASKET: AN OPTIMAL BALANCE OF ELEMENTS

Valeria de Martino, Lorenza Mistura, Raffaela Piccinelli

Abstract. The Inter Institutional Scientific Commission on Absolute Poverty (IISCAP) was established at the National Institute of Statistics (Istat) at the beginning of 2022 with the aim of confirming the validity of methodology used since 2005 and improving the models for estimating poverty incidence. Several issues were addressed, including the calculation of the new version of the sub-component of the food basket, using new data sources and considering changes in the habits and lifestyles of households in Italy. This new data allowed for a more realistic picture of the great variety of foods consumed by people and has facilitated enhancing the basket. The main objective of this study is to illustrate the new approach in calculating the food component. National and international guidelines were used to assess the nutritional adequacy of the dietary plans for 12 age groups, based on the Dietary Reference Values for energy and nutrients (DRVs) for a healthy Italian population. Categorization of foods into groups and subgroups enabled the merger of individual portions and consumption frequencies with those recommended by healthy eating guidelines. Daily quantities for each type of food were calculated by considering portions (in grams) and consumption frequencies (daily or weekly); then, twelve nutritionally balanced and appropriately diversified food plans were developed in accordance with the age groups considered. The last phase of defining the food sub-component concerned its valorization through the identification of the average minimum price for each food and the application of the saving scales to consider the economies of scale depending on the household composition.

1. Introduction

Absolute poverty refers to some time-consistent standard that represents individuals' and households' basic minimum needs (Ravallion, 2016). In the European context the Directorate-General for DG Employment, Social Affairs and Inclusion and the Joint Research Centre, began a project in December 2018, called "Measuring and monitoring absolute poverty (ABSPO)" to explore the possibility of developing a national absolute poverty measure comparable at European level from the methodological, technical and data availability point of view (Menyhért *et al.*, 2021). Italy is the only country in Europe that produces official statistics on absolute poverty; it has been a focus since the second world war (De Santis, 1996; Commissione di indagine sulla povertà e sull'emarginazione, 1998; Freguja and

Pannuzi, 2007; Freguja and Polidoro, 2024). In 2005 Istat set up the new methodology to produce absolute poverty indicators (Grassi and Pannuzi, 2009); a measure based on the monetary evaluation of a basket of goods and services, considered essential to avoid serious forms of social exclusion, using the Household Budget Survey (HBS), defined with reference to household consumption comparing the expenditure of Italian households with the absolute poverty thresholds.

The Commission's new methodology has begun its work by confirming the validity and robustness of the previous methodology (Grassi and Pannuzi, 2009), but introducing some important innovations, mainly in the estimation of thresholds given the richer availability of new data sources that are used for this purpose (Arigoni, 2024; Brunetti *et al*., 2024; Cutillo, 2024; Di Leo and Corazziari, 2024). The initial approach was to create a basket of essential goods and services by using the existing regulations for each component (De Santis, 1996). For example, for the sufficient size of a dwelling in relation to the number of household components, reference has been made to the regulations of the criterion of habitability of dwellings (Cutillo, 2023); for food component, reference has been made looking at the DRVs for the Italian population (SINU, 2014). Naturally, a study was done to understand changes in demand and consumption over time due to globalization of food production.

For the construction of the new food basket, Istat collaborated with the Council for Agricultural Research and Economics-Research Centre for Food and Nutrition (CREA) to identify the types of food to build the appropriate food diets for each age class considered, according with the DRVs for the Italian population and Guidelines for a Healthy Diet (CREA, 2018b). The first part of this paper is focused on the methodology adopted in the construction of the food basket, with a multistep approach; then the second part shows a comparison between selected food baskets and the previous version; and the last part explains the identification of the average minimum price of food items of the food basket, followed by the main conclusions.

2. Methodology adopted in the construction of the food basket

The food basket subcomponent was developed taking into account changes since 2005 in food demand and consumption partly caused by the globalization of food supply and inflation dynamics. The availability and choice of foods that previously had a more marked seasonality, as well as the accessibility of food through multiple channels, and the entire distribution chain have changed.

Furthermore, the use of updated databases has allowed the constitution of the food basket based on the identification of a heterogeneous set of foods among those most commonly consumed by individuals living in Italy. The combination and

quantification of these foods ensure an adequate nutritional and energy intake to keep the population in good health. The updated scientific documents of the previous methodological commission constituted the reference material for this work, in order to minimize the subjectivity of the expert group composed of nutritionists, statisticians, economists, and sociologists.

The new food basket was created through a meticulous analysis by the expert group regarding the methodology adopted. Thus identified the tools and documents needed to define the fundamental steps for building the food basket.

The main steps are described in the following subsections.

2.1 Step 1: Identification of age classes

Dietary consumption and energy/nutritional needs vary according to the age; for this reason, the DRVs of SINU subdivide the total population in ten age classes (0-11 months, 1-3 years, 4-6 years, 7-10 years, 11-14 years, 15-17 years, 18-29 years, 30-59 years, 60-74 years, and 75+ years). In addition, further division of two classes occurred for infant, "0-1 years", that was split into two (0-4 months and 5-11 months) to assess the intake of breast milk/formula and specific weaning foods (UNICEF, 2024), and the "1-3 years" class into "12-23 months" (from 1 year until just before completion of 2 years) and "24-47 months" (from 2 years until just before completion of 4 years) due to significant differences in energy requirements (SINU, 2014). All the other classes considered were confirmed and updated in energy requirements.

2.2 Step 2: Selection of food items

The process of selecting foods to be included in the dietary plans, was carried out within the varied and extensive foods available to the Italian population. To facilitate the selection process, foods were chosen by categorizing them into the 26 food subgroups of the 12 food groups for which the Guidelines for a Healthy Diet provides reference portions (in grams) and respective consumption frequencies (daily or weekly) (CREA, 2018a; CREA, 2018b). The guidelines for food subgroups were adapted to meet nutritional requirements: a) the cheese subgroup was divided into 3 subgroups instead of two; and b) 9 subgroups of infant foods were added.

Additionally, to make the dietary plans more realistic, 7 food items belonging to the group of food "voluptuaries" (ice cream, pastries, chocolate, jam, honey, sugar and preserved meat) were also included. These "voluptuary foods" are those commonly consumed primarily for sensory pleasure or taste, rather than for specific

nutritional purposes; they have low healthiness, high energy density, and low nutritional value. It is recommended to consume them in moderation due to their high sugar and/or fat and/or salt content (CREA, 2018a). Their inclusion was carefully monitored for nutritional adequacy, but they were still inserted to make the diet closer to real food habits.

For the 0-4 months age class, breast milk and first formula milk (both powdered and liquid) were selected, considering three scenarios: a) exclusive breastfeeding, as recommended by the guidelines; b) artificial feeding with formula in both powdered and liquid forms; and c) mixed feeding for completeness. For the weaning period (5-11 months), growth milk (both liquid and powdered) was also considered in the three different feeding scenarios, along with specific weaning foods for these months.

The final 13 food groups and 43 subgroups are shown in detail in Table 1. Within each food subgroup, a meticulous selection of food and beverages (referred to as "food items") was made by choosing from those most commonly consumed by the Italian population within age classes, based on data from the latest national survey on food consumption conducted by CREA (IV SCAI study 2017-2020), covering a sample (n = 1,969) aged between 3 months and 74 years (Turrini *et al.*, 2021; Turrini *et al.*, 2022). The dataset of foods consumed by children aged 1-3 years included 1,982 food items, excluding fortified, processed, and special diet foods.

To create nutritionally adequate and as varied as possible dietary plans, as recommended by the Guidelines for a Healthy Diet (CREA, 2018b), it was deemed appropriate to select a high number of food items. For calculation purposes in creating the food baskets, some of these were averaged based on nutritional similarity; for example, "beef" includes various cuts of veal, young beef, and beef, while "apple" encompasses all species of this fruit. Accordingly, for children were considered 214 food items. The expert panel selected and reviewed those with the highest frequency of consumption; this was the main criteria used to evaluate which food items must be included in the basket. A similar procedure and analysis were conducted for the dataset of the 4-10 years and the 11-74 years age classes. For each age class were considered 216 food items.

Table 1 – *Selected food items by food groups and subgroups.*

GROUP	SUBGROUP	FOOD ITEMS
Milk and dairy products	Milk	Whole milk, Semi-skimmed milk, Skimmed milk
	Infant milk	Human milk, First infant formula powered(1), First infant Formula liquid(1), Follow-on formula powered(1), Follow-on Formula liquid(1)
	Yogurt	Yogurt(1)
	Fresh cheese	Mozzarella cheese(1), Ricotta cheese(1), Cheese spread(1)
	Infant cheese	Infant cheese(1)
	Semi-hard cheese	Fontina cheese, Scamorza cheese
	Hard cheese	Pecorino cheese, Grana cheese, Parmigano cheese
Cereals and derivatives	Bread	Loaf bread(1), Bread rolls(1), Sandwich bread(1), Whole bread
	Pasta	Pasta, Egg fresh pasta, Egg dried, Stuffed pasta(1)
	Infant pasta	Infant pasta(1)
	Other cereals	Spelt, Corn(1)
	Infant cereals	Infant cereals, powder(1)
	Rice	Rice(1)
	Biscuits	Shortbread biscuits(1), Dried biscuits(1)
	Infant biscuits	Infant biscuits(1)
	Savoury fine bakery products	Rusks(1), Craker(1)
	Breakfast cereals	Breakfast cereals (1)
Meat	Red meat	Veal meat(1), Pork meat(1)
	White meat	Turkey meat(1), Chicken meat(1)
	Infant meat	Infant meat(1)
Fish and fish products	Seafoods	Squid, Shrimp
	Fish, fresh	Cod fish(1), Gilt-head bream, Sole fish(1), Salmon(1), Swordfish
	Fish, preserved	Tuna fish canned
	Infant, fish	Infant fish(1)
Legumes	Pulses, dried	Dried lentil, Dried beans(1)
	Pulses, fresh	Peas(1)
	Infant, pulses	Infant legumes(1)
Egg	Egg	Eggs(1)
Tubers	Tubers	Potatoes(1)

Table 1 (cont.) – *Selected food items by food groups and subgroups.*

GROUP	SUBGROUP	FOOD ITEMS
Fruit	Fruits, fresh	Oranges, Tangerines(1), Apricots, Apples(1), Pears, Peach, Banana
	Infant, fruits	Infant fruits(1)
Nuts, olive and seeds	Nut	Dried fruit(1), Olives(1)
Vegetable	Vegetables, fresh	Cabbages(1), Green beans, Mushroms(1), Broccoli, Chard, Spinach, Eggplants, Tomatos(1), Pumpinks, Zucchini, Carots, Celery, Fennels
	Salad	Lattuce(1), Rocket, Radicchio(1)
	Infant, vegetables	Infant vegetables(1)
Oils and fats	Seasoning fats	Olives oil(1), Seeds oil, Butter(1)
Voluptuaries' food	Cakes and sweet snacks	Ice cream(1), Sweet croissant(1), Ring-shaped cake(1), Crostata(1), Spread chocolate, Chocolate (1), Jam(1), Honey, Sugar
	Meat, preserved	Cooked ham, Raw Ham(1), Sausages(1)
Water	Water	Tap water(1)

(1) Food items averaged based on nutritional similarity.

Consumption frequencies of foods were compared by geographical breakdowns (North-east, North-west, Centre, South, and Islands) to determine if geographical differences could influence food selection.

2.3 Step 3: Evaluation of Nutritional Adequacy by age classes

The nutritional adequacy of the dietary plans was assessed for each age class using:

a) the "nutritional composition" database from the IV SCAI study (Turrini *et al*., 2021; Turrini *et al*., 2022). This database is derived from analytical data on nutritional composition of the Italian Food Composition Tables (Carnovale and Marletta, 2000). Any missing nutritional data from analytical results were completed using other Italian and international composition tables as sources; and

b) the DRVs suggested by the FAO, the WHO (FAO/WHO/UNU, 2001; WHO, 2006), and the DRVs (SINU, 2014). These DRVs refer to healthy individuals participating in moderate physical activity. The average of the DRVs between males and females was calculated, the difference between genders was not statistically different in this case, as it was in the past.

Specifically, for each dietary plan, the requirements of energy, macro and some micro nutrients were considered: energy (kcal), total fats (% of energy), saturated fats (% of energy), and polyunsaturated fats (% of energy), proteins (% of energy), available carbohydrates (% of energy), sugars (% of energy), fibers (g), iron and calcium (mg), vitamin C, B6 (mg), B12 (μg), and water (g).

2.4 Step 4: Calculation of daily quantities per food item

Daily quantities for each food item were determined based on national and international scientific documents. Specifically, for the early age classes (0-4 months and 5-11 months), daily quantities were estimated based on the energy requirements calculated as the average of the needs for the first 4 months (FAO/WHO/UNU, 2001; WHO, 2006). In the dietary plans for age classes from 1 to 17 years, portions (in grams) and consumption frequencies (daily or weekly) suggested for pediatric age by the Guidelines for a Healthy Diet were considered (CREA 2018a; CREA 2018b; Rossi *et al*., 2022). For subsequent age classes (18 to under 75 years), standard portions and recommended consumption frequencies for adults were used based on the energy requirements of each age class (CREA, 2018a; CREA 2018b; SINU, 2014). Due to the limited variety of selected food items compared to a real diet, it was sometimes necessary to modify the portion size or recommended frequency to ensure the nutritional adequacy of the dietary plans for the specific age class.

In each dietary plan, the total daily quantity (grams) should be considered as the sum of the amounts of all food items. However, this cannot be directly applied for the 0-11 months age class as one of the three infant foods are in powder form. Therefore, the sum of quantities should be calculated taking into account the dilution of the powdered milk.

3. Selected food basket products and comparison with the previous version

The analysis comparing average food group quantities between the old and new basket shows differences for almost all food groups, except for cereals (excluding infants because they were not considered in the old basket). Most of the differences were justified by the adoption of the new Guidelines and reference levels (Figure 1). Regarding energy intake compared to the level recommended (Figure 2), the old basket exceeds the requirement for all age classes except for the first one (1-3 years).

Figure 1 – *Comparison between old and new food baskets of the amount (g/die) of the food groups.*

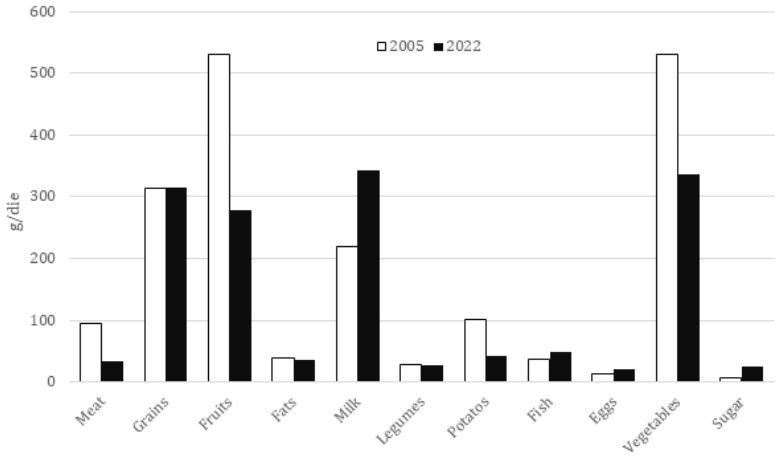
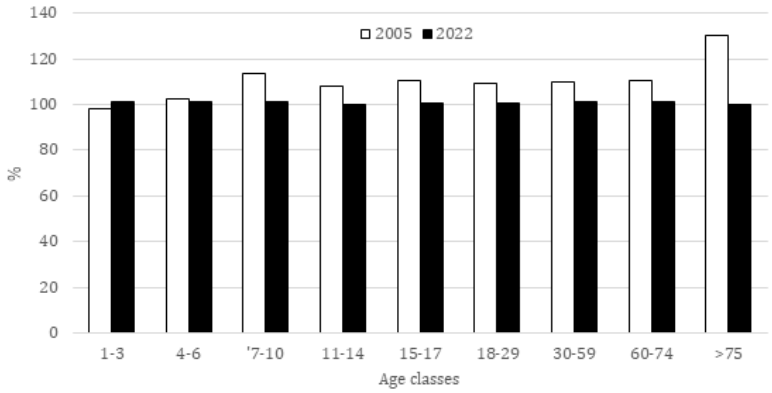


Figure 2 – *Comparison between old and new food baskets of the ratio of energy calculated to energy recommended by age classes.*



3.1 Main results of comparison in terms of daily amount

The increase in the number of food items compared to the old food basket (from 34 to 100 food products) is needed to ensure the variety of the diet, which is one of

the capstones of the new dietary guidelines, and to guarantee nutritional adequacy by both age classes and gender.

The food selection based on the frequency of consumption of the Italian population was adopted for creating more realistic dietary plans; therefore, 'Liver' and 'Margarina' were excluded from the new basket because the percentage of consumers (of 1.4% and 0.2, respectively) was very low. On the other hand, 'Mortadella' was not considered because the dietary guidelines discourage the consumption of processed meat, that in the new basket is well represented by the 'Ham' and 'Sausages'. In addition, the variety of food items allowed to develop a single dietary plan for genders while still ensuring the macronutrient adequacy for both males and females. At the food group level, the average amount of meat in the new food basket has decreased by 64%. It should be underlined that in recent years scientific literature and epidemiological studies have pointed out that excessive meat consumption, particularly red meat, is a risk factor for some non-communicable diseases and to ensure protein intake; so, the daily quantity of eggs and legumes has been increased, in accordance with the new dietary guidelines recommending the alternation of vegetable and animal proteins. The daily amount of fruits and vegetables was lowered in line with the portion sizes suggested by the new WHO guidelines.

Another difference between the two food baskets (2005 vs 2022) is the number of age classes, from ten to twelve. In the new one, age classes 0-4 and 5-11 months were included to account for weaning. The 1-4 years age class has been divided into two classes (1-2 years and 2-4 years) due to differences in energy requirements. Additionally, age classes 30-49 and 49-59 have been combined into a single one, 30-59 years, since there are no significant differences in energy requirements.

The comparison of the two food baskets is a critical point because the reference materials (SINU, 2014; CREA, 2018a; CREA, 2018b) were updated with the difference consequences in both in terms of the daily nutritional requirements (energy, micro and macro-nutrients), and in terms of suggested daily amounts (serving sizes and consumption frequencies).

The new methodology adopted has been described in such detail as it could serve as a guide for other and future food baskets.

4. Identification of the average minimum price of food items

The monetary evaluation of individual food combinations is based on Istat consumer price survey data, referred to year 2022. (Istat, 2023b; Brunetti *et al.*, 2024).

To estimate the minimum average price of each food identified in the basket, a mapping has been carried out that links each food item of the poverty basket to one or more elementary products of the consumer price index basket.

Tap water and human milk have been excluded from the mapping because they are not bought on the market. Additionally, for age class 0-4 and 5-11 months, concerning milk formula, both powder and liquid milk were considered. Therefore, the final number of food products to which a price was attributed was 96.

As the consumer price survey has been evolving in the last decades according to a multi-source approach, the methodology used for the valorisation of the food component of the poverty line has been adapted to take into account the characteristics of the information that is available for each of the elementary products involved. In particular, for 33 foods items (out of 96) of the poverty basket, the price quotations coming from the traditional price collection have been used. They are mainly fresh products such as fruits, vegetables, meat and some foods usually sold in packages of variable weight, such as dairy products.

For the remaining 63 food items, which generally consist of packaged processed food, transaction data coming from the sample of outlets (about 4,000) of the modern distribution have been used. The availability of this new data source, due to the size and granularity of the information that it provides, offered the opportunity to introduce a dramatic improvement in the procedure for the estimation of the minimum prices of this group of items (see Brunetti *et al*. 2024).

Independently from the source used, the price quotations are collected at the provincial level on a monthly basis[1]. In short, the procedure is the following: starting from the collected data, the provincial annual minimum prices of food items are first estimated as the arithmetic mean of the monthly provincial minimum prices. In the following step, the annual minimum prices of food items - for each region - are calculated as a weighted arithmetic average of the provincial annual minimum prices, with weights proportional to the population of the provinces.

The minimum prices so obtained provide the basis for the valorization of the food component of the poverty basket. However, to obtain the final value of the food sub-component it is necessary to apply the value of the savings scale, in order to take into account the number and the composition of the different types of households.

The saving scales represent some multiplicative coefficients that synthesize the effect of the forms of savings/not savings at the time of purchase. The coefficients of this saving scale have also been reformulated, through the processing of survey data, using the availability of a larger database. In 2022 the methodology followed

[1] It is important to note that the territorial coverage of the two data sources is different. The traditional price collection is carried out in the 79 provinces participating in the survey, while scanner data covers all the national territory (107 provinces). Moreover, as far as scanner data are concerned, monthly prices are obtained as the average weekly prices (see again Brunetti *et al*., 2004).

for the calculation of savings coefficients followed the lines of the previous version, but the phenomenon has been studied more thoroughly (Di Leo and Corazziari, 2024; Istat, 2023a).

Finally, the formula to obtain the value of the new food component (*fc*) for a family size *z* (with *z*1, ..., *z*7 components respectively in the 1st, ..., 7th age class) in the *k* region, is given by:

$$fc^{k}_{z1,\ldots,z7} = \sum_{j=1}^{7} q_j^k \, z_j \qquad (1)$$

where q_j^k is the monetary value of the food combination for an individual resident in the *k* region and belonging to the *j*-th age class; then after applying the scale coefficient the estimated value of the food component (*fcest*) for a family size *z* (with *z*1, ..., *z*7 components respectively in the 1st,... 7th age class) in the *k* region, is obtained as:

$$fcest^{k}_{z1,\ldots,z7} = fc^{k}_{z1,\ldots,z7} \, c_z \qquad (2)$$

where $fc^{k}_{z1,\ldots,z7}$ is the value of the food component obtained in (1) and c_z is the saving coefficient for a family size *z*.

The annual enhancement of the food sub-component is realized through specific regional price indices, calculated by homogeneous groups of food products. This allows the development of consumer prices to be taken into account in detail.

5. Main results of new poverty basket

The food component of the poverty basket is the result of specialized work by heterogeneous experts. The result is appreciable, although the greater detail of the thresholds (regional) and the increase in age classes of family members (from 6 age classes to 7) have multiplied the number of possible combinations within which it has been possible to calculate the sub-thresholds, the information available has been maximized.

The total number of food items identified for the creation of the food basket is 100 (Table 2), including the different types of infant formula, two (powered and liquid) for infants younger than 4 months (first infant formula) and for toddlers younger than 1 year (follow-on formula). The number of the food considered varies within the subgroups to ensure as much diet variety as possible and the nutritional needs of different age classes. The distribution by age groups shows how the number of food items increases with increasing age; specifically, from 3 food items for

infants 0-4 months, up to 79 for 11 to over 75 age classes (Table 2). Nutritional adequacy was achieved for all considered macro and micronutrients, except for calcium, which is lower than recommended in most age groups.

Table 2 – *Number of food items by age classes.*

	0-4 months	**5-11 months**	**1-3 years**	**4-6 years**	**7-10 years**	**11- 75+ years**	**All**
Food items	3	40	68	75	76	79	100

The study of the comparison between the old and new food basket revealed substantial differences between the food groups. According to the new guidelines, the contribution of animal proteins is reduced compared to the new basket but is compensated with legumes and dairy products; both fruit and vegetables have halved in the new basket, especially in children up to 15-17 years. For more adult classes, on the other hand, the amounts of dairy products, legumes, cereals and eggs are increased. This trade-off between foods, age class and nutritional adequacy, has increased the detail of the information available, and showed the great heterogeneity that is found within our country. The updated definition of food requirements and the achievement of age-balanced diets, combined with the values of the minimum average prices, provided a formidable starting point for further studies on the diversification between the different household types, showing the heterogeneity within the different regions of the country. The new food basket, in addition to achieving the nutritional adequacy by age, reflected more the real consumption habits of households because it was built on more detailed and updated information.

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Valeria de MARTINO, Italian National Institute of Statistics (Istat), valedema@istat.it

Lorenza MISTURA, Council for Agricultural Research and Economics, Research Centre for Food and Nutrition (CREA), lorenza.mistura@crea.gov.it

Raffaela PICCINELLI, Council for Agricultural Research and Economics, Research Centre for Food and Nutrition (CREA), raffaela.piccinelli@crea.gov.it