# Four Decades of Household Food Purchases: Changes in Inequalities of Nutritional Quality in France, 1971-2010

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**Abstract –** Socioeconomic inequalities affect all areas of consumption. Disparities in food consumption have nutritional consequences that may contribute to social inequalities in health. Drawing on 40 years of representative data at the household level (1971-2010), this paper examines changes in the major food groups and nutritional quality in at-home consumption by income and education. In a global trend of improving nutritional quality over the period, the study provides evidence of a positive trend for all income quartiles and for 4 levels of education. Inequalities were significant at the beginning of the period but on the decline in the 2000s: they were very pronounced between education levels in the 1970s but appear to be on the verge of disappearing by 2010; according to income level, they were limited and on the decline until 2010, but still persist.

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The rise and/or persistence of inequalities is a topical issue and an area where long-term analysis can yield useful contextual evidence. While they are more commonly examined in the context of purchasing power and employment, socioeconomic inequalities should be a focus in all areas, including food. Differences in food consumption are socially meaningful and can contribute to social inequalities in health.

Several decades of food consumption data have highlighted radical changes that have accompanied the profound lifestyle changes also seen over the same period. Food consumption surveys have existed in France since the end of the 18th century, incorporating social concerns from the outset (Desrosières, 2003; Lhuissier, 2007). Our view of consumption has also changed considerably as scientific knowledge has increasingly given us a better understanding of the major role of food consumption in the incidence of certain medical conditions (GBD, 2019).

The role of socioeconomic factors in nutritional and health inequalities has been highlighted in a number of studies (Darmon & Drewnowski, 2008; Mackenbach *et al*., 2008). Differences in dietary habits by income, education or occupation and socio-professional category have been studied for a long time. These differences relate, on the one hand, to expenditure, with the proportion of income spent on food decreasing as the standard of living rises (the classic Engel's law), a fact verified both cross-sectionally and over time. In France, as the standard of living has increased, the evidence shows a steady decrease in the proportion of income spent on food, from around 40% in 1950 (Sauvy, 1959) to 34% in 1960, 19.7% in 1979, 15.9% in 2011 and 15.6% in 2017 (Larochette & Sanchez-Gonzales, 2015; Ferret & Demoly, 2019). At each date, the share of income spent on food was higher among the least well-off households than among the richest: in 2011, 19% in the bottom income quintile compared to 13.8% in the top quintile (Accardo *et al*., 2013). This share also varies by education and socio-professional category, as well as the household composition and other socio-demographic characteristics (Caillavet *et al*., 2009; Buron *et al*., 2014; Ferret & Demoly, 2019).

In the field of economic statistics, the categories for collecting food consumption are based on the place of consumption (at home or outside the home) and the origin of food (purchases, self-consumption or self-supply). Shares of expenditure for the major food groups are little influenced by socio-economic variables. The main socio-economic differences are related to the proportion of expenditure on food outside the home and the quantities consumed for specific food categories, such as seafood and fruit and vegetables, particularly fresh fruit and vegetables, which have tended to be seen as indicators of social inequality (Caillavet *et al*., 2009; Castetbon, 2014; Plessz & Gojard, 2015; Bocquier *et al*., 2015). These disparities can lead to social, nutritional and health inequalities (Inserm, 2014). However, to establish these inequalities, a precise and detailed analysis of the content of diets is necessary. To properly understand the inequalities arising from disparities in consumption, we need to turn to the nutritional dimension, which means working at the finer level of quantities, even if the cost of food is clearly a determining factor in food choices (Darmon & Drewnowski, 2015).

Very little research covering a long period has been conducted in France, not least because of data availability issues. The collection of food consumption data brings into play two different disciplinary fields. Economic surveys have tended to focus on the share of food expenditure in overall expenditure to ensure information on household budget needed to compute price indices and the cost of living. This is the rationale behind the Insee surveys on Household Expenditure (*enquête Budget de famille*), for example. Epidemiological surveys, on the other hand, focus specifically on diet in the perspective of public health, both in terms of the quantities consumed by individuals and nutritional quality, which involves the use of tables detailing the composition of the food products consumed.

It is under this angle of nutritional quality that we examine in this article the changes in food consumption disparities in France over four decades (1971-2010). This requires data series providing both the information to calculate nutritional quality indicators and socio-economic characteristics of households. However, the conduct of representative surveys in this area has not been continuous. In particular, the Insee survey on food consumption (*enquête Consommation alimentaire*), which measures quantities, was stopped in 1991, and it has not been compensated by the Household Expenditure surveys, which do not record the quantities consumed. A series of food consumption surveys representative at the national level (*Étude individuelle nationale des consommations alimentaires*, INCA) has been

initiated at the end of the 1990s, carried out, so far, every seven years. In addition, changes in methodology prevent the comparability of the last two editions (INCA2 and INCA3). So, for the years after 1991, we have to mobilize private sector panel data (Kantar Worldpanel, see Appendix 1), in order to construct continuity – as much as possible – with the Insee survey. After significant work to ensure consistency, we are able to compute nutritional quality indicators over the entire period.

The rest of the article is organised as follows. First, we present the major long-term trends in food consumption at the international level. We then examine changes in food-at-home purchases in France over the period 1971-2010, in terms of caloric intake and nutritional quality, and then the change in disparities according to income and education level.

## 1. The International Context: Changes in Food Consumption and Nutritional Quality

Long-term trends and changes in food consumption have been the subject of numerous studies in a number of countries based mainly on FAO food balance sheet data. These provide a relatively imprecise estimate of food consumption based on production data adjusted by foreign trade data (FAO). What they provide is basically a measure of food availability. On the other hand, data from microeconomic sources, collected directly from individuals or households, are less commonly used but far more accurate. Here, we focus on research in this area. First, overall trends will be identified with the aim of contextualising the analysis of relative inequalities.

Changes in food consumption have two main characteristics. First, in terms of the major food groups, in the global context of the nutrition transition, foods of animal origin have gradually come to replace foods of plant origin (Drewnowski & Popkin, 2014). However, at a finer level, more complex patterns are in evidence. For example, in Portugal there was a decrease in the consumption of fish and fruit and an increase in meat, milk and starchy foods between 1987 and 1999 (Marques-Vidal *et al*., 2006). In the United States, decreasing amounts of milk, pork and beef and increasing amounts of salty snacks, pizzas and soft drinks were consumed between 1977 and 1996 (Nielsen *et al*., 2002).

In terms of food processing, there has been a significant growth in the consumption of processed foods and a decrease in the consumption of unprocessed foods. Evidence of this trend has been found in the United States over the period 1977-1996 (Nielsen *et al*., 2002), in Canada over the period 1938-2011 (Moubarac *et al*., 2014), in Brazil over the period 1987-2003 (Monteiro *et al*., 2013) and in Sweden over the period 1960-2010 (Juul & Hemmingson, 2015). The trend is also apparent in France over the period 1969-2001 (Nichèle *et al*., 2008).

However, determining whether these major changes in the structure of consumption represent positive or negative developments requires further analysis. As a logical continuation of these analyses at the level of food groups, the question arises as to changes in consumption from a nutritional point of view. Against the backdrop of an increase in the prevalence of nutrition-related chronic diseases, such as cardiovascular diseases, obesity and certain types of cancer, it is important to assess the impact of the radical changes in consumption patterns on the nutritional content of food, both in terms of quantity (caloric intake) and quality. Recent studies have linked increased body weight to increased caloric availability and caloric intake (Dave *et al*., 2016). In the United States, caloric intake increased between 1977 and 1996 (Nielsen *et al*., 2002), while it remained relatively stable in France between 1999 and 2007 (Lioret *et al*., 2010), in Spain between 2000 and 2005 (Valdés *et al*., 2009) and in Switzerland between 1993 and 2006 (Marques-Vidal *et al*., 2015). In our previous study on France (Nichèle *et al*., 2008), we found evidence of a decrease in caloric intake between 1969 and 2001 based on food-at-home purchases.

As regards changes in the nutritional quality of household consumption over the past decades, different findings have been reported in the literature. First, it is important to underline the difficulties involved in comparing studies in this area given the significant differences in methodology both in terms of the use of different nutritional quality scores and the reference population used, as well as the scope of consumption. In the case of countries with high living standards, studies show an overall improvement between 1990 and 2010 (Imamura *et al*., 2015), in the United States between 1965 and 1996 (Popkin *et al*., 2003), 1989 and 2008 (Beatty *et al*., 2014) and 1999 and 2010 (Wang *et al*., 2014), and in Australia between 1992 and 2007 (Arabshahi *et al*., 2011). On the

other hand, research on Mediterranean countries points to a decline in quality, including in Portugal between 1990 and 2000 (Rodrigues *et al*., 2008) and in Spain between 1987 and 2005 (Bach-Faig *et al*., 2010) and between 2000 and 2005 (Valdés *et al*., 2009).

As far as socioeconomic inequalities are concerned, few studies have provided evidence of trends and changes in this area. Longitudinal series that take socioeconomic status into account are few or only focus on recent decades. Most of the available studies in this area were conducted on data collected in the United States. Among them, only one study reported an improvement in nutritional quality by level of education between 1965 and 1996, but without finding any significant differences by income (Popkin *et al*., 2003). On the other hand, several of the studies conducted in North America have found evidence of persistent inequalities in the energy density of diets (i.e. calorie content per 100g consumed) and the probability of being obese according to income and education between 1997 and 2002 (Kant & Graubard, 2007), as well as a widening social gap in nutritional quality between 1999 and 2010 (Sugiyama *et al*., 2014; Wang *et al*., 2014), and differences in dietary intake according to ethnicity, education and income between 1999 and 2012 (Rehm *et al*., 2016). Here too, the variety of nutritional indicators and time periods considered probably accounts in part for the range of results found for the same country. An Australian study found that better nutritional quality was associated with a higher socio-professional status among men between 1992 and 2007, although no association was found with education or among women (Arabshahi *et al*., 2011). Fewer studies have been conducted in a European setting. In Denmark, Groth *et al*. (2014) reported some nutritional improvements between 1995 and 2008 for all levels of education. In Finland, Prättälä *et al*. (1992) found a decrease in differences in adherence to dietary recommendations between 1979 and 1990 by level of education.

In France, very few studies have been conducted, and covering only a short period of time. An analysis of children's dietary intake has shown no change, at 8-year interval, in the disparities observed according to the parent's level of education (Lioret *et al*., 2010). At each date, the study found a positive association between the consumption of foods known to be beneficial to health, such as fruit and vegetables, and the level of education of the parent surveyed, while children of parents with low education were found to have higher intakes of starchy foods, snacks, sugar and confectionery.

## 2. In France, a Major Change in the Structure of Consumption between 1969 and 2010, and the Improvement of the Nutritional Quality of Purchases

In order to compile the series required to calculate and monitor nutritional quality indicators over the long term since the 1970s, a significant amount of work has been necessary. We have used the surveys from the last four decades (1969-2010) that provide information to measure the nutritional quality of household food purchases, record socio-economic characteristics, and whose scope and methodology could be reconciled, namely the Insee's *Consommation alimentaire* surveys (hereafter "Insee series") available in France since 1969, unfortunately discontinued in 1991, and the Kantar-Worldpanel series. The characteristics of these two data sources, their methodology and the work carried out to link them are detailed in Appendix 1. Note that the data thus compiled, while allowing inequalities to be measured, do not allow for causal analysis.[1]

The common scope of the two sources covers food-at-home purchases, thus excluding both out-of-home eating and self-consumption. In both of these areas, there is a lack of reliable long-term data to compute nutritional quality indicators.

The available data on consumption of food outside the home are scattered across several sources, but (even if not comparable between sources) they all show an important increase. In monetary terms, on a national accounts basis, food consumed outside the home accounted for 14% of household food expenditures in 1960 and 26% in 2014 (Larochette & Sanchez-Gonzales, 2015). Based on the Household Expenditure survey, it is estimated at 21.9% of the household food budget in 2001, 23% in 2006 (Caillavet *et al*., 2009) and 25% in 2011 (Buron *et al*., 2014). The *Consommation alimentaire* surveys also shows a rise in expenditures for food consumed outside the home, from 13.7% in 1980 to 17.9% in 1991

*1. The data in question have been partially used for econometric modelling by focusing on a single source, Kantar Worldpanel (1998-2010), with an approach to inequalities related to the implementation of food tax policy (Caillavet* et al.*, 2016, 2019).*

(Manon, 1993). But the continuous recording of data on the number of meals taken away from home (as well as the quantities consumed) ceased with the discontinuation of the *Consommation alimentaire* surveys.

As regards self-consumption, the lack of national-level data is also critical since 1991, for the same reason.While the 1990s saw a decline of this source of supply in favour of commercial products, sociological studies suggest evidence of a revival in recent years. In the same way as out-of-home consumption, this phenomenon is not neutral in terms of social disparities. Food supply patterns are a source of socioeconomic disparity, with out-of-home consumption accounting for an increasing proportion of the budget as income rises and self-consumption being more linked to low levels of education and specific socio-professional categories (Caillavet *et al*., 2009). Unfortunately, the data are too fragmentary to make reasonable assumptions that would allow to complete the purchase data for food at home over the long period.

### 2.1. Changes in Caloric Content of Food-At-Home Purchases

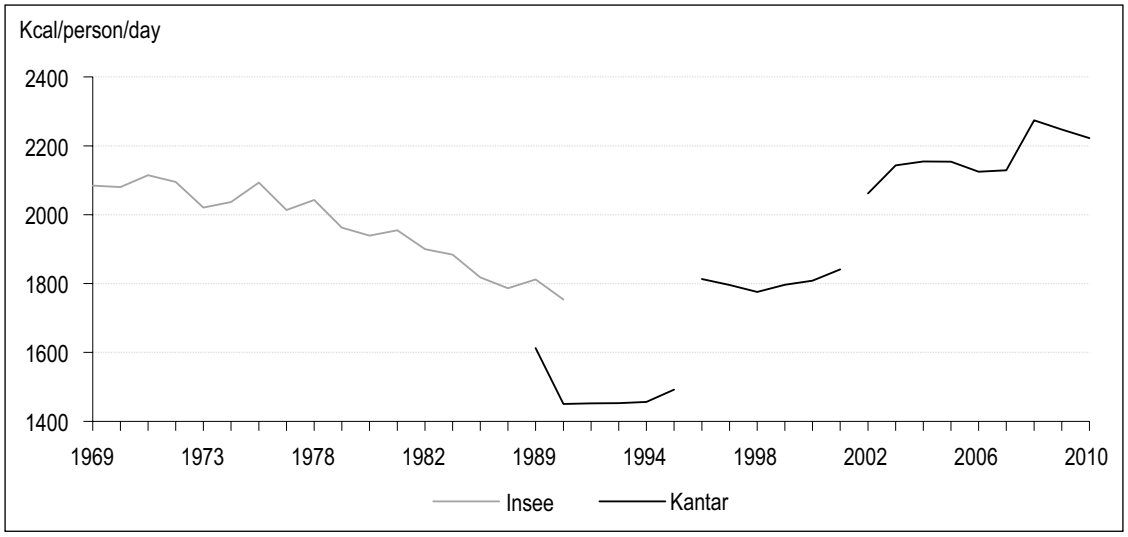
We begin by examining the evolution of the caloric content of consumption. To do this, purchases are converted into calories using a composition table (see Box). Here and throughout, we only consider non-alcoholic intakes.

Over the entire period, there is evidence of an increase in the caloric content of purchases (excluding alcohol), with averages per person per day of 2,084 kilocalories in 1969 compared to 2,222 kilocalories in 2010 (Figure I).

This general increase in fact covers a first phase of decline between 1969 and 1991 (Insee series), "stalled" results until 1995 (1st Kantar series) then stationary level from 1996 to 2001 (2nd Kantar series), followed by a phase of moderate growth between 2002 and 2009 (3rd Kantar series). Thus our two sources (Insee and Kantar) and the different segments within Kantar show a difference in caloric level and trend, which can be linked to significant methodological differences in sampling and data collection. These are detailed in Appendix 1.

It should be noted in particular that the changes in methodology within the Kantar series (collection method, composition of the population covered, sample size, nomenclature of food products – see Appendix 1) were numerous over the period and make a long-term analysis difficult. There is a substantial difference between the Insee source and the 1st Kantar series (1989-1995), the latter being on a lower level. The 2nd Kantar series is at the same level as the Insee figures and the 3rd series marks an increase. Regarding the 1st Kantar series, it does not yet cover purchases by single male households, and some products are not recorded. These two factors probably reduce the measured caloric intake. In the following

Figure I – **Caloric content of food-at-home purchases (kcal/person/day)**




Notes: Consumption at home, excluding alcohol. Note that due to the population census, there was no *Consommation alimentaire* survey in 1975.
Sources: Insee, *Consommation alimentaire* surveys, 1969-1991; Kantar, food purchase panels, Kantar-Worldpanel-SECODIP, 1989-2010.

series, the switch to a data collection mode using a "scanner" in 1996 led to omissions in the recording of products without a barcode (especially fresh products such as meat, fish, fruit and vegetables). These changes in methodology affect the various food groups differently, thus their respective balance in purchases and the assessment of nutritional quality. For this reason, the evolutions are presented without linking the different data series, even within the Kantar series (cf. Appendix 1).

The decrease in caloric intake observed during the first phase (Insee series) could reflect a shift towards eating outside the home: the number of meals taken outside the home rose from 1.9 per person per week in 1967 (Villeneuve & Bigata, 1975) to 2.8 in 1991 (Manon, 1993). Similar data are not available for the period corresponding to the Kantar data. On the basis of the two representative national INCA surveys recording all food intakes at the individual level, out-of-home caloric intakes remain stable: 19% of total caloric intake in 1999 vs. 20% in 2006-07 (AFSSA, 2009).

### 2.2. Changes in the Major Food Groups

Fresh food has always dominated purchases in the meat, poultry, fruit and vegetable groups/categories (Nichèle *et al*., 2008). However, dramatic changes occured in the structure of food purchases at the same time within all the major food groups (Figures I and II), reflecting a pattern of redistribution from unprocessed to processed foods. The consumption of traditional food categories (bread/pasta/rice, fresh meat, potatoes/pulses, sugar, butter, oils, whole milk) experienced a large decline, while processed categories (dairy products, ready meals, soft drinks, confectionery) have increased. Substitutions are also apparent within categories, with processed vegetables increasing at the expense of fresh vegetables, juices at the expense of fresh fruit and ready meals at the expense of fresh meat. And this goes beyond the under-declaration of purchases of fresh produce (without barcodes) that may have been caused for a few years by the switch to "scanning". Substitutions are also apparent at a finer level, for example between types of milk according to their fat content. Whole milk was the main type of milk purchased until 1981, then it was replaced by skimmed and semi-skimmed milk, declining from 58.6% to 6.2% of the total purchases made by 2010. Overall, since caloric level was higher in 2010 than in 1969, the growth in purchases of processed products more than compensated for the decrease in unprocessed foods, at least from 2002 onwards, when the caloric content of food-at-home purchases clearly increased (cf. Figure I).

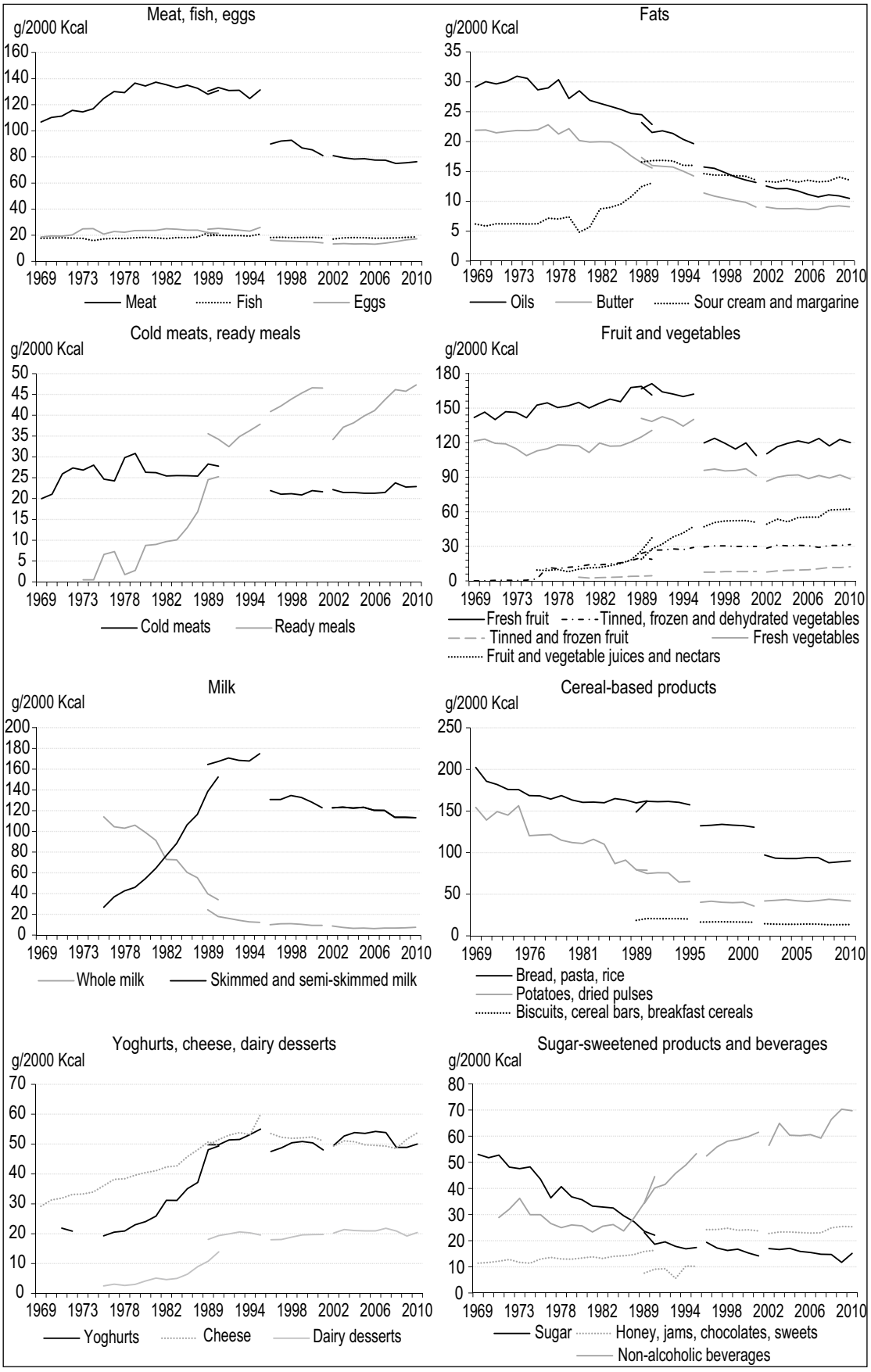
However, changes in the shares of the different food groups in purchases don't directly reflect the change in the caloric structure of purchases, since the total caloric content of purchases varies over time (cf. Figure I). To analyse the evolution of the structure of caloric intake and nutritional quality independently of variations in the overall caloric content (of all purchases), purchases of the different food groups are expressed for 2,000kcal, a reference value corresponding to the daily energy requirement of an average individual. It should be noted that any changes over time in the caloric or nutrient content of a given food cannot be taken into account here.

Figure II shows the evolution of the caloric content of food purchases, expressed in grams/2,000 kcal, by product category. We observe over the whole period a decrease in the consumption of fresh meat (from 106.8 to 76.4g/2,000kcal) while the consumption of cooked meats increased (from 20.0 to 22.9g/2,000kcal), with ready meals increasing sharply (from 0.5 to 47.3g/2,000kcal between 1973 and 2010). A similar trend is also observed for fruit and vegetables, with a decrease in fresh purchases (from 141.9 to 120.0g/2,000kcal for fruit and from 121.5 to 88.6g/2,000kcal for vegetables respectively), while juices (from 9.5 in 1976 to 62.3g/2,000kcal) and tins and frozen products (from 3.2 in 1980 to 12.3g/2,000kcal for fruit and from 0.1 to 31.5g/2,000kcal for vegetables respectively) increased. The discrepancy observed between raw and processed products is probably increased by the switch to "scanning" in 1996, which makes it easier to forget to declare fresh products.

### 2.3. Changes in Nutritional Quality

Since 1969, there has also been a significant decrease in purchases of cereal-based products, bread/pasta/rice, and potatoes and pulses. Purchases of fresh bread are not recorded in Kantar, unlike pre-packaged bread, so we have imputed the quantity purchased in the last year of the Insee series to all Kantar years (see Appendix 1), resulting in a minimum reduction. Lastly, purchases of sugar as a food fell by a factor of almost 3.5 between 1969 and 2010, while those of sugar-sweetened products such as jams, chocolates and sweets more than

Figure II – **Purchases of different food groups and food categories (grams for 2,000 kcal)**




Sources: Insee, *Consommation alimentaire* surveys, 1969-1991; Kantar Worldpanel consumer panels, 1989-2010.

doubled. At the same time, the purchases of sugar-sweetened soft drinks grew significantly from 1987 onwards. Overall, the purchases of dairy products increased over the period, with a more pronounced rise between 1970 and 1990. Cheese and especially yoghurts and dairy desserts saw a significant increase (from 29.2 to 53.7g/2,000kcal and 19.3 to 50.0g/2,000kcal, respectively). The purchases of lower-fat milk (skimmed and semi-skimmed), included in the statistics from 1976 onwards, increased significantly (from 26.8 to 113.2g/2,000kcal) at the expense of whole milk (114.0 to 7.5g/2,000kcal). Finally, purchases of fats, particularly oils and butter, fell sharply from 1969 onwards. In this category, only margarine and crème fraîche saw an increase.[2]

These significant variations observed at the main food group level and within each food group were accompanied by a change in nutritional quality measured by a score of adequacy to nutritional recommendations, the Mean

2. *A detailed commentary on all the product categories shown in Figures I and II can be found in Caillavet* et al. *(2018).*

Box – **From Food Purchases to Nutritional Measures**

In order to measure the caloric and nutritional content of food purchases, we use REGAL food composition table from the 1992 general inventory on food from Ciqual (*Centre d'information sur la qualité des aliments*). On this basis, we construct a matrix of conversion factors, allowing the 314 food products defined in the analytical classification of the Insee survey to be converted into their caloric and nutritional content. We are then able to measure the evolution of substitutions between categories in our food nomenclature (but not to take into account the possible evolution of the nutritional content of these categories over the period).

Energy value and nutrient content (macronutrients, micronutrients, (vitamins and minerals), fibre and cholesterol) refer to 100g of the edible part of the food item in question. A conversion factor specific to each food, termed edible portion, is used to convert the weight of the food as purchased into a weight of edible food.

**Caloric and Nutritional Content**

The caloric and nutritional content of food purchases is expressed as an average per person per day. Alcohol, water, diet drinks, tea and coffee are excluded. In practice, this amounts to calculating, for the Insee surveys and the Kantar panels:

$Energy_{ih} = q_{ih}\ (nrj_i/100)$
$Nutrient_{ijh} = q_{ih}\ (nutri_{ij}/100)$

where $q_{ih}$ is the quantity purchased, converted into consumable quantity, of food product *i* by household *h* during the survey week in the case of Insee or during all the weeks of activity in the case of Kantar and $nrj_i$ and $nutri_{ij}$ are, respectively, the energy content and nutrient content *j* per 100g of food product *i* purchased.

**Nutritional Quality**

The nutritional quality of food-at-home purchases is estimated using the Mean Adequacy Ratio (MAR). The MAR is a composite indicator calculated as the mean percentage of recommended dietary intake for fifteen nutrients calculated based on:

$$MAR = \frac{\sum_{i=1}^{15} ratio_i}{15} * 100$$

$$ratio_i = \begin{cases} 1 \text{ if } N_i \geq ANC_i \\ \dfrac{N_i}{ANC_i} \text{ otherwise} \end{cases}$$

where $N_i$ is the observed daily intake of nutrient *i* and $ANC_i$ is the recommended nutritional intake of nutrient *i.* The 15 nutrients considered are: protein, fibre, retinol (vitamin A), thiamine (vitamin B1), riboflavin (vitamin B2), niacin (vitamin B3), vitamin B6, folates (vitamin B9), vitamins C, E and D, calcium, iron, magnesium and potassium.

The scores are expressed for a caloric standard, so that the disparity in the caloric content of purchases does not affect differences in nutritional quality.

**Calculation of Deviations from the Mean**

For each food product *i* and each income quartile (resp. education level) *Niv*, we calculate $D_{iNiv}$ the percentage deviation from the national average of purchases per capita per year as follows:

$$D_{iNiv} = \left( \frac{q_{iNiv}}{q_i} - 1 \right) * 100$$

where $q_i$ is the mean quantity of food product *i* purchased per capita per year(a) and $q_{iNiv}$ is the mean quantity of food product *i* purchased by capita per year by households belonging to the income quartile (resp. education level) *Niv*.

*(a) In the course of the survey week for the Insee survey and during all the weeks of activity in the case of Kantar (cf. Appendix 1).*

Adequacy Ratio (MAR, see Box). Overall, the score increases over the whole period (Figure III). This reflects an improvement in nutritional quality, which can be explained in particular by the reduction in the purchases of calorie-dense and nutrient-poor foods, such as sugar and fat. However, within the overall changes in the MAR, we see an initial phase of sustained growth until 2003[3] (observed in the Insee series until 1991, then the 1st Kantar series until 1995, then at the beginning of the 3rd Kantar series in 2002 and 2003), followed by a second phase of stagnation thereafter.

The discontinuation between 1996 and 2002 corresponds to a change in the methodology of the Kantar series, which in particular reduces the recording of fruit and vegetables, meat and fish without barcodes (fresh products). Yet these foods are sources of nutrients that positively contribute to the construction of the nutritional score (see Box and Appendix 1).

It should be noted that apart from this period of a major change in methodology, the differences in calorie levels observed between the Insee and Kantar series do not seem to affect the coherence and continuity of the nutritional score.

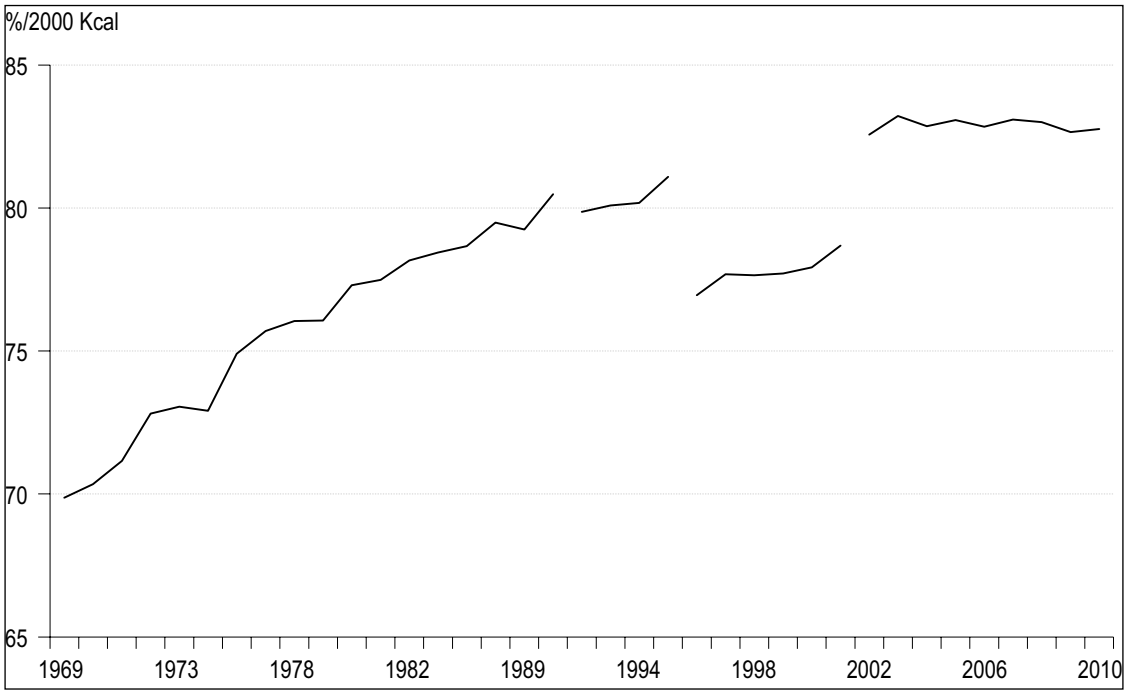
## 3. Socioeconomic Inequalities Relating to Nutritional Quality are on the Decrease but Remain Significant

Socioeconomic inequalities are examined on the basis of two variables constructed at the household level: the income quartile per equivalent-adult and the level of education. Household income per adult equivalent is calculated using the equivalence scale currently used by Insee.[4] It should be noted that this is not a measure of living standards, as the calculation is based on total income and not disposable income. In addition, the information available is of self-reporting origin, and its approximate nature and under-reporting bias are well known; we hope to minimize its consequences by considering income quartiles.

The level of education is measured by the highest level of education attained by the household's reference person; four levels are distinguished: primary, secondary, baccalaureate and higher

*3. The drop-off between 1996 and 2002 corresponds to a change in the methodology of the Kantar Worldpanel series (see Appendix 1).*
*4. The so-called "modified OECD" scale, also applied in Euroepan statistics. For data from the Kantar series, in which only income per bracket is available, the equivalence scale was applied to the bracket centre.*

Figure III – **Changes in the MAR nutritional score of food-at-home purchases**




Sources: Insee, *Consommation alimentaire* surveys, 1969-1991; Kantar Worldpanel consumer panels, 1989-2010.

education. Information on education is only available from 1978 onwards. Unlike income quartiles, the education level is an absolute measure. Thus, as the overall level of education increases over the period, the share of the less educated group decreases over time and that of the highest educated group increases. The complementarity of measures of socioeconomic status based on monetary and non-monetary indicators has been highlighted in several studies (Galobardes *et al*., 2007; Lalluka, 2007). Income and education are known to be linked and interact (as well as with demographic characteristics, including age, household composition, occupation, geographical location, etc.). However, our data do not allow these interactions to be taken into account, and we keep to a separate presentation of changes by income level and by education level.

To study the variation in inequalities independently of the overall variation in nutritional quality, we calculate, for each income quartile and each level of education, the percentage deviation from the national average of energy content and of the MAR, taking into account the purchases of each food product (see Box). The results are presented for 5 points of the period: 1971, 1981, 1991, 2002, 2010, i.e. approximately every 10 years. The choice of these points allows us to minimize the disparities in methodology since we mobilize only 2 of the 4 series. The first 3 points in the period come from the Insee series (1971, 1981, 1991) and the last two (2002 and 2010) from the 3rd Kantar series.

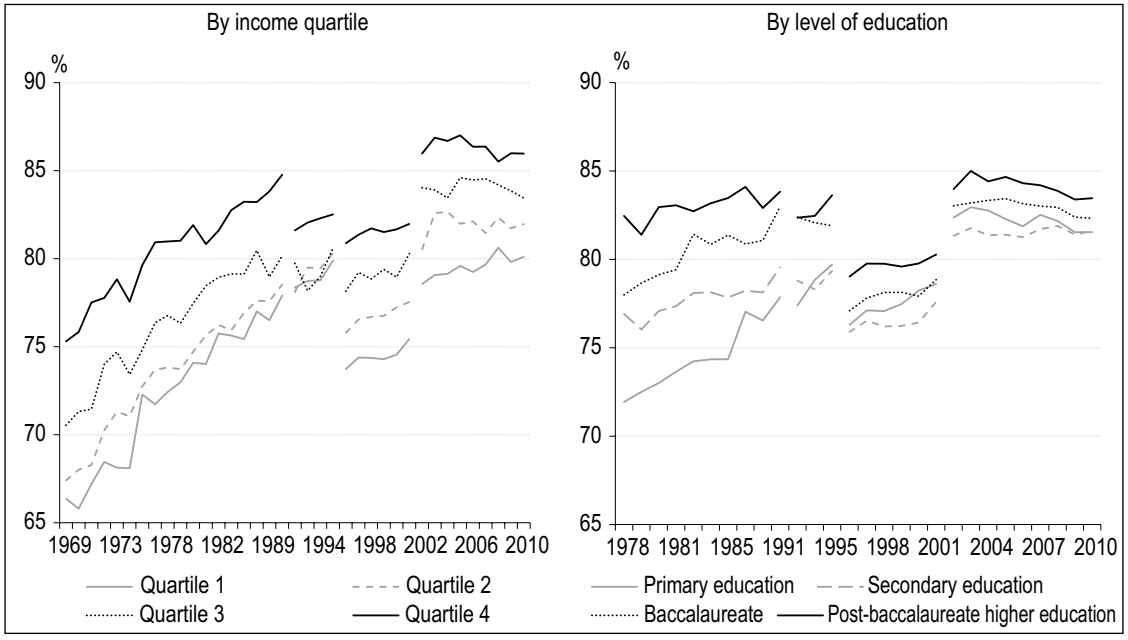
Inequalities in nutritional quality are apparent both at the beginning and at the end of the period and for the two socioeconomic variables considered, i.e. household income per adult equivalent and level of education of the reference person (see box for definitions): the MAR is always the highest among households with the highest income level or education level (Figure IV).

While they were very pronounced at the beginning of the period, the differences in the nutritional quality of purchases by income level and by education level tended to diminish, although some inequalities persist.

### 3.1. By Income Quartile: Inequality of Nutritional Quality rather than Caloric Content

From a nutritional point of view, it is known that there is a hierarchy of foods according to their cost/nutritional quality ratio: energy-dense foods, generally high in sugars and fats, are cheap sources of calories but contribute little to the intake of protective micronutrients and are therefore less favourable to health. This hierarchy tends to lead financially constrained households towards less healthy foods, thus

Figure IV – **Evolution of the MAR nutritional score of food-at-home purchases, by income and education**




Sources: Insee, *Consommation alimentaire* surveys, 1969-1991; Kantar Worldpanel consumer panels, 1989-2010.

promoting the highest prevalence of obesity and related diseases in the least favoured populations (Darmon & Drewnowski, 2015). Hence the importance of the caloric content of food in the question of inequalities. But it cannot be separated from a qualitative analysis, since we do not know the number of meals to which this level of calories corresponds in purchases.

As regards the caloric content of purchases, there are two phases: a first phase (1971, 1981 and 1991 - Insee series) during which it is above average for the lowest income quartiles (Q1, Q2 and, to a lesser extent, Q3) and below average for the highest income quartile Q4 (Figure V); and a second phase (2002, 2010 - Kantar series) in which the trend is reversed: Q1 is below average, while Q4 is now above average in both 2002 and 2010. The two different phases form part, on the one hand, of the 1st phase of decreased caloric content and, on the other, the 2nd phase of higher and broadly increasing caloric content in the 2000s. At the same time, as noted above, they correspond to the two different data sources used, the consistency of which is only guaranteed within these sub-periods. In other words, the trend reversal is difficult to interpret. In all cases, the magnitude of the deviations from the mean caloric content is relatively small and tends to decrease, with the deviations from the mean at the level of each quartile barely exceeding 5% in absolute terms at all points during the period and remaining below 2.5% in 2010. However, since the extreme quartiles reveal deviations of opposite sign from the mean, there is a gap between Q1 and Q4 of 8.3 points in 1971, which still stands at 5.4 points in 2010.

Focusing on the 1st phase (1971-1981-1991, Insee series), the higher caloric content of purchases among the least affluent compared to the most affluent households may reflect a number of factors. On the one hand, this may be indicative of a lesser tendency to eat outside the home. For example, it was found that households in the lowest income deciles spent a smaller share of their food budget on out-of-home consumption (14% for the 1st income decile compared to 30% in the last decile; see Caillavet *et al*., 2009). The higher caloric level observed among less affluent households in terms of purchases may reflect the social gradient of overweight and obesity (i.e. prevalence is inversely related to social status). However, this may also reflect different sociability practices (invitations to the home vs to restaurant), working-day constraints (lunchtime break of working people at home vs eating in restaurants or in the workplace (see Lhuissier *et al*., 2020), which are obviously underpinned by the economic logic of meal cost.

The slight reversal of the trend apparent from 2002 (3rd Kantar series) onwards coincides with the stabilisation of food-at-home caloric intake at around 80% based on estimates from the INCA individual food surveys (INCA1 1998-1999 et INCA2 2006-2007, cf. AFSSA, 2009), although there is no evidence on the social differentiation of this figure. However, the general context of changes affecting inequalities in living standards in France appears to support the hypothesis of two distinct phases, with inequalities declining continuously in the 1970s and then increasing in the 2000s (Boiron, 2016).

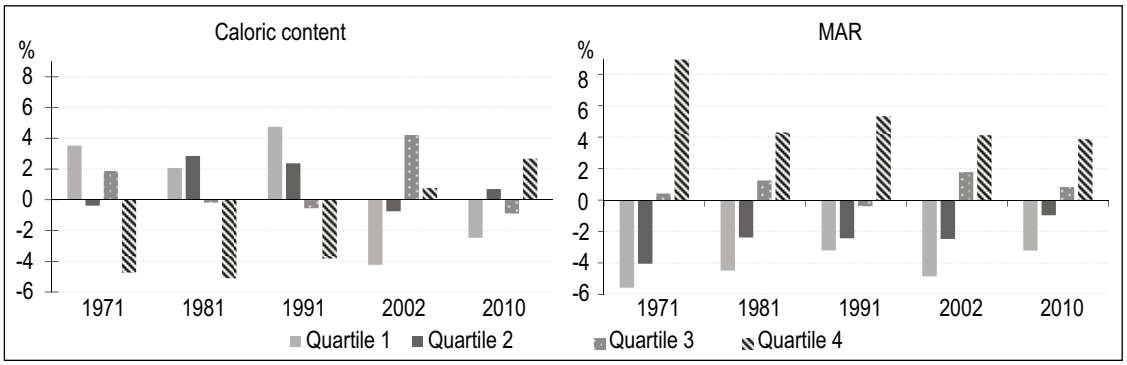
In terms of nutritional quality (Figure V-B), the change by income level is unequivocal: at all times throughout the period and with any data series, deviations from the MAR are below average for the lowest income quartiles (Q1 and, to a lesser extent, Q2). At the same time, the highest income quartile (Q4) achieves relatively higher nutritional quality. As with calorie levels, the gap between Q1 and Q4 narrows over time, reaching 9 points in 1971 and remaining at 6 points in 2010.

### 3.2. According to Education: Inequalities that Tend to Disappear

Deviations in the calorie content of purchases by level of education compared to the mean (Figure VI-A) are more pronounced than they were by income. The lowest level of education (primary education) shows above-average calorie content over the entire period, while the other three levels of education remains below average. Deviations from the mean are high, with the absolute difference between the lowest and highest levels of education reaching 13 points in 1978 (first year for which the education level is available). However, by 2010 (3rd Kantar series) they had disappeared, with the gap standing at less than 1 point.

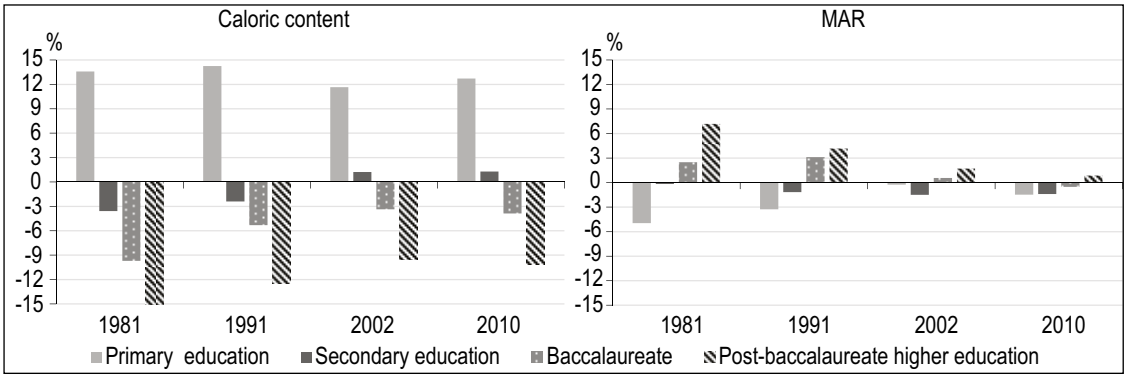
As with income, higher-calorie purchases among households with a less educated reference person may be indicative of more frequent at-home food consumption. No research appears to have been conducted on differences in the frequency of home consumption by level of education, although studies have shown that high socio-professional categories such as senior executives eat more frequently outside the home (4.6 meals

Figure V – **Deviation from the mean (%) of the caloric content and the MAR of food-at-home purchases, by income quartile**




Notes: Home consumption (excluding alcohol).
Sources: Insee, *Consommation alimentaire* surveys, 1971-1981-1991; Kantar Worldpanel consumer panels, 2002-2010.

Figure VI – **Deviation from the mean (%) of the caloric content and the MAR of food-at-home purchases, by education level**




Notes: Home consumption (excluding alcohol).
Sources: Insee, *Consommation alimentaire* surveys, 1971-1981-1991; Kantar Worldpanel consumer panels, 2002-2010.

per week compared to 2.8 on average in 1991; see Manon, 1993).

Regarding the overall nutritional quality of purchases (Figure VI), there were clear inequalities at the beginning of the period, reflected by significant differences in the deviations of the MAR from the mean according to both education and income. However, while there is evidence of persistent income-related inequalities, the same cannot be said of education, where inequalities decreased throughout the period of study before almost disappearing in 2010 (3rd Kantar series).

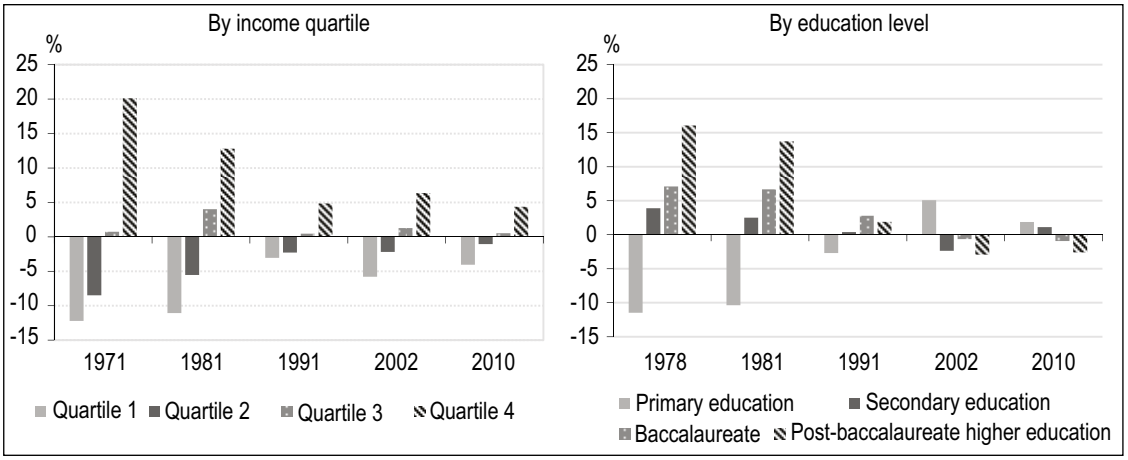
### 3.3. Despide the Convergence, Inequalities Remain

Between the different socioeconomic levels, whether estimated according to income or education, we see a convergence over the four decades studied towards the same overall nutritional quality of purchases. However, disparities persist in the case of some nutritional characteristics.

First, the caloric content of these purchases remains higher among the less educated.

Then, macronutrient content (fat, carbohydrates, protein) follows the general trend of convergence with deviations from the mean by income and education not exceeding 5% at the end of the period in 2010 (see Appendix 2). For fats and carbohydrates, the deviation from the mean of their contribution to the caloric content of purchases remains low over the entire period, although we see a trend reversal in more recent years, corresponding to the 3rd Kantar series. Fat content, with a marked difference between deviations from the mean, remains a

Figure VII – **Deviation from the mean (%) of animal protein content of food-at-home purchases**




Sources: Insee, *Consommation alimentaire* surveys, 1971-1981-1991; Kantar Worldpanel consumer panels, 2002-2010.

factor of inequality between levels of education (cf. Appendix 2)

The deviation from the mean of the contribution of proteins declines over time. On the other hand, in the case of animal protein, the deviation from the mean highlights significant income disparities (Figure VII) at the beginning of the period, with the wealthiest households having intakes more than 20% higher than the mean in 1971, the gap narrowing to 4.4% in 2010. The changes observed in the variable according to the level of education were also found to differ, with, at the beginning of the period, a much higher animal protein content in purchases among the most educated compared to the least educated (+16.1% and -11.5% respectively in 1978), i.e. a difference between deviations of 27.6 points. This trend seems to be reversed in the 3rd Kantar series, from 2002, with higher animal protein intakes among those with the lowest level of education (5.1% above the mean in 2002, but becoming very low at 1.9%, in 2010). While this reversal of trend corresponds to the change in series (Kantar), it can be noted, however, that this is not so with respect to income level, for which a continuous trend is observed.

Thus, more than total protein, protein sources appear to be a dividing line at the beginning of the period, which may have an impact at the nutritional content and on the sustainability of diets. The role traditionally assigned to the consumption of animal protein as a marker of social status (Grignon, 1996) completely fades by the end of the period. There is even a slight trend reversal for the most educated households in 2002.[5] This evolution may reflect the impact of nutritional information relating to the harmful effects of over-consumption of certain animal products. Several studies have highlighted the differentiated effect of information by social status and, in particular, the greater sensitivity to nutritional recommendations of individuals with a higher socioeconomic status (Régnier & Masullo, 2009). This would contribute, for the scope of home consumption, to the convergence between the most educated and the least educated households.

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This study drew on the construction of an original database on food-at-home purchases over four decades based on direct household surveys. No long time series of food consumption data are available for France, and the data used in this study are the only ones that can provide information on the period at the household level. Constructing this database involved extensive and meticulous work to ensure consistency between the two data sources, the Insee's *Consommation alimentaire* survey covering from 1969 to 1991 and the Kantar-Worldpanel series from 1989 to 2010. We specifically

*5. This is not necessarily the case in all countries. For example, in a Nordic country such as Denmark, meat consumption remained more common in wealthier households during the same period (Smed & Jensen, 2007).*

speak of "consistency" and not harmonisation, because the scope and methodology of the two sources differ significantly, including within the Kantar series itself. This is why we have chosen to present the evolutions while leaving the breaks in series apparent. Data constraints also lead to the adoption of a limited number of indicators to analyse household inequalities and their evolution; we have retained the income quartile per adult equivalent, and the level of education, approached by that of the household's reference person.

Based on these data, the article offers a descriptive study of the change in food consumption, analysed in terms of caloric contents and nutritional quality. The analysis of inequalities is based on the calculation of a nutritional quality score (MAR). This score is adjusted to a caloric standard, so that the disparity in the caloric content of purchases does not affect the evaluation of nutritional quality. Our results indicate a general trend towards an improvement in nutritional quality (the MAR increases). Then we examine how inequalities in food purchases – in nutritional terms – have changed between household income levels and education levels.

Over the four decades studied (1971-2010), households in the highest income quartile or the highest education level have consistently benefited from better nutritional quality of food-at-home purchases, thereby contributing to social inequalities in health. However, the magnitude of these inequalities has decreased, as can be observed in both the Insee series and the 3rd Kantar series. The difference in the MAR between the extreme income quartiles decreased from 9 points in 1971 to 6 points in 2010, while the difference in the MAR between the extreme levels of education fell from 13 points in 1978 to less than 1 point in 2010. It must be recalled here that the evolution of inequalities between income levels and education levels cannot be interpreted in the same way: indeed, income groups (quartiles) have a constant relative importance over time. This is not the case for levels of education that are measured in "absolute" terms. With the overall rise in the level of education in over the period studied, their relative weight in the population has changed very significantly; in particular, the proportion of households at the lowest level has been divided by ten, while at the other extreme, that of households at the highest level has more than doubled, thus changing the social significance of these inequalities. An analysis in terms of cohorts combining age and education would make it possible to take generational effects into account, were data available. In fact, the period studied and the use of sources with so different methodology respond to the vacancy of the national statistical apparatus in this domain.

Finally, it should be noted that the trends observed concern only food purchases for the home known through household surveys. Thus, on the one hand, self-consumption and out-of-home consumption are not taken into account, and on the other hand, populations that are invisible in household surveys – those in collective housing and those without housing. Other aspects of food purchases involve public health and social inequalities: access to places of purchase insofar as the food supply may determine the consumer's universe of choice (Chaix *et al.*, 2012; Drewnowski *et al.*, 2014; Caillavet *et al.*, 2015), or to the characteristics of products (e.g. quality, organic certification, etc.) with higher prices making these products less accessible for lower income households (Marette et al., 2012; UFC, 2017). But long-term data are even less available here. Based on the structure of purchases for food-at-home, our results show that in 2010, inequalities in nutritional quality by level of education seem to be close to disappearing, but inequalities by income remain. At present, at the global level, one would hope that the stagnation in the nutritional quality of purchases observed at the beginning of the 21st century, the last period of our analysis, would be replaced by an improvement. Indeed, policies have been put in place (Plan national nutrition santé, PNNS, a national information program on nutrition and health) with both general campaigns and product-level signals (the "NutriScore"). Consumers seem to be aware of the nutritional quality of their food, as shown by the growing success of digital tools (cf. Ifop, 2019). However, recent work suggests that their mode of use reproduces social inequalities in access to information (Régnier & Chauvel, 2018). Food and health policies therefore remain relevant to reduce social inequalities. □

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## APPENDIX 1

### CONSTRUCTION OF FOOD CONSUMPTION DATA

To examine changes in food consumption over four decades, we constructed long time series based on microeconomic data relating to household food supplies from two sources: The "Food Consumption" survey (*enquête Consommation alimentaire*) conducted by Insee and the Kantar Worldpanel (formerly SECODIP) household panel.

Each survey is conducted on a representative sample of "ordinary households" (excluding those living in mobile homes, retirement homes, university residences, shelters, penal institutions, etc.) residing in metropolitan France. Weightings are provided for each dataset.

#### The Insee Food Consumption Survey

It was conducted annually from 1969 to 1983 (except in 1975 because of the demographic census) and subsequently every two years until 1991, when the survey was definitively discontinued. We therefore have 18 surveys covering 6,000 to 8,000 households depending on the year. The collection method, in two visits, has remained constant.

Number of observations of the harmonized samples

| Year | Number of households | Number of individuals |
|---|---|---|
| 1969 | 8,178 | 25,488 |
| 1970 | 8,149 | 25,150 |
| 1971 | 8,047 | 24,820 |
| 1972 | 7,980 | 24,534 |
| 1973 | 6,551 | 19,658 |
| 1974 | 7,524 | 22,677 |
| 1976 | 8,715 | 25,869 |
| 1977 | 7,660 | 22,776 |
| 1978 | 7,934 | 23,257 |
| 1979 | 7,644 | 22,166 |
| 1980 | 7,872 | 22,805 |
| 1981 | 8,406 | 23,895 |
| 1982 | 8,841 | 24,952 |
| 1983 | 8,877 | 24,851 |
| 1985 | 7,288 | 20,443 |
| 1987 | 6,938 | 19,103 |
| 1989 | 3,202 | 8,781 |
| 1991 | 6,353 | 16,906 |
| Total | 136,159 | 398,131 |

Insee, *Consommation alimentaire*

Each household was surveyed once over a period of seven consecutive days. To take into account the seasonal dimensions of food consumption, the survey was conducted throughout the year. Specifically, the year was divided into eight periods of six weeks each, plus two fortnights without a survey: the first fortnight of August and the second fortnight of December. During a first visit, the surveyor collects information on the sociodemographic characteristics of the household, together with data on the availability of a garden or family livestock holding, the kitchen and refrigeration equipment available to the household and its supply habits. At the end of the interview, the surveyor gives a log book to the household member in charge of food supplies in which all food supplies for home consumption were to be recorded on a daily basis over a period of one week, whether from a purchase, a gift received, household production (self-consumption) or stock (self-supply) and food expenditure outside the home, together with any consumption in a restaurant, canteen, bar, etc.

Over the years, the content of the surveys has evolved, with two important changes: One, in 1978, is the introduction of a new variable, the level of education of each individual in the household. The other concerns the analytical nomenclature variable for identifying food products, which has been enriched: it described 170 different products in 1969, and 320 in 1991. Work to harmonize the variables within the Insee series was therefore carried out on data at the household, individual and product levels.

#### The Kantar Worldpanel Data (formerly Secodip)

Kantar (ex-SECODIP), a private company, produces household purchase data to meet the mainly commercial interests of agri-food firms. These data, which are subject to a fee, are therefore subject to confidential and strictly controlled use. The data collection tools meet the needs of Kantar's customers and can change quite significantly from one year to the next. In order to limit the workload of the households surveyed, they do not record all food products.

Kantar series are panel data, i.e. involving repeated recordings among the same households. A given household records its purchases over an average period of four years. The available data cover the 12 months of 1989 and every year from 1991 to 2010, i.e. 20 surveys. Kantar follows a very large number of households throughout the year, and provides samples of households that meet their criteria for satisfactory responses and representativeness with adjustment weights (main adjustment criteria: age, CSP, region, socio-economic level) while managing attrition phenomena. The selected households are called "active housholds", and the corresponding sample is of about 3000 households between 1989 and 1995, 6,000 from 1996 to 2001, and about 10,000 at the end of the period.

The Kantar data relate to purchases of food products for home consumption. Data on self-supply, self-consumption and out-of-home eating are not collected. Information on sociodemographic variables and the availability of a garden, orchard and household appliances is collected once a year by means of a questionnaire.

The structuring of data collection during the period studied here has undergone several major changes. Three main periods can be distinguished, corresponding to changes in data collection techniques, changes in nomenclature, and changes in sample size.

*From 1989 to 1995: collection by log books*

In these years, there are 2 independent panels P1 and P2, each composed of about 3,000 households. To better distribute the collection burden between households, panel P2 is being further divided into 2 sub-panels P3 and P4. Each panel records the following products:

- P1: groceries, yoghurts, desserts, soft drinks and fats.
- P2: meat, cold cuts, fish, frozen products, milk, cheese, alcoholic beverages, canned vegetables, fresh fruit and vegetables
- P3: fresh fruit
- P4: fresh vegetables

Some food products are not recorded in purchases (e.g. liqueurs), and single male households are not surveyed.

*1996-2008: collection by "scanner"*

There are three panels: a general panel of about 5,000 annual "active households", GC, and two sub-panels: VP and FL of about 3,000 annual "active households" each. Each panel records the following products:

- GC: frozen products, dairy, milk, groceries, water, alcohols other than wine, eggs, cheese, sugar and pastries

- VP: meat, charcuterie, fresh fish and wine
- FL: fresh fruit and vegetables

The coverage of products is improved, and all household types are surveyed, regardless of their composition, including those consisting of a single man.

*2009: merging of the two sub-panels VP and FL into PF, GC remaining the same.*

The merged VP and FL sub-panels count approximately 10,000 and 6,000 "active households" annually, respectively.

**Pooling of the Two Data Sources**

Constituting long series of average food consumption requires the adoption of common definitions. These relate, on the one hand, to the list of food products studied and, on the other, to the chosen measure of average quantity. The different fields covered by the two data sources require the adoption of a common definition of consumption based solely on the purchase of food products for at-home consumption. Self-consumption, self-supply and out-of-home consumption are therefore not taken into account.

The switch to "scanning" encourages "forgetting" to record some purchases: the procedure for products without barcodes (mainly purchases of fresh produce) is more cumbersome than for other products. As a result, between 1995 (the last year of the register) and 1996 (the first year the scanner was used) there was a significant drop in purchases of several products such as potatoes, fresh vegetables, fresh fruit, poultry and fresh fish.

We have tested a correction procedure by applying a correction coefficient to the average purchases per person per day of these fresh products affected by the switch to scanning. For the years 1996 to 2001, the averages were adjusted by a coefficient representing the ratio of average purchases in 1995 to those in 1996 (the coefficients were 1.33 for potatoes, 1.21 for fresh vegetables, 1.14 for fresh fruit, 1.19 for poultry and 1.23 for fresh fish). However, the change in nomenclature in 2002 made it difficult to continue this correction. Moreover, the volume of purchases without barcodes is set to decrease over time as a result of the adjustment of supply. These uncertainties about the applicability of the coefficients calculated on the basis of data from the mid-1990s led us to waive this correction.

The purchase data from the various Kantar consumer panels were recoded using the analytical product classification of the Insee "1991 Food Consumption" survey. This common definition of food products was used as a basis for a new classification. The resulting classification is based on a compromise between the classification conventions used in Insee's economic publications on food and diet, the limitations set by the data sources used and our interest in assessing the nutritional consequences of food consumption.

This gives a grouping of products at two levels of aggregation. At the most aggregate level, 18 main categories of food products are considered: (1) cereal products; (2) potatoes; (3) vegetables; (4) fruit; (5) meat and meat products; (6) poultry, rabbit, game; (7) eggs; (8) fish; (9) ready meals; (10) milk; and 11) yoghurts and dairy desserts; 12) cheese; 13) added fats; 14) sugar-sweetened products; 15) bottled water; 16) soft drinks; 17) alcoholic beverages; 18) coffee, tea, herbal infusions. At the finest level, 78 product groups are obtained. However, changes in the purchasing patterns of each of these groups is not always monitored exhaustively. This is because the scope and coverage of the two data sources may differ because of the changes made to the classifications used. Especially, bread pruchases are not included. Therefore, we have added 100 g of bread to the daily food purchases (according to the data from the 1991 Insee survey). Conversely, the quantities of tinned fish were not measured in the Insee surveys, and dairy desserts are only identifiable as such from 1976, while sunflower oil is only identifiable from 1979.

In both data sources, the methods used to collect the quantities purchased allow for an assessment of the different food products at the level of each household, but without the possibility of moving to the individual level. To eliminate the effects of scale associated with household size, estimates were made on a per capita basis, which amounts to assuming an identical distribution for all household members. We therefore used the average consumption measure established by Insee as part of the food consumption survey, namely annual at-home consumption per capita (excluding self-consumption and self-supply) defined as the ratio of total annual purchases made by the households surveyed to the total number of household members. In practice, this amounts to calculating:

- For the Insee surveys:

$$q_i = \frac{\sum_h q_{ih} * poids_h * 52}{\sum_h npers_h * poids_h}$$

- For the Kantar series:

$$q_i = \frac{\sum_h q_{ih} * poids_h * (52/nbsem_h)}{\sum_h npers_h * poids_h}$$

where $q_{ih}$ is the total quantity of item *i* purchased by household *h* during the survey week in the case of Insee or during all the weeks of activity in the case of Kantar, poidsh is the adjustment factor of household *h*, $npers_h$ is the number of members of household *h* and $nbsem_h$ is the number of weeks of activity of household *h* in the Kantar panel. We therefore have one point per year.

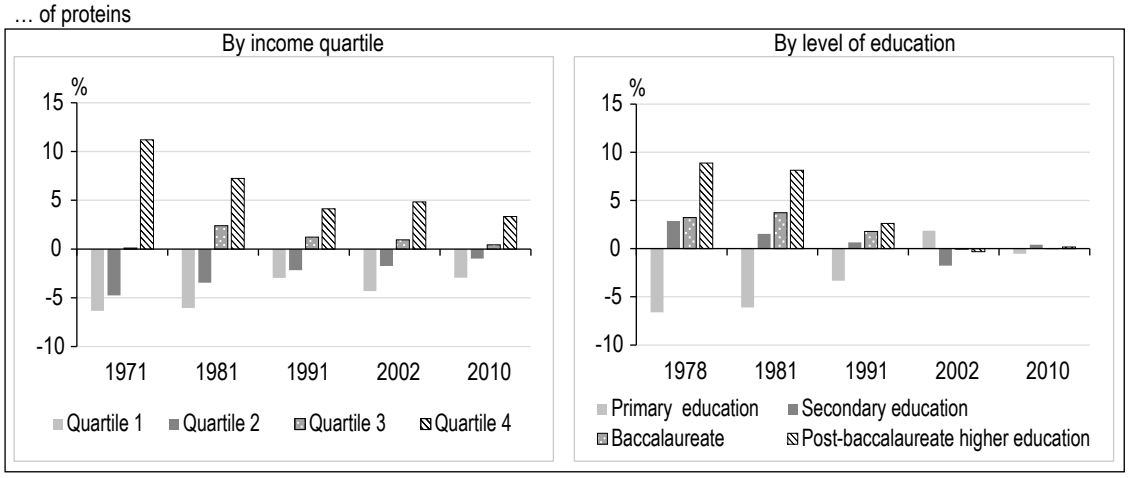
In the article, we chose to present the evolutions without connecting the different data sources, or the different series within Kantar, to keep track of the gaps resulting from methodological changes.

**APPENDIX 2**

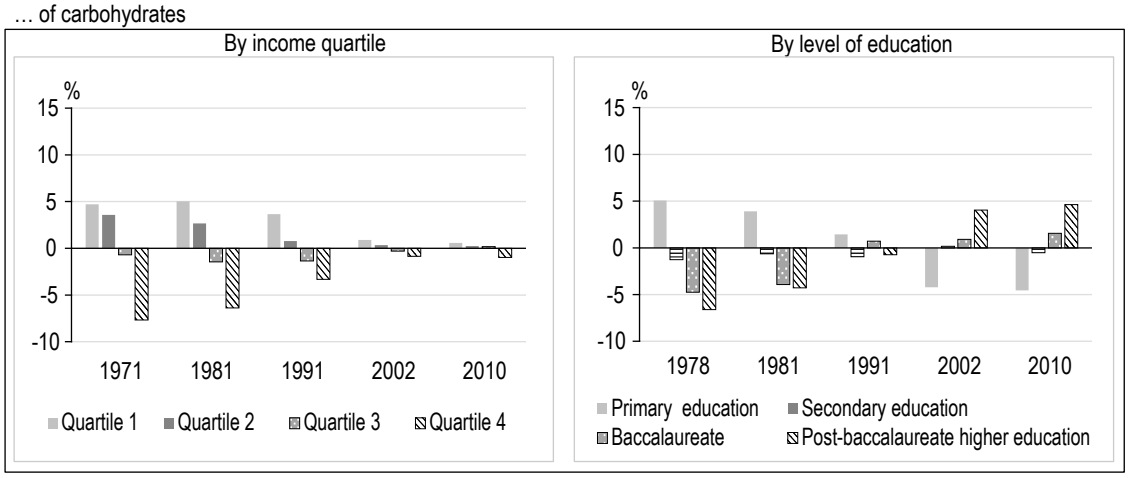
**INEQUALITY OF MACRONUTRIENT CONTRIBUTIONS TO CALORIC CONTENT BY INCOME AND EDUCATION**

**Deviations from the mean, in % of the contribution to caloric content…**

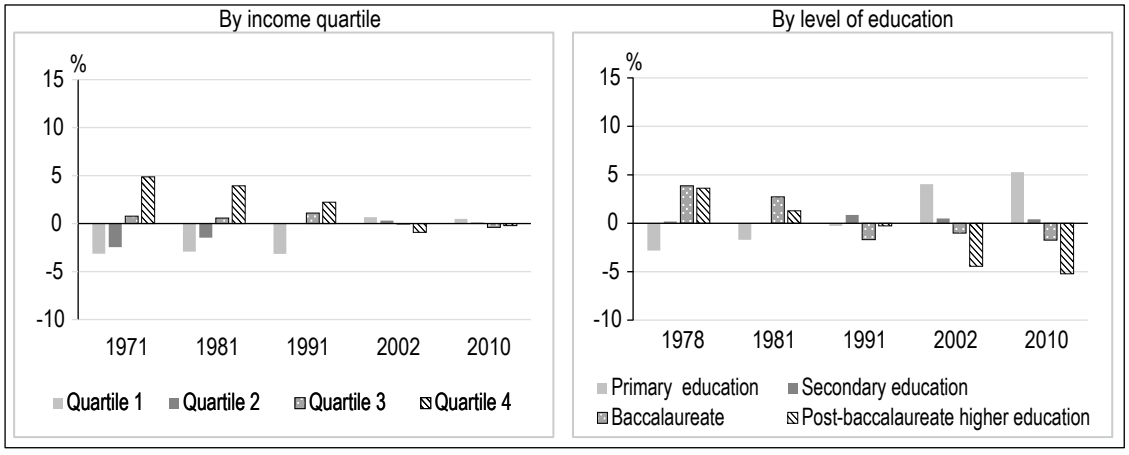
… of proteins




… of carbohydrates




… of fats




Sources : Insee, *Consommation alimentaire* surveys, 1971-1981-1991; Kantar Worldpanel consumer panels, 2002-2010.