To what extent can food nutritional quality improvement allow public health goals to be reached?

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Oqali
French Observatory of Food Quality

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Introduction

To face the burden of chronic diseases linked to food consumption, improving nutritional quality of processed foods becomes a crucial issue for health policy makers. This issue raises two questions: to what extent modifications of food composition are feasible and what can be their impacts on health, and what means can be used by policy makers to favor food quality improvement.

The purpose of the study is to contribute to these debates by assessing what can be the potential contribution of food quality modification from a public health point of view. More precisely, we assume that consumers continue to consume the same food products but that the nutritional characteristics of each one of these food products have been improved in a realistic way, i.e. acceptable from technological and sensorial points of view. Then, what could be the impacts on the individual nutritional intakes?

To address this question, detailed data on nutritional characteristics of food items and on individual consumption among representative samples of population are clearly required.

Methods

Food Quality database

In France, Ministries in charge of Food and Agriculture, Health, and Consumption decided to fund the creation of an Observatory of Food Quality (Oqali) in 2008. The goal was to set up an independent system of observation in order to assess the nutritional composition of food items marketed by all the brands present in the French market. In 2010, the Oqali database contains about 15,000 items, representing around 30% of the processed food marketed in France.

We used these data to assess the nutrient composition of individual branded food items among three groups: breakfast cereals (355 items available divided into 29 food categories, covering 75% of the market in 2008), biscuits/pastries (1805 items, 51 food categories, 72% of the market shares in 2008) and bread-based products (620 items, 31 food categories, 57% of the market shares in 2009).

Consumption databases

For each food item, we matched the food quality database with two consumption databases: TNS Kantar Worldpanel (to assess the market shares of each food item delivered to the market) and INCA2 (an individual consumption survey).

On this basis, we considered mean consumers of the 3 groups studied for children and adult sub-populations.

Scenario analysis

First, we determined the nutrient composition variability among each product category of breakfast cereals, biscuits/pastries and bread-based products.

Second, we considered several scenarios of food composition modification within each product category, by assuming that the lowest nutritional quality food items were modified in order to reach better quality levels already observed in the food category. Then, for each scenario, we calculated the variation of total quantities of sugars, fat, fiber and sodium delivered to the market. Finally, we determined the variation induced at the individual consumption level by each scenario and assessed the modification of the individual consumption distribution of each of these nutrients among adults and children.

Scenario S0: current situation.
Scenario S1: in each product category, the contents in sugars, or fat or sodium which are above the third quartile are reduced to meet the level of the third quartile.
Scenario S2: the items whose content in sugars, or fat or sodium are above the median of the food category, meet the median values.
Scenario S3: the items whose content in sugars, or fat or sodium are above the first quartile are reduced to meet the level of the first quartile.
The content in fiber is similarly increased in scenarios S1, S2, S3.

To test the significance of nutrient individual consumption evolution, two-sample *t* statistic tests were performed (α=5%) which allow to compare the current situation with the various scenarios.

Results

Table 1: Relative interquartile ranges (RIR) greater than 25% for sugars, fat, fiber and sodium content within the categories of breakfast cereals having at least 10 items

Food categories	Number of items	Nutrient	Relative interquartile range (q3-q1)/q2
Honey puffed wheat	13	fat	73%
		fiber	36%
		sodium	> 100%
Unflavoured fiber-rich cereals	10	sugars	31%
		fat	58%
		fiber	83%
		sodium	52%
Fruit fiber-rich cereals	17	fat	28%
		fiber	31%
		sodium	29%
Unflavoured corn flakes	12	sugars	67%
		fat	39%
		fiber	35%
		sodium	29%
Chocolate wheat flakes	23	fat	43%
		fiber	42%
		sodium	> 100%
Chocolate filled cereals	27	fiber	54%
		sodium	50%
Unflavoured light cereals	23	fat	33%
		sodium	38%
Chocolate light cereals	16	sodium	44%
Fruit light cereals	24	sodium	43%
Traditional muesli flakes	11	sugars	39%
		fat	> 100%
		fiber	25%
		sodium	> 100%
Fruit crunchy muesli	23	fiber	36%
		sodium	70%
Chocolate crunchy muesli	20	fiber	28%
		sodium	> 100%
Traditional muesli flakes no added sugars	12	fat	69%
		fiber	33%
		sodium	> 100%
Honey frosty wheat flakes	11	sugars	39%
		fat	83%
		fiber	50%
Chocolate puffed rice	15	fat	48%
Honey corn balls		fiber	71%
		sodium	78%
Chocolate puffed cereals	17	fat	50%
		fiber	33%
		sodium	60%

We observe a large variability of nutritional composition within food categories: RIR are greater than 50% for 21 cases out of 68, and greater than 25% for 43 cases out of 68.

For the other groups, we also have a large variability within food categories: in bread-based products RIR are greater than 25% for 39 cases out of 60 and in biscuits and pastries for 46 cases out of 88.

Table 2: Impacts of scenarios on the total amounts of nutrients delivered to the market

Food groups	Nutrient	Current situation (tons)	S1 (%)	S2 (%)	S3 (%)
Breakfast cereals	sugars	34049	-3%	-6%	-11%
	fat	8773	-4%	-8%	-13%
	fiber	6101	2%	7%	18%
	sodium	389	-4%	-9%	-20%
Biscuits/pastries	sugars	146641	-1%	-2%	-6%
	fat	84467	-2%	-3%	-7%
	fiber	14916	1%	4%	19%
	sodium	1195	-3%	-7%	-16%
Bread-based products	sugars	37771	-5%	-9%	-22%
	fat	32812	-1%	-4%	-14%
	fiber	15777	2%	6%	20%
	sodium	1939	-3%	-7%	-14%

The impacts of scenarios on the total amounts of nutrients delivered to the market are between 1% and 5% for S1, 2% and 9% for S2 and 6% and 22% for S3 depending on the food sector and the nutrient considered. For each scenario, the strongest impact concerns quantities of sugars delivered by bread-based products (-5%, -9% and -22%). For S2, we also observe a great impact on the amount of sodium delivered by breakfast cereals (-9%).

Table 3: Impacts of scenarios on individual consumption for adults and children subpopulations

Food groups	Nutrient	Adults mean consumers			
		Current situation (g/d)	S1 (%)	S2 (%)	S3 (%)
Breakfast cereals	sugars	6,95	-1,8%*	-4,0%*	-7,9%*
	fat	2,29	-1,4%	-3,7%*	-7,5%*
	fiber	1,9	1,5%	3,5%*	10,9%*
	sodium	0,093	-1,4%*	-3,7%*	-13,5%*
Biscuits/pastries	sugars	1,94	-0,3%*	-1,1%*	-3,5%*
	fat	1,16	-1,4%*	-2,8%*	-5,3%*
	fiber	0,2	0,4%*	2,4%*	11,7%*
	sodium	0,018	-1,7%*	-3,6%*	-10,81%*
Bread-based products	sugars	2,07	-2,8%*	-5,7%*	-13,9%*
	fat	2,31	-0,4%*	-2,4%*	-9,9%*
	fiber	1,13	1,0%*	2,5%*	12,1%*
	sodium	0,145	-1,6%*	-4,5%*	-8,8%*

Food groups	Nutrient	Children mean consumers			
		Current situation (g/d)	S1 (%)	S2 (%)	S3 (%)
Breakfast cereals	sugars	7,07	-2,6%*	-5,6%*	-9,1%*
	fat	1,32	-4.2%*	-8,2%*	-11,6%*
	fiber	1,01	1,8%*	6,5%*	16,6%*
	sodium	0,071	-3,6%*	-8.4%*	-15,8%*
Biscuits/pastries	sugars	2,89	-0,5%*	-1,4%*	-4,2%*
	fat	1,7	-1,2%*	-2,5%*	-5,1%*
	fiber	0,27	0,5%*	3,1%*	14,6%*
	sodium	0,024	-1,9%*	-4,1%*	-11,0%*
Bread-based products	sugars	2,42	-3,0%*	-6,1%*	-13,7%*
	fat	2,6	-0,4%*	-2,1%*	-9,9%*
	fiber	0,75	1,4%*	3,5%*	18,8%*
	sodium	0,108	-2,6%*	-5,1%*	-9,6%*

**significant difference compared with the current situation (α=5%)*

The impacts of scenarios on individual consumption for adults and children subpopulations are up to 4.2% for S1, to 8.4% for S2 and to 18.8% for S3, depending on the sector and the nutrient considered.

For adults, the greatest impact is observed for each scenario on sugars intakes provided by bread-based products (respectively -2.8%, -5.7% and -13.9%).

For children, the strongest impact depends on the scenario considered: for S1 it concerns fat intakes provided by breakfast cereals (-4.2%), for S2 it concerns sodium intakes provided by breakfast cereals (-8.4%) and for S3 it concerns fiber intakes provided by bread-based products (+18.8%).

Statistical tests show that nutrient individual consumption evolution is significant, for all scenarios and nutrients tested except for fat and fiber adults individual consumption within scenario S1 for breakfast cereals.

Conclusions and perspectives

The results give useful insights and show to what extent food modifications can contribute to public health goals. Nevertheless, it would be necessary to take into account the interactions between nutrients. For instance, a decrease in fat may in some cases imply an increase in the sugar content (for technological or sensorial reasons).

The food modifications simulated in the study can be interpreted as the improvement of the Minimum Quality Standard (MQS) - i.e. the enhancement of the lowest nutritional quality items - within each food category. The potential magnitude of the effects suggests that such a strategy can constitute a relevant target for the public authorities, which radically differs from the one which would promote quality improvement through differentiated product claims.

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