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# Relationship between voluntary nutrition labeling, food composition and prices: the example of biscuits and pastries

Marine SPITERI, Marion HENINI, Raffaella GOGLIA, Pierre COMBRIS, Louis Georges SOLER  
French National Institute for Agronomic Research (INRA: Institut National de la Recherche Agronomique)

## INTRODUCTION

To prevent some food related illnesses, health policies may influence consumers' behaviors through appropriate food labeling. In some countries, like the US, nutrition labeling is mandatory, whereas it is still optional in the EU, except when a nutrition claim is made in the labeling or the advertising of a foodstuff. In fact, the choice between voluntary versus mandatory labeling depends on several factors related, on the demand side, to the potential impacts of nutrition labeling on consumers' health, and on the supply side, to the possible extension of labeling if it only relies on firms' initiatives. Focusing on the supply side, the purpose of this study is to assess the development of voluntary nutrition labeling in France, and to determine the relationship between the presence of nutritional label, the food composition and prices. Analyses are performed on biscuits/pastries data, using detailed data on nutritional characteristics and prices of food items.

## METHODS

### Food quality database

In France, Ministries in charge of Food and Agriculture, Health, and Consumption decided to create 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 existing in the French market. In 2010, the Oqali database contains about 15,000 items, representing around 30% of the processed food marketed in France. Each product is described by several parameters such as the nutrient content (energy, protein, fat, saturated fat, carbohydrates, sugars, fiber and sodium), the nutrition labeling, the ingredient list, nutrition and health claims, the serving size, the nutrition guidelines included on the packaging and the brand.

In this study, we analyze nutrition labeling, nutritional composition and prices of biscuits and pastries items, keeping out those with nutrition claims for which label is mandatory. To fill out data, physico-chemical analyses of nutritional composition have been performed for some items with incomplete nutrition labeling on the packaging. Finally, our sample of biscuits and pastries is composed of 1427 items, 136 of which were chemically analyzed.

### Socio-economic database

The mean price of each food item is assessed by matching Oqali database with data provided

by TNS Kantar/Worldpanel which records in-store purchases made by representative households in France during the year in progress.

### Analyses

First, a detailed analysis of nutrition labeling was performed on the data. This analysis allows the assessment of the presence/absence of various types of labels (with basic or extended information) according to the category of products (table 1).

Second, we compared the nutrient contents of products with and without extended nutrition labeling, using either the information available on the packaging, or analytical results when this information was missing.

Third, we compared the prices of food items according to the presence/absence of extended nutritional information on their packaging.

Two-sample *t* statistic tests were used when conditions for parametric test were fulfilled, Mann-Whitney tests otherwise.

Table 1: types of labels

Basic nutritional information	Group 1 : energy, protein, fat, carbohydrates Group 1+: group 1 + minerals or vitamins
Extended nutritional information	Group 2 : energy, protein, fat, saturated fat, carbohydrates, sugars, fiber, sodium Group 2+: group 2 + minerals or vitamins

## MAIN RESULTS

First, the results show that voluntary nutrition labeling is rather well developed (figure 1). Indeed, only 16% of biscuits/pastries of the sample have no nutrition labeling at all. 51% of the products present basic nutritional information and 33% of the products have extended nutritional information.

Second, we observe that products with extended nutritional information are not of a better nutritional quality (table 2). Indeed, we compared nutrients contents (protein, fat, saturated fat, carbohydrates, sugars, fiber and sodium) of products with extended nutritional information versus other products (without nutritional label or with a basic one) for 8 categories of products. Statistical comparisons show that in most of the cases, nutrient contents of the two sub-populations are not significantly different (for 47 tests out of 56 performed). Nevertheless, we note that nutritional compositions differ significantly according to the level of detail of the nutritional label for cookies and chocolate filled wafers:

- cookies with extended nutritional information have protein, fat and fiber contents significantly higher and carbohydrates contents significantly lower;
- chocolate filled wafers with extended nutritional information have carbohydrates and sugars contents significantly lower and fiber contents significantly higher.

Table 2: Food composition of 8 categories of biscuits and pastries according to the type of nutrition labeling on the packaging

Category	Sub-sample	Protein			Carbohydrates			Sugars			Fat			Saturated fat			Fiber			Sodium		
		n	Mean content (g/100g)	sd	n	Mean content (g/100g)	sd	n	Mean content (g/100g)	sd	n	Mean content (g/100g)	sd	n	Mean content (g/100g)	sd	n	Mean content (g/100g)	sd	n	Mean content (g/100g)	sd
Butter biscuits with chocolate tablet	A	23	6.43	0.50	23	64.06	3.13	23	38.76	2.84	23	24.02	2.23	23	14.67	1.31	23	2.84	1.08	23	0.24	0.08
	B	24	6.38	0.79	24	65.99	3.07	13	37.95	4.53	24	23.83	2.41	13	15.11	2.51	13	2.17	0.97	13	0.18	0.06
Other chocolate coated biscuits	A	12	6.84	0.71	12	61.13 *	2.82	12	38.15	4.24	12	25.95	2.14	12	15.39 *	1.76	12	2.56	0.55	12	0.20	0.03
	B	12	6.89	0.66	12	63.36 *	2.83	10	37.31	5.19	12	22.55	3.41	10	12.66 *	1.48	10	2.58	1.57	10	0.22	0.09
Chocolate coated biscuits (butter biscuits)	A	37	6.84	0.53	37	64.10	2.72	37	28.52	3.84	37	23.10	2.48	37	13.10	1.41	37	2.91	1.52	37	0.22	0.08
	B	40	6.66	0.86	40	64.45	3.84	10	30.22	3.22	40	24.53	3.31	10	13.47	2.49	10	2.44	1.09	10	0.22	0.08
Fruit coated biscuits	A	28	4.81	0.32	28	72.50	2.43	28	42.11	9.81	28	8.83	5.25	28	4.05	3.66	28	1.85	0.57	28	0.19	0.15
	B	47	4.75	0.49	47	73.66	2.64	17	42.10	14.84	47	10.07	5.61	17	5.55	4.19	17	1.66	1.35	17	0.13	0.08
Shortbread biscuits	A	20	6.45	0.87	20	63.88	9.92	20	25.74	2.84	20	23.15	4.54	20	14.20	2.86	20	2.01	0.99	20	0.30	0.15
	B	72	6.26	0.67	72	66.56	5.05	18	24.75	4.61	72	22.05	5.15	18	11.69	3.18	18	2.19	1.00	18	0.31	0.16
Cookies	A	43	6.52 *	0.70	43	59.90 *	3.20	43	30.98	3.17	43	26.71 *	2.25	43	13.16	1.56	43	3.20 *	0.78	43	0.43	0.15
	B	43	6.22 *	0.54	43	62.20 *	3.51	14	32.32	3.81	43	25.22 *	2.35	14	12.87	2.29	14	2.00 *	0.91	14	0.38	0.19
Wafers filled with chocolate/hazelnut	A	15	6.53	1.25	15	55.23 *	5.02	15	34.68 *	4.74	15	31.87	4.32	15	24.10	4.23	15	4.07 *	1.15	15	0.11	0.05
	B	34	6.04	1.03	34	60.89 *	6.01	11	43.04 *	6.85	34	29.45	4.97	11	19.11	4.38	11	2.24 *	1.41	10	0.07	0.03
Butter biscuits	A	11	8.01	0.98	11	70.39	4.09	11	22.43	3.22	11	14.52	1.71	11	8.64	0.92	11	3.57	2.19	11	0.38	0.11
	B	19	7.45	0.83	19	74.68	3.93	11	23.80	2.53	19	13.18	2.70	11	7.64	2.12	11	1.69	1.15	11	0.40	0.08

\* mean nutrient contents are significantly different in the two sub-samples (adjusted  $\alpha=0.7\%$ )

Sub-sample A: products with extended nutritional information  
Sub-sample B: products with basic or no nutrition information  
n: number of observations ; sd : standard deviation

Third, products with extended nutritional label appear to be more expensive for 8 categories out of 10. Nevertheless, statistical tests show that those differences in prices are significant only for 2 categories of products: coated sponge cakes filled with jam and wafers filled with chocolate/hazelnut (table 3). Further investigation will account for products promoted as traditional recipes which are generally more expensive and do not have systematically a nutritional label.

## CONCLUSIONS AND PERSPECTIVES

The presence of an extended nutritional label on the packages is not correlated with a better nutritional quality or higher prices for biscuits and pastries. This work is a preliminary one and should be extended to other food groups. Moreover, nutritional label is more and more developed on packages, including those of low-price products. So it would be interesting to repeat this survey over time.

The final aim is to provide useful insights to discuss the opportunity of voluntary/mandatory nutrition labeling.

Figure 1: Nutrition labeling in biscuits/pastries (no nutrition labeling: n=222; group 1: n=721; group 1 + minerals or vitamins: n=15; group 2: n=372; group 2 + minerals or vitamins: n=97)

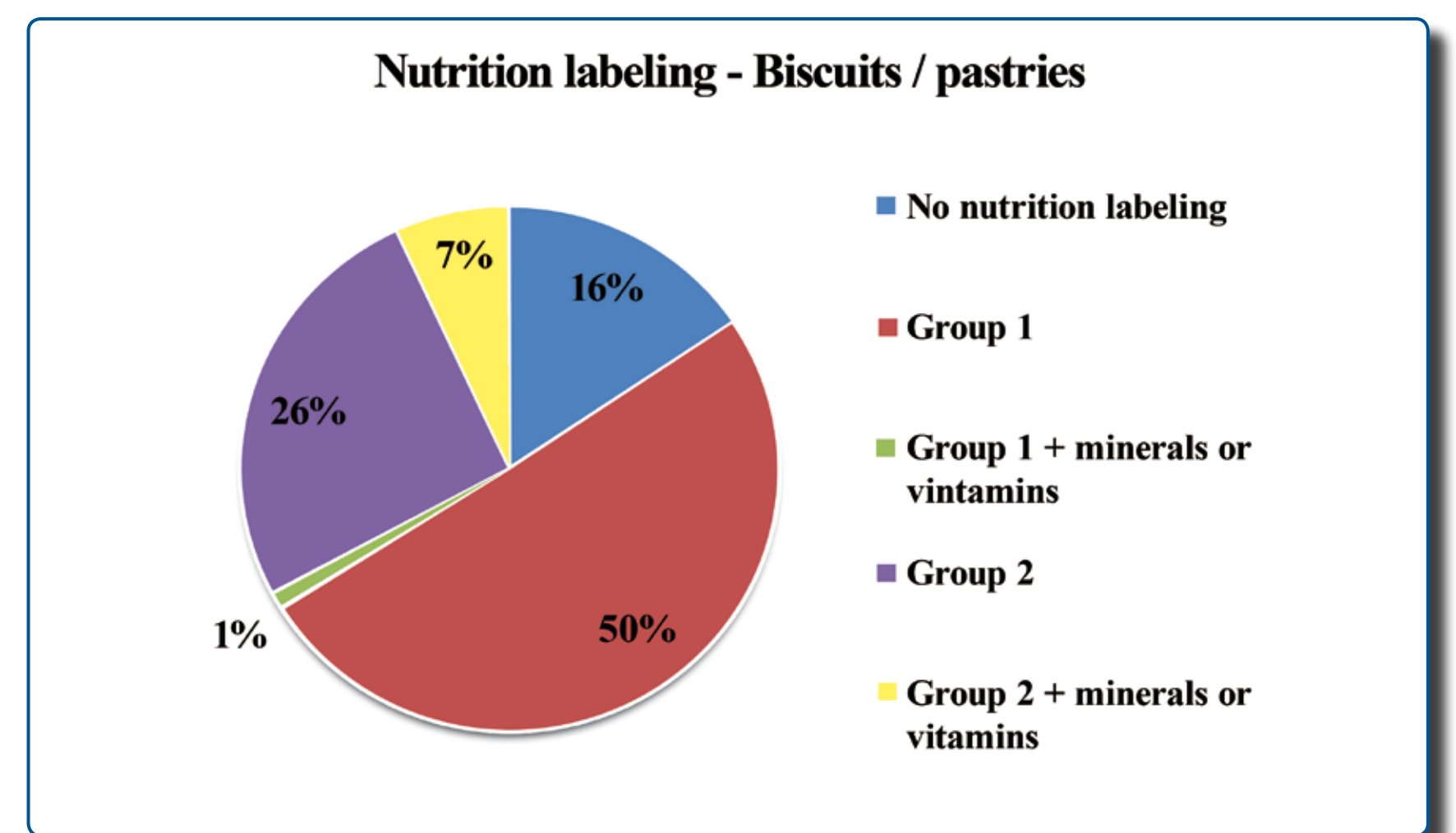


Table 3: Mean prices of 10 categories of biscuits and pastries according to the type of nutrition labeling on the packaging

Category	Sub-sample	Number of observations	Mean price (€/kg)	Standard deviation
Butter biscuits with chocolate tablet	A	20	6.48	1.68
	B	32	7.19	3.99
Chocolate coated biscuits (butter biscuits)	A	27	6.41	3.44
	B	26	6.02	4.15
Sandwich biscuits filled with chocolate	A	29	3.42	1.53
	B	28	3.09	1.78
Fruit coated biscuits	A	23	5.65	1.90
	B	42	5.10	2.58
Shortbread biscuits	A	18	6.33	2.78
	B	77	6.61	4.23
Cookies	A	34	4.99	2.23
	B	42	4.49	2.06
Coated sponge cake filled with jam	A	10	6.54*	2.47
	B	24	4.80*	1.80
Wafers filled with chocolate/hazelnut	A	13	7.27*	2.59
	B	27	5.59*	3.85
Madeleines	A	10	4.63	1.77
	B	36	3.73	1.88
Marble cakes	A	11	5.89	2.80
	B	37	5.51	3.32

\* mean prices are significantly different in the two sub-samples ( $\alpha=5\%$ )

Sub-sample A: products with extended nutritional information  
Sub-sample B: products with basic or no nutrition information