Food insecurity, health restriction and poverty among French adults: Implications for public policies

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Introduction

Malnutrition or undernutrition are rare in France. However, INCA2 data show that in 2007, 11% of adults faced food insecurity in their households. Understanding food insecurity in the economic and social environment of French society is complex. Although food is widely available in stores and is relatively low priced by world and historical standards, individuals report being constrained in food quantity or food quality and/or having anxiety that their food supply would not last. From a social perspective, food insecurity can result in poorer health outcomes and reduced labor or school performance. The relationship between food insecurity, health and poverty is not straightforward: contrasted evidence is provided. For example, Dunifon and Kowaleski-Jones (2001) and Cook et al. (2004) find that food insecurity is associated with health difficulties (among children). Several works point out the link with obesity risk (Adams et al. 2003). Poverty defined as low income may not coincidate with those results. Alaimo et al. 2002 show that family food insufficiency but not low family income is positively associated with dysthymia and suicide symptoms in adolescents. Identifying effective policies that can reduce food insecurity in France and address the food needs of the vulnerable groups of population is fundamental.

This paper deals with food insecurity, its measurement and its determinants, then its relation with other restrictions in consumption such as health restrictions and with poverty. Recent concern for this phenomenon has led several French surveys to include an index developed first in USA and Canada. This is a first attempt to evaluate the extent and the determinants of French food insecurity at the national level in several dimensions: food restriction, protein restriction, food anxiety. From a biological concept of hunger as lack of available calories or proteins, economists have turned to issues of household access to food and the ability of consumers to have and allocate sufficient resources for food. This change in focus moves from supply to demand orientation. Most papers evidence close ties between poverty and available food resources and relates subjective measures of perceived food needs to the food insecurity measure.

Our first issue is to address the relevance of this concept in France, which is rather new among north American results and few European data. We focus here on food insecurity at the level of the household, though an extensive use has been made at the countries or world level. This concept was developed when poverty and undernutrition were well-diffused indicators in world statistics and source of food policies. Is there a real contribution of this concept? From a nutritional standpoint, Bhattacharya, Currie and Haider () find that, among adults, food insecurity and poverty are predictive of poor nutrition. However, this is not the case on the sample of preschool children, where poverty but *not* food insecurity is associated with nutritional outcomes. Hence, connections between food insecurity, poverty and nutritional outcomes should not be considered as systematic. This was suggested also by Olson's work (1999) which found, independently of socioeconomic status and poverty, relationship between food insecurity and nutrition outcomes. In the French case with INCA2 data, Darmon et al. (2010) found an association with consumption behavior (higher frequency of snacks, higher time spent on TV, higher frequency of smokers) and with nutritional outcomes: an inferior consumption of fruit, vegetables, fish and sweet products, compared with individuals which are food secure, even when poor individuals are isolated among the food secure sample. So, food insecurity is associated with nutritional outcomes which are different from those associated with poverty. Another health issue deals with the connection between food insecurity and obesity: in some works, it is not evidenced for children (Gundersen et al. 2009; Alaimo et al. 2001); for Canadian women an association is found

(Lyons et al. 2007); Darmon et al. evidence a stronger proportion of obese among food insecure adults in France.

Our second issue is to test the relevance of food insecurity data in France in linking the nutrition and economic debate to examine food policies and poverty interventions. Food insecurity concept has been widely used since its introduction in US surveys in 1995 to design food policies and in particular food stamps or the national lunch program. Several papers examine the effectiveness of such a policy (Kowalevski-Jones and Dunifon, Borjas 2002, Winship and Jencks 2002, Gunderson and Oliveira 2004, Jensen 2004). Some critics have been made (Dinour et al. 2007). Should such a policy be advocated in France on the basis of food insecurity indicators? Though some limited attempts have been tested through the allocation of foodstamps dedicated to fruit and vegetables (Bihan et al., 2010), it seems that there is no consensus on this type of program at the moment, since this issue has not been included in the latest French food program.

The concept and measurement of food insecurity

The FAO World Food summit in 1996 provided an official definition : "Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for a healthy and active life". Questionnaires were designed to collect data mainly in North American countries (for a review of literature, see Radimer's work, 2002). Bickel (2000) designed the US Household Food Security Module (HFSM). It is a list of 18 items addressing food insecurity for adults and for children in an household. It is based on subjective declaration. In the literature, most papers use the Bickel formulation and choose as explained variable one of the items. As such they do not always choose the same definition. Winship and Jencks (2002) prefer to use the 18 items as a cumulative list of "food-related problems". However, the indicator which is the most used is the "USDA Food Sufficiency Indicator" (USDA FSI). To register the perceiption of food insecurity, it is based on a single question of four modalities: "among the four foolowing situations, which corresponds the best to the current situation in your household ?
   a- You can eat all the foods you want
   b- You have enough to eat but not the variety of foods wanted
   c- Sometimes you do not have enough to eat
   d- Frequently you do not have enough to eat.

These four modalities may be analised separately or together. Grouping of b to d modalities gives a rather good estimation of food insecurity, compared to the development of a more complete questionnaire (Radimer 2002). These works allow to collect regularly data and measure food insecurity. With the HFSM tool, food insecurity is estimated to 9.2% in Canada in 2004 and to 12.6% in the US in 2004-2006.

In France, food insecurity is not a well developed concept and is sometimes mistakenly interpreted as absence of sanitarily safe food. Though some works indicate that food insecure population is not limited to food aid beneficiaries (Kirkpatrick and Karasuk 2009), the vision underlying the first French public food programs has been reduced to that population. The 2003 "Food and Insertion Program" relies only on structures involved in giving food aid. The first surveys designed to register food vulnerability in France by the Health and Social Affairs Ministry in 2004-2005 have focused on food aid beneficiaries (ABENA) and food aid structures (E3A). Importantly, these surveys showed that food aid represented a major part of food intakes for those beneficiaries, and not just some side consumption. But they did not reflect all the situations of food insecurity and could not allow estimating the prevalence of food insecurity in France.

This has been made possible with the introduction of some items concerning food insecurity in the nationally representative survey INCA2. It has been carried out by AFSSA (French Agency for Food Safety) in 2006-2007.

Prevalence of food insecurity and food deprivation
In this survey, several questions concern food problems as perceived by the individual. Food insecurity has been estimated through the 4 modalities question of the USDA FSI presented above. When respondents declared insecurity situations (b to d answers), a supplementary question asked them on the motives (diet, lack of time, lack of money, transport problems, limited supply, lack of space or equipment). Persons answering yes to lack of money when declaring b to d situations have been considered as "food insecure for financial reasons". Two more questions deal with associated food problems. One registers "anxiety to be short of food" and another "having difficulties for financial reasons to eat meat, poultry or fish every 2 days". This set of questions relates to what we will call "food deprivation" indicators. Note that this type of questionnaire may underestimate the prevalence of food problems. First, the questions are addressed to one only person in the household and collect a subjective declaration which may vary from member to member. We know that among the household, adults and in particular women reduce first qualitatively, then quantitatively, their own food consumption to protect their children from any restriction (Tarasuk 2001, Dowler 1998). Moreover, INCA2 collects this subjective information on a face-to-face basis, and some persons may have shame to mention food problems. While the necessity to fill a 7-day food intake diary may discourage possible food insecure persons (illiterate, diificulties in writing in French) to participate to the survey.

Darmon et al. (2010) give a first analysis of these food problems (or food deprivation indicators) in INCA2 on the 2624 adults (18-79 years) participating to the survey. On the whole, 16.9% of adults declared not having enough to eat (sometimes or frequently) or having enough to eat but not the variety of foods wanted. 12.2% declared so because of financial reasons. This is our definition of food insecurity. To the additional questions, 7.3% of adults declared they had anxiety to lack food, even from time to time. The proportion of adults which declared that the financial situation of their household prevented them to eat meat, poultry or fish every 2 days represented 3.6%. This is the animal protein restriction. The magnitude of these food problems can be compared with other studies. Food insecurity share in France is close to the HFSM indicator in USA (12.6%).
As in other nutritional surveys, some individuals reported intakes inferior to standard physiological needs. Considering the normo-reporting individuals, we found in table 1 a prevalence rate of 14.89%. Food insecurity indicator, as revealed by this study, does not evidence severe deprivation since quantities are seldom affected by financial restrictions. However, it may be interpreted as a correlate of consumption restrictions in a qualitative way.

Table 1: Food, Health and Income deprivation indicators

Food, Health and Income Deprivations
**in France - INCA2 - 2006/07**
n=1917 adults (normo-reporting)

	n	Weighted %
1- Food anxiety	146	6.79
2- Animal protein restriction (Meat/poultry/fish)	55	2.66
3- Food insecurity (FSI)	239	14.89
-Qualitative : Enough to eat but not the choice wanted	*227*	
-Quantitative : Not enough to eat, sometimes or frequently	*12*	
Any form of FOOD DEPRIVATION (1-3)	327	15.69
RESTRICTION IN HEALTH DEMAND	176	8.62
MONETARY POVERTY (Household income per uc < 908€/month)	702	37.02

Food in a multideprivation framework

One major point is the coincidence of food insecurity with poverty. Poverty is known to require a multidimension framework (Sen 1984). Our framework of analysis is multi-deprivation and poverty, as measured by monetary income, may be considered as a deprivation in income. Food insecurity for financial reasons and monetary poverty do not affect exactly the same population. Restrictions in food demand can also be compared to restrictions in health demand.

Graph 1: Food deprivation indicators and poverty

Distribution of Food deprived households by Poverty level
in France - INCA2 - 2006/07
n=1917 adults (normo-reporting)

Legend:
- INC > 2xPoverty Level
- Poverty Level < INC < 2xPoverty Level
- INC < Poverty Level
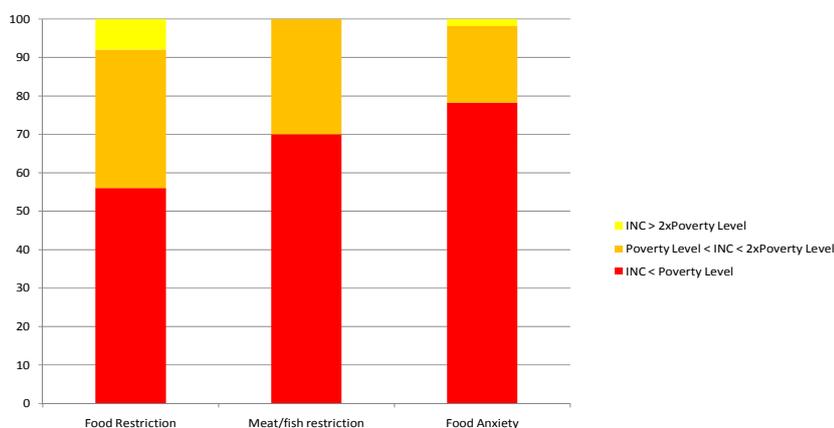
Actually, food anxiety appears as the more coincident indicator with monetary poverty.

Modeling food insecurity and deprivations

Here we will study different forms of food deprivation: food insecurity, animal proteins restriction, food anxiety. We will also combine several dimensions of deprivations, in food and health demand, with poverty indicators.

In a first step, we consider here all 3 indicators of food deprivation, food insecurity (FSI) being one of them. They can be modeled as 4 discrete states for the household food status, defined and indexed by j = 0,1,2,3. These states are discrete and unordered. The probability for each individual to be in a determinate household food status, yi, is modeled using an unordered logistic model based on the following equation:

For each individual *i*,

yi = j means that the individual *i* is in a household of food status *j*

where i = 1,…n (number of individuals)
and j= 0,…k number of food states

The logit model consists in estimating the coefficients of the equation :

$$y^j = \beta_j X + \varepsilon_j,$$

where y^j is a latent variable, unobserved and continuous, such as

$$y_i = j \text{ if } y_i^j = \beta_j X_i + \varepsilon_j >$$

X are the individual characteristics

β_j is the coefficients vector

ϵ_j is the error term, supposedly iid $\forall$ i, j(j $\neq$ 0, j = 0 being the reference).

A logit regression is defined by :

$$Proba(y_i = j \; /X_i) = Proba(\beta_j X_i + \epsilon_j > 0) = F(-\beta_j X_i),$$

F being the distribution of the ϵ_j

and $F(-\beta_j X_i) = \dfrac{\exp^{\beta_j X_i}}{1 + \sum_{m=1}^{m=k} \exp^{\beta_m X_i}}$

The marginal effect of variables is estimated using the function mfx de stata, by numeric methods.

Let $\bar{x}^t$ be the t ieme dimension of the mean of the X_i):

and the marginal effect is $\dfrac{\partial \log (P_{j)}}{\partial \log (\bar{x}^t)}$

It is interpreted as the percentage of variation of the probability of a state *j* when the value $\bar{x}^t$ varies of 1%.

In the same scope, we model the probability to be affected by any one indicator of food deprivation with a multinomial logit.

In a second step, we will analyze food in relation with other dimensions of deprivation (in health, and in monetary income). We can also consider the diverse indicators of deprivation as

cumulative items representing a multi-deprivation gradient. For this, we will model an ordered logit.

Data and Methodology

The sample includes 1917 adults (18 to 79 years) which declare acceptable intakes from a physiological standpoint. INCA2 survey has also collected information on a sample of children, which are not considered in this study.

Dependent variables

Food deprivation was specified in four states: non food deprived, food insecure (in quantity or quality), restrictions in animal proteins (meat/poultry/fish), food anxiety. Health deprivation corresponds to restrictions in health expenditures during the last 12 months. Income deprivation corresponds to being in a household under the poverty level (Statistics in table 1).

Explanatory variables

Socioeconomic characteristics (Xi) are represented by individual variables (age, sex, education, country of birth, marital status) and by variables at the household level (socioeconomic status of the family head, adjusted household income per unit of consumption).

Concerning *income*, 19% of individuals did not declare this variable. A specific procedure was applied to impute values to undeclared information. We used the Kohonen self-organizing algorithm to deal with data which contain missing values and to estimate them (Cottrell et al., 2008). Household income information is reported by levels. We converted the categorical income variable to a continuous measure by using the range midpoints as representative of household income, then applied the modified Oxford equivalence scale to obtain a measure of income per unit of consumption. The poverty level, according to Eurostat definition, is fixed at 60% of median income. It represented 908€/month in 2007 (Insee). Explanatory variables include home characteristics as indicators for living conditions variables with especial reference to food patterns : home property, existence of a garden, cooking equipment (freezer, oven, microoven).

Health indicators are BMI, smoking status, sedentarity indicators (daily time in front of TV, daily time in front of computer, daily time spent sitting).

Meals patterns are frequency of consumption between meals, consumption of food or drinks in vending-machines, frequency of meals at fast-foods.

Food purchase patterns represents positive answers if considered important for choice in food purchasing the following items: interest for food, reading of labels, origin, price, quality signals, sanitary control, habit, label, aspect and presentation, taste, in front of the pack information, nutritional content.

Information on food budget is not directly available in the survey. We realized an important work of imputation of prices so we could obtain, by applying unitary prices to the food quantities declared in the survey, imputed food budget (or an estimation of the value corresponding to food intakes of the individual). It is expressed in euros per day. This estimation is based on retail prices such as declared in 2007 TNS purchase survey. One limit of this imputation method is that food away from home will be priced at food at home value. Finally we introduced a dummy variable indicating whether the individual experienced restrictions in health demand. Basic statistics are available upon request.

Results

Determinants of food deprivation
Food deprivation is experienced under 3 forms. In order of occurrence, we find food insecurity (14.9%), anxiety to lack food (6.8%), restrictions in meat or fish consumption (2.7%). Table 2 shows that these forms associate with different characteristics and consumption behavior.
The probability to experience food insecurity is associated with low SES variables but also to medium level occupation.
Food insecurity is affected by numerous variables. It registers a positive impact of being in a middle age category, and the influence of every SES variable (education, occupation, household income). Let us note that, though associated with a low SES through a blue-collar or low level occupation, it is **also** positively associated with a middle level and white collar, inactive. This probability is negatively influenced by an education level reaching the baccalaureate, a monetary income over the poverty level, and a owner status. Health variables have an impact since a low BMI lowers the probability while being a current smoker increases the probability of experiencing food restriction. Among food budget variables, high expenditures in fruit, vegetables, fish, are associated to a food security situation. Conversely, high expenditure in meat are associated with food insecurity, meaning that meat restriction is more difficult to achieve than in other food categories.
The probability to experience restrictions in animal proteins
It is affected positively by marital status (being in couple) , absence of freezer, and currently smoking. It is associated with a medium expenditure in soups and in meat, and a low level of fresh vegetables and fish expenditures. Being in the highest category of income is negatively associated.
The probability to experience food anxiety
Being a woman, not consuming from vending machines, the amount of time watching TV, having high expenditures in meat are associated with food anxiety. Anxiety is discouraged by 1st grade of university, income over the poverty level, owner status. Are negatively associated high expenditures in soft drinks and restriction in health expenditures. Note that SES family head, region or area have no effect.

Has food deprivation the same determinants than other social or economic dimensions of deprivation?
The probability to experience health restriction is associated to being a woman, living alone, not being in the last income tertile . As a determinant, restriction in health is associated to every form of food deprivation and poverty.
Finally there are common determinants between food deprivation and poverty, mainly SES variables such as education and occupation. In terms of budget, monetary poverty and food deprivation are associated with low budgets of fresh fruit and fresh vegetables, as well as meat. But some other determinants characterize each phenomena: food or health restriction are associated with age, marital status, BMI, being a smoker. Only in the case of food deprivation appears also fish budget. Being born out of France, consumption in fast food is a decisive factor for poverty not for other dimensions. Note that health variables (BMI, smoking status) are not correlated to poverty.

Targeting food insecurity or targeting multi-deprivation (food, health, income)?

We study now the coincidence of deprivations in food, in health, and in income. We estimate an ordered logistic regression for 5 states of deprivation : the 3 states of food deprivation

analysed above, health expenditure restriction and monetary poverty (under the poverty level). We calculated the marginal effects of the associated factors for the extreme cases of no deprivation and the simultaneity of the 5 deprivation states (graph 2). This latter situation can be seen as extreme deprivation. We observe that the main factors strongly associated to the probabilities of deprivation are kitchen equipment, home ownership, meat and vegetable budget (to a lesser extent fruit budget), being in couple, the occupational situation, the education level, some food patterns such as eating between meals, regions and rural area.

Conclusion and policy implications
Most prevalent indicators of food deprivation for French adults are food insecurity (14.9%), anxiety to lack food (6.8%), restrictions in animal proteins consumption (2.7%). The main variables explaining food insecurity are not very different than for restrictions in health demand (education, home equipment) though individuals differ in purchase behavior. Comparing with the determinants of monetary poverty which include nationality, age, and socioeconomic status, food or health restriction appear less associated with sociodemographic characteristics. Our results show that the probability to experience food insecurity is associated with low SES variables but also to medium level occupation. Thus, food insecurity and food deprivation indicators appear to identify another dimension of economic and social deprivation which is not relevantly accounted for by monetary poverty. Hence public interventions cannot rely on traditional income policies to reach food insecure households. They should consider that, beyond individual characteristics of low SES (education, income, occupation), living conditions and home equipment play an important role as well as purchasing patterns. This supports the relevance of improving housing conditions and the interest of regulating supply to improve purchasing patterns.

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T2-Probability to experience household food insecurity and other forms of deprivation - logits

	Food insecurity			Food anxiety			Health restriction			Monetary poverty		
	Coef.	P>z		Coef.	P>z		Coef.	P>z		Coef.	P>z	
Age *(ref 18-36)*												
37- 47	0.679	0.004	***	0.159	0.565		0.111	0.659		0.191	0.259	
48-59	0.751	0.008	***	-0.080	0.817		0.425	0.152		-0.093	0.649	
60-79	0.679	0.114		-0.799	0.158		-0.077	0.871		-0.242	0.405	
Female *(ref male)*	0.244	0.183		0.717	0.003	***	0.595	0.003	***	0.198	0.106	
Diploma *(réf: max cep/cap)*												
bac or equivalent	-0.395	0.087	*	-0.279	0.321		-0.292	0.235		-0.274	0.061	*
university (1st level)	-0.367	0.198		-0.645	0.096	*	-0.030	0.918		-0.496	0.008	***
university upper level or grande ecole	-0.412	0.167		-0.289	0.453		-0.553	0.084	*	-0.363	0.065	*
Country of birth: out of France *(réf: F*	0.022	0.941		0.128	0.711		-0.050	0.869		0.579	0.005	***
Marital status: en couple *(réf: seul)*	0.058	0.794		-0.316	0.226		-0.472	0.038	**	-0.389	0.013	**
SES family head (ref : self-employed inc. retired)												
prof. and managers (higher)	0.627	0.195		-0.235	0.698		-0.387	0.377		-1.254	0.000	***
prof. and managers (lower) and manual	1.008	0.01	***	0.504	0.241		-0.165	0.635		-0.187	0.371	
other prof. and managers (lower)	0.647	0.162		-0.288	0.607		-0.197	0.655		0.481	0.058	*
employees	0.912	0.041	**	-0.436	0.425		-0.691	0.106		-0.514	0.044	**
unpaid worker or inactive	0.687	0.101		-0.012	0.979		-0.245	0.509		-0.025	0.915	
retired	0.797	0.101		0.459	0.373		-0.534	0.247		1.892	0.000	***
Household inc per UC *(ref:<=908)* :												
908< RUC <=1800	-0.285	0.113		-0.727	0.002	***	-0.165	0.410				
RUC>1800	-0.912	0.003	***	-1.124	0.007	***	-0.713	0.035	**			
Housing												
owner status	-0.711	0.001	***	-0.606	0.025	**	-0.469	0.038	**	-0.335	0.016	**
no garden	-0.210	0.296		-0.101	0.690		-0.294	0.183		-0.319	0.026	**
no freezer	-0.210	0.431		0.405	0.247		-0.331	0.227		-0.567	0.006	***
no oven	-0.311	0.445		-0.272	0.553		-0.027	0.950		-0.399	0.235	
no microoven	-0.057	0.811		0.154	0.623		-0.518	0.029	**	-0.041	0.804	
Region (ref: Parisian region)												
North-West	0.436	0.196		-0.114	0.785		-0.621	0.074	*	0.438	0.060	*
East	0.326	0.367		0.578	0.165		-0.509	0.180		0.671	0.007	***
West	0.541	0.114		0.269	0.529		-0.323	0.358		0.655	0.006	***
Center	0.170	0.654		0.036	0.937		-0.643	0.104		0.741	0.003	***
Center-East	0.496	0.149		0.362	0.381		-0.140	0.678		0.639	0.007	***
South-West	-0.033	0.934		-0.458	0.382		0.059	0.873		0.613	0.017	**
South-East	0.574	0.079	*	0.151	0.712		-0.090	0.779		0.446	0.054	*
Area (ref: >100000 inhab)												
rural	0.115	0.633		-0.266	0.410		-0.088	0.749		0.351	0.027	**
2000 to 1000000inhab	-0.082	0.688		-0.248	0.317		-0.220	0.323		0.029	0.839	
Health												
BMI *(ref: normal)*												
leanness	-1.008	0.032	**	0.259	0.519		-0.069	0.856		0.236	0.398	
overweight	0.001	0.997		0.266	0.283		-0.224	0.331		-0.079	0.548	
Obese	-0.045	0.866		-0.020	0.954		0.579	0.031	**	0.292	0.116	

	Food insecurity			Food anxiety			Health restriction			Monetary poverty		
	Coef.	P>z		Coef.	P>z		Coef.	P>z		Coef.	P>z	
Smoking status												
Current smoker	0.356	0.047	**	-0.075	0.736		0.519	0.007	***	-0.161	0.228	
Time watching TV (mn/day)	0.073	0.457		0.228	0.058	*	0.028	0.787		0.070	0.292	
Time in front of computer over the med	0.062	0.729		-0.259	0.247		0.439	0.024	**	-0.477	0.000	***
Time sitting (mn/day)	-0.102	0.315		-0.021	0.872		-0.103	0.355		-0.184	0.009	***
Food patterns												
consumption between meals (ref: once	-0.144	0.392		-0.114	0.591		-0.151	0.409		-0.309	0.007	***
Food or drink purchase in vending mac	0.133	0.367		-0.358	0.019	**	0.135	0.385		-0.096	0.361	
Meal consumption in fast foods	-0.173	0.171		0.090	0.563		-0.020	0.885		0.110	0.230	
Interest for food	-0.150	0.17		-0.055	0.686		-0.034	0.768		0.110	0.143	
Reading labels	-0.074	0.466		-0.124	0.322		-0.111	0.312		-0.129	0.068	*
Purchase criteria (ref: important criteria)												
origin/provenance not important	0.025	0.897		0.126	0.614		-0.402	0.078	*	-0.059	0.656	
price not important	0.824	0	***	0.430	0.089	*	0.547	0.016	**	0.411	0.001	***
quality signals not important	0.112	0.593		0.304	0.249		-0.280	0.246		-0.328	0.019	**
safety control indication not important	0.032	0.915		-0.216	0.584		-0.345	0.340		0.415	0.032	**
habit not important	-0.407	0.024	**	0.238	0.274		-0.429	0.029	**	0.141	0.250	
label not important	-0.410	0.05	**	0.300	0.197		0.036	0.866		-0.014	0.915	
appearance and presentation not impor	-0.495	0.093	*	0.637	0.029	**	-0.205	0.500		-0.426	0.023	**
taste not important	-0.167	0.33		0.224	0.280		-0.166	0.373		-0.031	0.788	
on the pack information not important	0.279	0.217		-0.243	0.429		0.179	0.479		0.061	0.701	
nutritional composition not important	-0.211	0.468		0.595	0.065	*	0.287	0.331		0.273	0.150	
Choice between 2 products on health c	0.077	0.327		0.082	0.394		0.177	0.038	**	0.132	0.013	**
Food budget :												
soups (ref: lowest tertile of consumption)												
2nd tertile	0.129	0.566		0.230	0.393		0.125	0.603		0.108	0.489	
3rd tertile	0.307	0.118		0.091	0.715		-0.294	0.172		0.343	0.012	**
soft drinks (continuous variable)	-0.287	0.628		-1.598	0.043	**	0.374	0.501		-0.817	0.085	*
fruit (ref: lowest tertile of consumption)												
2nd tertile	-0.237	0.244		-0.331	0.199		-0.537	0.021	**	-0.203	0.153	
3rd tertile	-0.484	0.052	*	-0.309	0.318		-0.227	0.393		-0.655	0.000	***
vegetables (continuous variable)	-0.684	0.078	*	-0.617	0.221		-0.905	0.023	**	-0.591	0.028	**
fish (ref: lowest tertile of consumption)												
2nd tertile	-0.095	0.626		-0.093	0.702		-0.220	0.325		0.066	0.632	
3rd tertile	-0.384	0.083	*	0.037	0.891		0.323	0.169		-0.150	0.315	
Meat (ref: lowest tertile of consumption)												
2nd tertile	0.326	0.115		0.295	0.253		-0.172	0.453		-0.174	0.213	
3rd tertile	1.036	0	***	0.995	0.002	***	0.502	0.073	*	-0.629	0.002	***
restriction in demand for health	-1.663	0	***	-1.495	0.000	***				-0.342	0.074	*
constant	1.655	0.266		1.110	0.528		-0.781	0.598		2.304	0.031	**
*** significativity at the 99% level, ** 95% level, * 90% level												

Graph 2: Determinants of multi-deprivation : food, health, income

Multi-deprivation: Food insecurity, Health restriction and Poverty
Impact of Determinants : no deprivation, 3 dimensions
(Marginal effects calculated from an ordered logit)