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## **Associations of socioeconomic factors with inadequate dietary intake in food aid users in France (The ABENA study 2004-2005)**

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## ABSTRACT

**Background/Objectives:** Few studies in Europe have examined the relationship of sociodemographic and economic factors with diet in deprived populations. We analysed the association between socioeconomic characteristics and consumption of different food groups in food aid users.

**Subjects/Methods:** A cross-sectional study was conducted among food aid users in four urban French zones (n=1,664). Associations of sociodemographic and economic factors and food aid use with frequency of consumption of the main food groups were tested using multivariate logistic regression models accounting for sampling weights.

**Results:** Both migrant status and consumption of fewer than 3 daily meals were associated with risk of low frequency of starchy food consumption (<3 times per day). Migrant status was also associated with low frequency of consumption of fruits and vegetables (<3.5 times per day) and dairy products (<2 times per day). Subjects with severe food insufficiency were more likely to be low consumers of fruits and vegetables, meat, seafood and eggs (<1 time per day), and dairy products. A low monthly food budget, temporary housing in a shelter and no source of household income were all associated with risk of low frequency of seafood consumption (< 2 times per week). Finally, duration of food aid use, type of food aid distribution and perception of poor health status were associated with low consumption of meat, seafood and eggs.

**Conclusion:** Economic level and other social characteristics were associated with an unhealthy diet within this deprived French population.

**KEY WORDS:** food aid, food supply, dietary behaviour, socioeconomic discrepancies, deprived population

## INTRODUCTION

Diet is influenced by sociodemographic, economic and cultural factors. It is well documented that low socioeconomic status, a poor education level and unemployment are associated with an unhealthier diet than that found for populations with higher economic status (Darmon & Drewnowski, 2008; Irala-Estevez *et al.*, 2000; Lallukka *et al.*, 2007). In addition, dietary patterns vary according to demographic profiles, including gender, marital status and acculturation (Neuhouser *et al.*, 2004; Sanchez-Villegas *et al.*, 2003).

Associations between diet and the above determinants have been studied mainly within general populations or in deprived populations. Most available studies in deprived populations were conducted among participants in food assistance programs in the USA and Canada (Bhargava, 2004; Rose, 1999). They showed a gradient of unhealthy dietary patterns in parallel with lower socioeconomic status and increasing food insufficiency. Food insufficiency, defined as "an inadequate amount of food intake due to lack of resources" (Alaimo *et al.*, 1998), forms a part of a causal chain that begins with economic considerations and ends with nutritional outcome. As a consequence, poor nutritional status, i.e. insufficient quality and frequency of food intake (Dixon *et al.*, 2001; Sharkey, 2008), can lead to poor health status (Siefert *et al.*, 2004; Vozoris & Tarasuk, 2003).

Although food insufficiency has become a matter of increasing concern in Europe over the past few decades, very few studies on this continent have assessed dietary intake and its determinants in deprived populations. In France, the French Nutrition and Health Programme ("Programme National Nutrition Santé", PNNS implemented in 2001) has incorporated a national programme of diet and social integration that was begun in 2003. One of its priorities was to improve the nutritional status of disadvantaged populations (Herberg *et al.*, 2008). In this framework, the "Diet and nutritional status of beneficiaries of food aid" study ("Alimentation et état nutritionnel des Bénéficiaires de l'Aide Alimentaire", ABENA), conducted in 2004-2005, provided evidence of unhealthy diet and poor health profiles and highlighted the diversity of precarious situations and sociodemographic heterogeneity among recipients of various types of food aid (Bellin-Lestienne *et al.*, 2006). French food aid

organisations are charities engaged in directly distributing food to deprived populations; they target potential beneficiaries according to restrictive economic criteria. The food aid structure includes centres which serve meals, others that distribute food parcels (food is prepared beforehand) and social grocery stores (offering some choice of low-cost foods).

Sociodemographic and/or economic high-risk profiles resulting in unhealthy diet might be emerging within this deprived European population. The aim of the present analysis was to elucidate, in food aid users participating in the ABENA study, possible associations of sociodemographic characteristics, economic factors and food insufficiency levels with inadequate dietary intake.

## METHODS

**Design and sampling.** The ABENA study was a cross-sectional study conducted from November 2004 to May 2005 among individuals frequenting food aid organisations in four urban French zones (Paris, Seine-St-Denis, Dijon and Marseille). A two-stage cluster sampling method was used to select individuals. For the first stage, 12 food aid centres in each zone were randomly selected among the one-hundred-forty centres which had been previously identified within the four urban areas (Darmon *et al.*, 2008). Then, subjects aged  $\geq 18$  years were randomly selected at each selected food aid centre according to the usual manner of frequentation (with or without an appointment). Only one responder per household was enrolled. We selected subjects who spoke French unless an interpreter was available. Indeed, given the diversity of countries of origin of migrants in France, specific translations for each language during the survey were not possible.

Interviewers questioned subjects on sociodemographic and economic status, diet, food supply and food aid use, and requested that they undergo clinical and biochemical examinations. We informed participants about voluntary participation, the confidentiality agreement and their right to refuse to participate. The protocol was approved by the French data protection authorities (CNIL n°04.312) and by the Ethical Committee (Comité Consultatif pour la Protection des Personnes se prêtant aux Recherches Biomédicales, Hôpital Paris Cochin n°2178).

Since the first objective of the ABENA study was to assess the nutritional status of food aid users in France, for sample size determination, we assumed that the estimated prevalence of obesity among food aid recipients was twice as high as that of the general population, i.e. 20% (Charles *et al.*, 2008) with an alpha-type error of 0.05 and statistical power of 0.90. This gave a designated sample of 250 persons in each zone.

**Data collection.** Data were collected by dieticians trained and standardised in the use of computer-assisted personal interviews, including quality checks (Ethnos©CAPI, Soft Concept, Lyon, France).

A short food-frequency questionnaire was used to describe the daily or weekly frequency of consumption of food groups, without estimation of portion sizes. Food groups mentioned in dietary guidelines of the French Nutrition and Health Programme (PNNS) (Hercberg *et al.*, 2008) were specified at the time of the interview. Initially based on 8 questions, we finally described five food groups for which food specifications were as follows: The 'starchy foods' group included potatoes, pasta/semolina, rice, legumes, bread, and breakfast cereals. The fruits and vegetables group was composed of all fruits and vegetables and 100% juices. Milk, yoghurt, cheese and fresh cheese, but not sugared creamy desserts, were included in the 'dairy products' group. Finally, the meat, seafood and eggs category included red meat, white meat, offal, fish, crustaceans-molluscs and eggs. Since a specific recommendation had been elaborated for seafood in French dietary guidelines (Hercberg *et al.*, 2008), this food group was separately analysed.

Sociodemographic and economic factors studied included gender, age, place of birth, marital status, having at least one child, housing, education level, current job status and primary source of household income. Food insufficiency was also measured using the USDA Food Sufficiency Indicator (Radimer & Radimer, 2002) and was classified into three categories: 'food-sufficiency', 'mild food insufficiency' and 'severe food insufficiency' (Townsend *et al.*, 2001). Food budget (per month and per person), maximum number of meals per day and duration of food aid use were also evaluated. Finally, general self-perceived health status was assessed.

**Statistical analysis.** To take into account the complex survey design, a survey weight equal to the inverse of the probability of selection was assigned to each sampled centre and each sampled subject, stratified by zone and type of organisation.

Low frequency of consumption was defined for each food group as follows: <3 times per day for starchy foods; <3.5 times per day for fruit and vegetables; <1 time per day for meat, seafood and eggs; <2 times per week for seafood; and <2 times per day for dairy products. These frequency cut-offs were based on French dietary guidelines with two exceptions. For

fruits and vegetables, we used the public health objective which advises “reducing the prevalence of low consumers”, defined as those eating fewer than 3.5 fruits and vegetables per day (Hercberg *et al.*, 2008). For dairy products, we used a lower threshold than the recommendation (“3 times per day”) because too few subjects were above the recommended value.

Univariate logistic regressions were performed by calculating odds ratios (OR) and 95% CI to determine the strength of the association between ‘low’ frequency of food group consumption and each explanatory variable. Only explanatory variables associated with frequency of food group consumption at the 0.2 significance level, were retained for inclusion in the initial multivariate model. Subsequently, using stepwise backward elimination, multivariate logistic regression models were constructed. Gender was retained as a potential confounder in all models. Variables were removed from the model one by one using  $P > 0.10$  for exclusion. Variables whose exclusion from the model caused large fluctuations in OR ( $> 10\%$ ), as well as variables whose exclusion gave rise to significant likelihood ratio tests ( $P < 0.05$ ), were re-entered into the model. Significance tests were 2-sided, with a  $P$  value set at  $< 0.05$ . Interaction effects between gender and other explanatory variables were also examined. All analyses took sampling weights into account. Statistical analyses were conducted using the SAS procedures ‘surveyfreq’, and ‘surveylogistic’ (version 9.1; SAS Institute, Cary, USA). The Taylor Series expansion method was used to adjust SE and CI for complex survey design.

## RESULTS

Seventy-seven percent of eligible subjects (1,164/1,506) agreed to participate in the study. General characteristics of the sample are presented in Table 1. For analyses of associated factors with frequencies of low consumption, none of the interaction terms between gender and the other main effect variables proved to be statistically significant in final models. For each food group, variables retained from univariate analyses for introduction into multivariate models are presented in Table 2.

**Starchy foods.** Almost half of the subjects (48.7%) consumed at least 3 times per day. In the final model (results not shown), North African migrants were less likely to be low consumers of starchy foods than local-born French (OR=0.60 [0.39-0.94]; P=0.03). Moreover, individuals who ate at most 3 meals a day were low consumers of starchy foods (OR=2.85 [1.86-4.37]; P<0.0001).

**Fruit and vegetables.** Only 1.2 % of participants ate at least 5 fruits and vegetables daily and 94.5% ate less than 3.5 per day. North African migrants and 'other migrants' were significantly more likely to be low consumers of fruit and vegetables than local-born French (respectively OR=2.93 [1.01-8.54]; P=0.04 and OR=7.38 [2.36-23.10]; P=0.0006) (results not shown). Subjects experiencing severe food insufficiency were more likely to be low consumers than those who were food-sufficient (OR=5.77 [1.49-22.33]; P=0.01).

**Meat, seafood and eggs.** Half of the participants consumed meat, seafood and eggs one to two times a day, in line with the PNNS, whereas 42.6% were low consumers of this food group. Food aid users who frequented centres which distributed food parcels were less likely to be low consumers of meat, seafood and eggs than those who frequented social grocery stores (OR=0.48 [0.31-0.74]; P=0.01) (result not shown). Individuals experiencing severe food insufficiency were more likely to be low consumers of this category than those with mild food insufficiency (OR= 2.06 [1.33; 3.18]; P=0.001). In addition, food aid users who ate at most than 3 meals a day, and those who declared having medium or low health status perception were more likely to be low consumers of this food group (respectively, OR=3.30 [2.15-5.04]; P<0.0001 and OR=1.75 [1.14-2.67]; P=0.01).

Concerning seafood, only 27.3% of participants ate seafood at least 2 times a week. Subjects who frequented centres which served meals were more likely to be low consumers of seafood than those who frequented social grocery stores (Table 3). Food aid users who lived in a shelter were less likely to be low consumers of this food group than those who had their own housing. In addition, food budget and duration of food aid use were inversely associated with low consumption of seafood (Table 3). Individuals who ate at most 3 meals a day and who declared having medium or low health status perception were more likely to be

low consumers of this food group. Furthermore, subjects who had no source of household income had less probability of being low consumers of seafood than those who received social assistance benefits (OR=0.31 [0.12; 0.77]; P=0.01) and those with other sources of income (OR=0.31 [0.12; 0.76]; P=0.01).

**Dairy products.** Only 9.2% of participants met the recommendations of the PNNS for 3 dairy products per day, whereas 61.0% were low consumers (< 2 per day). Compared with local-born French, sub-Saharan migrants were more likely to be low consumers of dairy products, whereas Eastern European migrants were less likely to be low consumers (Table 4). Individuals who did not work and those who did not have administrative approval for working were more likely to be low consumers of dairy products. In addition, food insufficiency was positively associated with low consumption of this food group (Table 4). Finally, subjects who ate at most 3 meals a day were more likely to be low consumers of dairy products.

## DISCUSSION

Our study highlights the fact that economic factors and food insufficiency are strongly related to low consumption of certain food groups, even in food aid users in France. Although subjects all belonged to very low-income populations, such disparities were determinants of unhealthy diet. Moreover, our results showed no influence of the usual sociodemographic factors in this deprived population, i.e. age, marital status or educational level. Finally, frequency of consumption was influenced by behaviour relating to food aid, such as duration of food aid use.

Regarding dietary intake of food aid users, we found low levels of fruit and vegetable consumption in line with a recent national study among low-income households in the UK (Low Income Diet and Nutrition Survey) (Nelson et al., 2007). However, the dietary assessment methods and recruitment methods were very different (four 24-h recalls in the UK compared to an 8-question-food frequency questionnaire in our study).

In terms of socioeconomic factors, food aid users who lived in a shelter and those without any source of household income were less likely to be low consumers of seafood.

Detailed analysis showed that more deprived individuals (in terms of housing and income) strongly depended on food aid for their seafood supply (data not shown). Indeed, because of distribution of canned seafood, access to seafood was better at food aid centres than at other seafood sources. Moreover, seafood was the sole food group for which consumption was strongly associated with food budget. Food aid users may have restricted their choices through less consumption of more expensive food products (Maillot *et al.*, 2007). Our questionnaire was unable to differentiate fresh from canned seafood, but we hypothesize that this association mainly referred to canned seafood. Indeed, fresh seafood was less frequently distributed at food aid centres than were the other food groups and than canned seafood, which is heavily distributed at social grocery stores and centres distributing food parcels (Darmon *et al.*, 2008). Moreover, subjects who had benefited from food aid for less than three years were lower consumers of seafood than long-term users. Long-term food aid users may have a better knowledge of the food aid system and consequently know how and where to obtain seafood so as to maintain their consumption.

Consistent with other studies on both general and low-income populations (Cristofar & Basiotis, 1992; Dixon *et al.*, 2001; Tarasuk, 2001), our findings also highlighted the fact that, the more severe the food insufficiency, the lower the consumption of meat, seafood and eggs, dairy products and, fruits and vegetables. Although food aid users generally had much lower consumption of these foods than the general French population (Castetbon *et al.*, 2009), this observation underlines the fact that, irrespective of their common highly precarious situation, some food aid users considered themselves to be food-sufficient. Various strategies may be employed by individuals when confronted with the problem of food insufficiency, including dietary changes, food-seeking strategies and rationing strategies, such as skipping meals and skipping eating for entire days (Oldewage-Theron *et al.*, 2006). Food aid would appear to be insufficient for overcoming food insufficiency, as almost half of food aid users skipped one of the three daily meals (Bellin-Lestienne *et al.*, 2006). Consequently, our results also showed that reduced meal frequency was strongly associated with low consumption of starchy foods, meat, seafood and eggs, and dairy products.

In addition, low consumption of food groups was associated with country of birth. In accordance with our results, previous studies showed higher consumption of starchy foods among North African migrants in France compared with local-born French (Darmon & Khlata, 2001). In contrast, unlike our findings for fruits and vegetables, other studies indicated that North African migrants conserved a traditionally high consumption of this food group (Darmon & Khlata, 2001; Mejean *et al.*, 2007). Contrary to studies in the general population, country of birth in this deprived population probably reflected economic barriers to food access rather than sociocultural characteristics, which help to maintain traditional healthy dietary patterns (Mejean *et al.*, 2008). Our results also showed the substantial influence of country of birth in other migrant groups. To our knowledge, up to now, no study has specifically assessed the dietary patterns of these migrant groups in France. Furthermore, in contrast with studies on the French general population (Kesse-Guyot *et al.*, 2008; Perrin *et al.*, 2002), an unhealthy dietary pattern among food aid users was not associated with age, marital status or education level. The influence of common sociodemographic factors seems to be lessened by differences in economic profiles and food insufficiency levels within this deprived population.

Characteristics of the study must be taken into account for interpreting results. Since the study was limited to four French areas, it did not intend to represent food aid centres at a national level. However, because of the random nature of the sample, our study was representative of food aid users in these four urban zones. Concerning selection bias, elimination of persons not meeting the French language requirement and who were not accompanied by a French speaker may have led to underestimating the dietary quality of food aid users. In contrast, since participants were interviewed at food aid centres, they were awaiting food assistance during the survey; consequently, they may have underreported their food consumption. Moreover, data collected using a very short food frequency questionnaire, without recording portion sizes, are not as accurate as data gathered using classical validated food frequency questionnaires. Moreover, food frequency methods are less precise than recall and food record methods (Willett, 1998). However, we did not aim to

comprehensively assess detailed dietary intake. Rather, we were primarily interested in obtaining a high participation rate, in light of the difficulties in carrying out a survey at food aid centres. And finally, since the USDA indicator is a subjective appreciation of the food insufficiency level, this direct measurement might underestimate the prevalence of food insufficiency because of a perceived reluctance to report problems with food. However, the literature recommends using direct rather than indirect indicators, since the latter, such as poverty or low income, would incorrectly identify a large percentage of households as being affected by food insufficiency (Rose, 1999).

Finally, various social and economic factors as well as food insufficiency levels were strong determinants of dietary inadequacy. Thus, our study would appear to confirm those carried out on general populations showing that access to healthy diet depends on the poverty gradient, even within this deprived population. Moreover, despite heterogeneity among food aid users, no specific sociodemographic high-risk profile for low consumption of food groups was observed, indicating only a weak influence of sociodemographic characteristics upon dietary patterns, as opposed to economic factors. Based on our results, specific strategies could be set up within food aid organisations to take into account economic disparities among food aid users. It is particularly important to improve food availability and diversity at food aid centres in order to improve the diet of food aid users. Thus, our study provides useful observations on characteristics of food aid use and its association with diet, with the goal of assisting health policy decisions and those of food aid associations. In the context of a reform of the European "Most Deprived" food aid scheme, our results should help to more clearly identify the needs of food aid users, and consequently, to better define food aid distribution.

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**Table 2.** Univariate analysis of the association between explanatory variables and low consumption of food groups

		Starchy foods			Fruits and vegetables			Meat, seafood, eggs			Seafood			Dairy products		
		OR <sup>1</sup>	CI	P-value	OR <sup>1</sup>	CI	P-value	OR <sup>1</sup>	CI	P-value	OR	CI	P-value	OR <sup>1</sup>	CI	P-value
Type of centre	Served meals	1.18	0.79-1.77	0.41	1.20	0.51-2.82	0.67	1.21	0.81-1.81	0.36	2.13	1.38-3.30	0.0007	1.97	1.30-2.99	0.001
	Food parcels	0.97	0.64-1.46	0.88	1.45	0.62-3.42	0.39	0.53	0.35-0.81	0.003	1.02	0.66-1.56	0.93	0.99	0.66-1.50	0.98
	Social grocery	1.00			1.00			1.00			1.00			1.00		
Gender	Male	1.20	0.81-1.77	0.36	0.83	0.36-1.90	0.66	1.62	1.09-2.39	0.02	1.87	1.23-2.88	0.003	1.64	1.10-2.45	0.01
	Female	1.00			1.00			1.00			1.00			1.00		
Age, years	< 35	1.52	0.82-2.84	0.18	0.55	0.17-1.76	0.31	0.61	0.32-1.13	0.12	0.87	0.45-1.67	0.67	1.32	0.71-2.47	0.38
	35-55	1.34	0.77-2.35	0.30	1.04	0.34-3.17	0.95	0.84	0.48-1.47	0.54	0.95	0.53-1.72	0.87	1.43	0.82-2.51	0.21
	≥ 55	1.00			1.00			1.00			1.00			1.00		
Migration status	Other migrants	1.45	0.57-3.67	0.43	9.34	2.98-29.24	0.0001	0.82	0.33-2.06	0.67	0.36	0.14-0.93	0.03	1.43	0.58-3.53	0.44
	Eastern European migrants	0.51	0.18-1.40	0.19	0.90	0.19-4.27	0.87	1.35	0.49-3.71	0.56	0.99	0.33-2.93	0.98	1.29	0.46-3.59	0.62
	Sub-Saharan migrants	1.63	0.83-3.22	0.16	2.73	0.57-12.97	0.21	0.80	0.40-1.61	0.53	0.49	0.25-0.95	0.04	2.70	1.30-5.60	0.007
	North African migrants	0.57	0.37-0.89	0.01	3.67	1.24-10.85	0.02	1.34	0.86-2.09	0.19	0.72	0.45-1.17	0.19	1.32	0.85-2.06	0.22
	Local-born French	1.00			1.00			1.00			1.00			1.00		
Marital status	Single	1.22	0.81-1.85	0.33	1.49	0.62-3.54	0.37	1.23	0.81-1.85	0.33	1.28	0.82-1.99	0.27	1.33	0.88-2.02	0.17
	Married or living with a partner	1.00			1.00			1.00			1.00			1.00		
Had at least one child	Yes	0.72	0.49-1.07	0.10	1.33	0.57-3.07	0.51	0.72	0.49-1.06	0.10	0.53	0.35-0.81	0.003	0.69	0.46-1.02	0.06
	No	1.00			1.00			1.00			1.00			1.00		
Type of dwelling	Homeless	1.38	0.74-2.58	0.31	1.30	0.29-5.88	0.73	2.36	1.25-4.46	0.007	2.76	1.24-6.14	0.01	2.89	1.42-5.88	0.003
	Shelters	1.02	0.64-1.64	0.93	1.14	0.39-3.33	0.80	1.41	0.88-2.26	0.16	0.88	0.54-1.44	0.62	1.20	0.74-1.92	0.46
	House/flat, housed by family	1.00			1.00			1.00			1.00			1.00		
Current job status	No current authorization for working <sup>2</sup>	1.97	0.80-4.84	0.31	3.15	0.45-22.00	0.25	2.13	0.85-5.36	0.11	2.23	0.89-5.54	0.08	12.44	5.20-29.75	<0.0001
	Not working	1.92	0.84-4.39	0.92	1.73	0.37-8.07	0.49	1.55	0.66-3.66	0.31	2.70	1.16-6.27	0.02	4.19	1.94-9.05	0.0003
	Working	1.00			1.00			1.00			1.00			1.00		
Primary source of household income	Other	1.03	0.56-1.90	0.91	0.53	0.15-1.93	0.34	2.61	1.42-4.81	0.002	1.81	0.95-3.46	0.07	3.41	1.79-6.50	0.0002
	None	1.77	0.86-3.64	0.11	1.30	0.18-9.23	0.80	1.23	0.60-2.49	0.57	1.04	0.52-2.11	0.90	4.73	2.17-10.27	<0.0001
	Social assistance benefits	1.06	0.66-1.70	0.82	0.64	0.24-1.67	0.36	1.74	1.08-2.78	0.02	1.95	1.17-3.26	0.01	1.47	0.91-2.36	0.11

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Méjean, C., Deschamps, V., Bellin-Lestienne, C., Oleko, A., Darmon, N., Serge, H., Katia, C. (2010). Associations of socioeconomic factors with inadequate dietary intake in food aid users in France (the ABENA study 2004–2005). *European Journal of Clinical Nutrition*, 64 (4), 374-382. DOI : 10.1038/ejcn.2009.153

Employment, retirement pension or unemployment insurance	1.00			1.00			1.00			1.00			1.00		
Education level															
None or primary	0.92	0.55-1.54	0.76	1.57	0.53-4.68	0.41	1.21	0.73-2.02	0.45	1.17	0.68-2.00	0.57	1.22	0.72-2.04	0.46
Secondary	0.78	0.43-1.42	0.41	0.67	0.21-2.16	0.51	0.66	0.36-1.21	0.18	1.05	0.55-1.99	0.88	0.65	0.35-1.18	0.16
University	1.00			1.00			1.00			1.00			1.00		
Food insufficiency level															
Severe food insufficiency	1.33	0.52-3.38	0.55	7.25	1.77-29.62	0.006	3.30	1.15-9.49	0.03	2.15	0.82-5.62	0.12	4.56	1.75-11.90	0.002
Mild food insufficiency	1.01	0.39-2.59	0.97	4.58	1.16-19.98	0.03	1.46	0.51-4.22	0.48	1.46	0.56-3.80	0.44	3.13	1.20-8.17	0.02
Food sufficiency	1.00			1.00			1.00			1.00			1.00		
Food budget (per month & per person)															
< 60 euros	1.32	0.72-2.41	0.37	2.36	0.72-7.70	0.15	1.69	0.89-3.19	0.10	2.42	1.29-4.54	0.006	1.80	0.97-3.32	0.06
60-120 euros	1.28	0.66-2.48	0.46	1.37	0.41-4.50	0.61	1.38	0.69-2.75	0.36	2.85	1.43-5.65	0.003	1.17	0.60-2.27	0.64
> 120 euros	1.00			1.00			1.00			1.00			1.00		
Duration of food aid use															
< 1 year	1.15	0.70-1.86	0.58	1.18	0.43-3.26	0.75	1.27	1.09-2.41	0.35	1.63	0.99-2.70	0.06	1.16	0.71-1.90	0.55
1-3 years	1.19	0.70-2.05	0.52	0.95	0.31-2.91	0.92	0.94	0.55-1.63	0.84	1.78	0.99-3.20	0.05	1.44	0.83-2.51	0.19
≥ 3 years	1.00			1.00			1.00			1.00			1.00		
Maximum number of meals per day															
< 3 meals	2.64	1.76-3.95	<0.0001	1.83	0.72-4.63	0.20	3.92	2.62-5.88	<0.0001	2.58	1.66-4.03	<0.0001	3.73	2.44-5.70	<0.0001
≥ 3 meals	1.00			1.00			1.00			1.00			1.00		
Health status perception															
Medium/low	1.04	0.70-1.54	0.86	1.90	0.80-4.52	0.14	1.95	1.31-2.91	0.0009	1.91	1.25-2.91	0.003	1.21	0.81-1.82	0.34
High	1.00			1.00			1.00			1.00			1.00		

1- Odds ratios

2- Persons who did not have administrative approval for working but who had access to food aid

**Table 1.** General characteristics of the sample, n=1,164 (%) (ABENA study, 2004-2005)

		%
Type of centre	Served meals	38.7
	Food parcels	43.4
	Social grocery	17.9
Gender	Male	48.5
	Female	51.5
Age, years	< 35	25.8
	35-54	59.1
	≥ 55	15.1
Place of birth	France	34.4
	North Africa	43.7
	Sub-Saharan countries	11.4
	Eastern Europe	5.0
	Other	5.5
Marital status	Single	64.7
	Married or living with a partner	35.3
Had at least one child	yes	51.6
	no	48.4
Housing	House/flat, housed by family	65.3
	Shelter	20.4
	Homeless	14.3
Education level	None or primary	58.5
	Secondary	21.9
	University	19.6
Current job status	Working	5.5
	Not working	70.9
	No current authorization for working <sup>1</sup>	23.6
Primary source of household income	None	12.2
	Other	14.8
	Employment, retirement pension, unemployment insurance	26.0
	Social assistance benefits	47.0
Food budget (per month & per person)	< 60 euros	55.4
	60-120 euros	32.8
	> 120 euros	11.7
Food insufficiency level	Severe food insufficiency	49.6
	Mild food insufficiency	46.0
	Food sufficiency	4.4
Duration of food aid use	< 1 year	42.6
	1-3 years	30.2
	≥ 3 years	27.2
Maximum number of meals per day	< 3 meals	48.1
	≥ 3 meals	51.9
Health status perception	Medium/low	55.4
	High	44.6

1- Persons who did not have administrative approval for working but who had access to food aid

**Table 3.** Multivariate logistic analysis of the association between social and economic characteristics and low consumption of seafood

		Multivariate model		
		OR <sup>1</sup>	CI	P-value
Type of centre	Served meals	3.42	1.61-7.29	0.01
	Food parcels	1.38	0.79-2.39	0.25
	Social grocery	1.00		
Gender	Male	1.68	0.82-3.43	0.15
	Female	1.00		
Type of dwelling	Homeless	0.68	0.26-1.81	0.44
	Shelters	0.46	0.25-0.83	0.01
	House/flat, housed by family	1.00		
Current job status	No current authorization for working <sup>2</sup>	1.47	0.35-6.22	0.59
	Not working	2.90	0.95-8.89	0.06
	Working	1.00		
Primary source of household income	Other	1.23	0.41-3.69	0.72
	None	0.38	0.12-1.13	0.08
	Social assistance benefits	1.21	0.59-2.51	0.60
	Employment, senior's pension or unemployment insurance	1.00		
Food budget (per month/ per person)	< 60 euros	3.37	1.64-6.79	0.0009
	60-120 euros	4.37	2.06-9.29	0.0001
	> 120 euros	1.00		
Duration of food aid use	< 1 year	3.59	1.92-6.72	<0.0001
	1-3 years	3.96	1.93-8.13	0.0002
	≥ 3 years	1.00		
Maximum number of meals per day	< 3 meals	2.47	1.40-4.36	0.002
	≥ 3 meals	1.00		
Health status perception	Medium/low	2.01	1.20-3.36	0.008
	High	1.00		

1- Adjusted odds ratios

2- Persons who did not have administrative approval for working but who had access to food aid

**Table 4.** Multivariate logistic analysis of the association between social and economic characteristics and low consumption of dairy products

		Multivariate model		
		OR <sup>1</sup>	CI	P-value
Gender	Male	1.35	0.83-2.21	0.22
	Female	1.00		
Migration status	Other migrants	1.06	0.30-3.74	0.92
	Eastern European migrants	0.15	0.03-0.69	0.01
	Sub-Saharan migrants	2.42	1.03-5.70	0.04
	North African migrants	1.26	0.72-2.21	0.41
	Local-born French	1.00		
Current job status	No current authorization for working <sup>2</sup>	8.30	2.57-26.80	0.004
	Not working	4.37	1.58-12.08	0.0004
	Working	1.00		
Education level	None or primary	1.14	0.60-2.19	0.68
	Secondary	0.95	0.48-1.87	0.88
	University	1.00		
Food insufficiency level	Severe food insufficiency	4.93	1.56-15.52	0.006
	Mild food insufficiency	3.84	1.22-12.05	0.02
	Food sufficiency	1.00		
Food budget (per month/ per person)	< 60 euros	1.53	0.71-3.26	0.27
	60-120 euros	1.15	0.52-2.55	0.72
	> 120 euros	1.00		
Maximum number of meals per day	< 3 meals	3.74	2.27-6.14	<0.0001
	≥ 3 meals	1.00		

1- Adjusted odds ratios

2- Persons who did not have administrative approval for working but who had access to food aid.