NUTRITION

INSTITUT NATIONAL DU CANCER

Santé publique France

CANCER BAROMETER 2015
NUTRITION AND CANCER

Perception of risk and protective factors

INTRODUCTION

Nutrition, as defined by the World Health Organization [1], includes diet, physical activity and nutritional status (i.e. underweight, normal weight, overweight or obesity). For the last fifteen years in France, nutrition has played an important role in public health policies. The French National Programme on Nutrition and Health (PNNS) [2-5] sets out objectives aimed at improving the population's general health, by targeting nutrition which is one of its determinants. Based on the most recent knowledge available, this programme issues guidelines on behaviours to be adopted to reduce the risk of onset of chronic diseases such as cardiovascular diseases, type 2 diabetes and cancer. Indeed, recent research by the International Agency for Research on Cancer (IARC) on the preventable causes of cancers shows that 5.4% of cancers in France in 2015 can be attributed to an unbalanced diet, 5.4% to excess weight (overweight/obesity) and 0.9% to insufficient physical activity [6]. Today, cancer remains the leading cause of premature mortality in France. To address this major public health challenge, besides the PNNS, France has developed a sustained cancer control policy through various cancer plans. One of the actions in the 2014-2019 Cancer Plan (action 9.17) involves an update of the cancer barometer. The purpose of this national study is to analyse the population's representations/beliefs with respect to cancers and their changes over time; one of the sections of this barometer relates to nutrition.

The links between nutrition and cancer risk are examined regularly by national or international expert groups, who review the knowledge available, assess the levels of evidence and, where possible, propose recommendations. These expert assessments have highlighted progress in scientific knowledge in this field over the last ten years. They have been reported more or less faithfully in a variety of media and may have resulted in changes in the perceptions of the general public. Current knowledge is summarised in the third report published in 2018 by the World Cancer Research Fund (WCRF) and the American Institute for Cancer Research (AICR), which is considered as the international gold standard [7]. The main factors of relevance for the French population with levels of evidence deemed to be convincing or probable are as follows:

- excess weight, consumption of alcoholic drinks, excessive consumption of red meat, processed meat and salt-preserved foods increase cancer risk;
- consumption of wholegrain products, fruit and vegetables, dietary fibre, dairy products (including milk), coffee, physical activity and breastfeeding (for breast cancer in breastfeeding mothers) lower cancer risk.

For other factors (white meat, fish, potatoes), the level of evidence is limited or inconclusive.

Various studies conducted on large populations have demonstrated that adopting protective behaviours helps lower cancer risk [8. 9]. However, it is not always easy to get individuals to adopt these behaviours. A number of variables may influence changes in individual behaviour (e.g. knowledge, attitudes).[1] A better grasp of protective and harmful nutritional factors associated with the onset of cancer could however provide leverage to

encourage people to develop health protective behaviours [13, 14].

The Cancer Barometer of the French National Cancer Institute (INCa) and Santé Publique France has therefore specifically assessed the perceptions of the French population in matters of nutrition-related cancer risk. The findings of the survey conducted in 2015 are presented and then compared with the 2010 data. These findings are subsequently discussed to offer a more refined interpretation of the data. In conclusion, possible public policy measures are proposed for consideration to bring about appropriate changes in practices.

Methodology

All the data presented have been weighted so as to be representative of the French population.

Description of the population

The data are from the 2010 and 2015 Cancer Barometers. The methodology of the 2015 survey is described in a dedicated section [15]. Between May and October 2015, 3,764 subjects aged from 15 to 85 years were asked the questions on nutrition. Subjects who had previously been treated for cancer were excluded to avoid any bias associated with the change in perception caused by the onset of the disease.

2010-2015 comparisons

Subjects in the over 75 age group were not asked the questions in the nutrition section in 2010; therefore, these subjects' responses have not been included in the comparison. The sizes of the samples of subjects aged 15-75 years in 2010 and 2015 were 3,243 and 3,508, respectively. Only questions asked in strictly the same way between 2010 and 2015 were used for the comparative section.

Variables

Those surveyed were asked to state whether they thought that the role played by diet in the onset of cancer was: "very important", "somewhat important", "somewhat unimportant", "not at all important", "don't know / no opinion". This variable was grouped together as follows: "very / somewhat important" or "somewhat unimportant / not at all important", while "don't know" responses were implemented as missing data.

Those surveyed were then asked, for different food groups, to state the impact of frequent consumption on cancer risk in their view ("decrease", "increase", "no impact", "don't know").

As regards occupations and socioeconomic status, given that farmers only represented 1.6% of the sample in 2015, they were grouped together with tradespeople, merchants and company directors. Retired people and unemployed people with previous work experience were assigned the socioeconomic status matching their most recent employment.

Statistical analyses

SAS Enterprise Guide 7.13 software was used for the statistical analyses. Chi^2 tests were carried out in order to study the differences in terms of sociodemographic variables associated with the various questions asked in relation to nutrition and cancer risk. Logistic regressions were carried out in order to assess the associations between individual characteristics and the perception of different nutritional factors on cancer risk. The explanatory variables of the models were: age, sex, level of income, level of education, socioeconomic status and perceived information of the health effect of diet (or of physical inactivity depending on the model). A second model was produced with the same explanatory variables as well as the level of food insecurity (only the odds ratios [OR] of this variable are given). In order to define the explanatory variables of each regression model, a "stepwise" variable selection was applied.

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1. Various conceptual models for behavioural change are available. It is reckoned that there are over forty [10,11]. For example, among these models, the theory of planned behaviour [12] is based on the principle that an individual's behaviour (for example increasing their fruit and vegetable consumption) is determined by intention which is in turn predicted by norms, perceived control and attitudes.

FINDINGS

STRONG PERCEPTION OF THE ROLE OF DIET IN THE ONSET OF CANCER

In total, 90.8% of those surveyed are of the view that diet has an important role in the onset of cancer (40.6% "very important" and 50.2% "somewhat important").

Table I shows these results and the differences in perception observed according to the sociodemographic variables measured. This perception does not vary according to socioeconomic status. However, it changes significantly with age. Indeed,

90.8% of those surveyed are of the view that diet has an important role in the onset of cancer

younger subjects seem less convinced of the importance of the role of diet in the onset of cancer. 86% of the 15-24 age group consider its role to be important, whereas this percentage is at least 90% in other age groups and attains 94% in the oldest age group (75-85 years).

Furthermore, women are more likely to consider the role of diet in the onset of cancer to be important: 92.4% as opposed to 89.2% for men.

The percentage of subjects of the view that diet has an important role in the onset of cancer increases with the level of education: 88.9% (pre-high school diploma), 93.7% (high school diploma equivalent), 92.6% (post-high school diploma). The same trend is observed for the income level: 87.4% of subjects with an income less than €1,100/CU (per consumption unit) state that diet has an important role versus 92.5% of subjects earning over €1,800/CU.

Furthermore, differences in perception were identified according to the regions of residence: compared to subjects residing in the Paris region, subjects residing in the West, South-West or East state more frequently that diet has an important role in the onset of cancer.

Moreover, the univariate analyses (Table II) demonstrated that no significant difference was observed according to alcohol consumption. On the other hand, a difference is observed according to the interviewee's smoking status: more ex-smokers (93.4% of this category) attribute an important role to diet in the onset of cancer compared to occasional smokers (91.9%), non-smokers (90.2%) and regular/daily smokers (88.5%).

Opinions vary according to certain social vulnerability indicators, such as food insecurity status or individuals' perception of their financial status[2]: subjects who may not have access to sufficient food are less likely to perceive the role of diet in the risk of onset of cancer (81.2% versus 91.3% for subjects stating that they were able to eat all the food they wanted).

Similarly, differences are apparent according to the perceived information with respect to the role of diet in the onset of cancer: 91.5% of subjects stating that they were well-informed on the health effects of diet are of the view that diet has an important role in the onset of cancer versus 89.5% of those who feel that they are poorly informed on the matter (p = 0.04).

Proximity to the disease (subjects having at least one relative affected by cancer) has an impact on the importance attributed to diet in the onset of the disease: 91.2% of subjects having at least one relative affected versus 86.9% of those who do not know anyone affected (p = 0.013)[3].

DIFFERENT PERCEPTIONS OF CANCER RISK ACCORDING TO FOODS

The perceptions of foods recognised as cancer risk or protective factors varies according to the food in question (Table III). Processed meat and salt or salty food consumption is perceived by a majority of participants (respectively: 62.2% and 54.6%) as increasing the risk of onset of cancer. In the case of fruit and vegetable consumption, a majority of participants (58.1%) perceive benefits. However, there is a lower perception of the benefits for milk consumption and the risks associated with red meat consumption: respectively, only 11.8% and 42.6% of participants perceive these foods as beneficial for health, linked with cancer, or increasing the risk of onset of cancer.

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2. Variable not included in the model due to redundancy with the income level.
3. The "proximity to disease" variable was not selected in the logistic regression model.

TABLE I | Factors associated with considering diet as an important factor in the onset of cancer: logistic regression results

		Univariate	Multivariate[a]
	n	%	OR [95% CI]
SEX		***	
Male (ref.)	1,643	89.2	1
Female	1,770	92.4	1.6 [1.3-2.1]***
AGE		***	
15-24 years (ref.)	495	85.8	1
25-34 years	571	90.5	1.5 [1.0-2.1]*
35-44 years	599	91.1	1.6 [1.1-2.3]*
45-54 years	611	92.0	2.0 [1.4-2.9]***
55-64 years	550	91.9	1.9 [1.3-2.9]***
65-74 years	341	92.9	2.0 [1.3-3.4]**
75-85 years	247	93.7	2.5 [1.4-4.4]**
INCOME/CU		***	
€0- €1,100 (ref.)	1,038	87.4	1
€1,101-€1,800	1,219	93.5	1.8 [1.4-2.5]***
>€1,800	872	92.5	1.5 [1.1-2.1]*
DK/declined to answer	284	88.0	1.0 [0.7-1.5]
REGION		**	
Paris region (ref.)	632	88.5	1
North	210	88.3	1.1 [0.7-1.7]
Eastern Paris Basin	260	88.1	1.0 [0.7-1.6]
Western Paris Basin	302	88.6	1.1 [0.7-1.7]
West	485	93.8	2.1 [1.4-3.2]***
South-West	385	93.5	2.1 [1.3-3.4]**
Mediterranean	418	91.5	1.5 [1.0-2.3]
Centre East	420	91.6	1.5 [1.0-2.3]
East	301	92.5	1.7 [1.0-2.7]*
EDUCATION		***	
No qualifications or pre-high school diploma (ref.)	1,770	88.9	1
High school diploma	672	93.7	2.1 [1.5-3.0]***
Post-high school diploma	971	92.6	1.5 [1.1-2.1]**

*: p<0.05; **: p<0.01; ***: p<0.001
[a] Logistic regression model, reference: important; adjustment variables: sex, age, income per consumption unit, region of residence and level of education.
The * in the percentage column indicate the global Chi^2 test results. For example, in a bivariate analysis, the percentage variation according to sex of subjects who view the role of diet in the onset of cancer as important is significant.
Abbreviations: CI = Confidence interval; DK = Don't know; OR = Odds ratio; ref. = reference; CU = consumption unit.

TABLE II | Factors associated with considering diet as an important factor in the onset of cancer: Chi^2 test results

	n	%
SMOKING STATUS		***
Occasional smoker	199	91.9
Regular / daily smoker	933	88.5
Ex-smoker	1,086	93.4
Never or just to try	1,192	90.2
ALCOHOL		
Daily	254	90.2
Once a week	1,270	91.7
Once a month or less	1,282	91.3
Never	607	88.3
FOOD INSECURITY		***
You can eat all the food you want	2,422	91.3
You have enough to eat but not always the food that you would like	835	91.0
At times, you do not have enough to eat	118	81.2
PERCEIVED INFORMATION ON THE HEALTH EFFECTS OF DIET		*
Very or somewhat poorly informed	1,142	89.5
Very or somewhat well informed	2,271	91.5
PROXIMITY TO CANCER		*
No relatives affected	259	86.9
At least one relative affected in family circle	3,154	91.2

*: p<0.05; ***: p<0.001

Processed meat and salt consumption is mostly perceived as a risk factor

Questions relating to the consumption of foods with no demonstrated link with cancer (fish, white meat and potatoes) were also asked. Potato and white meat consumption is perceived by a majority of participants as not having an impact on cancer risk (64.7% and 57.3%, respectively). However, respondents were less likely to perceive the lack of effect of fish consumption. As such, 38.3% of participants perceive fish consumption as lowering cancer risk and 39.4% as not having an impact.

The perception of foods as risk or protective factors varies significantly with certain sociodemographic characteristics (age, sex and education level) and perceived information on the health effects of diet. These results were observed following logistic regression analyses (Table IV).

A strong association with age is observed for red meat and salt or salty food consumption. For frequent red meat consumption, the perception of an increase in cancer risk becomes greater with age, whereas it decreases for salt or salty food. For fruit and vegetables as well as processed meat, there is a greater perception of the protective and harmful (respectively) role of these foods in the 45-64 age group than in younger subjects (15-24 years).

Finally, sex is also a factor in the perception of the influence of salt or salty food consumption on cancer risk. Slightly fewer women than men (52.3% versus 56.9%) perceive salt consumption as potentially increasing

TABLE III | Perception of the impact of dietary consumption, physical activity, being overweight and breastfeeding on cancer risk

	… lower cancer risk?	… increase risk?	No impact	Don't know (stated)
IN YOUR OPINION, FREQUENT CONSUMPTION OF...CAN...				
Fruit and vegetables	58.1	3.9	29.5	8.5
Red meat	6.2	42.6	33.5	17.8
Milk	11.8	13.4	53.4	21.5
Processed meat	2.4	62.2	21.3	14.2
White meat	19.7	4.8	57.3	18.2
Fish	38.3	7.8	39.4	14.5
Salt or salty foods	3.8	54.6	25.6	16.0
Potatoes	7.4	3.7	64.7	24.3
IN YOUR OPINION, REGULAR PHYSICAL ACTIVITY CAN...				
	70.0	1.3	19.7	8.9
IN YOUR OPINION, OVERWEIGHT OR OBESITY CAN...				
	2.1	75.5	11.8	10.6
IN YOUR OPINION, BREASTFEEDING CAN… THE MOTHER'S BREAST CANCER RISK (WOMEN)				
	34.0	4.0	37.7	24.2

Bold type: known risk or protective factors (i.e. for which evidence of a reduction or increase in cancer risk is available [7]).

cancer risk. For other nutritional factors, sex does not tend to be a determinant.

The participants' level of education is also important. Subjects with a post-high school diploma are more likely to perceive the risks associated with the consumption of certain foods: red meat and processed meat. These subjects are also more likely to perceive the benefits associated with fruit and vegetable consumption.

Perceived information on the health effects of diet has an important role. Regardless of the food group in question, subjects who consider themselves well-informed are more likely to perceive the influence of the consumption of these foods on cancer risk.

Furthermore, subjects experiencing food insecurity are less likely to think that excessive salt or salty food consumption may increase cancer risk than those able to eat all the food they want.

PHYSICAL ACTIVITY PERCEIVED AS A PROTECTIVE FACTOR AND OVERWEIGHT AND OBESITY PERCEIVED AS CANCER RISK FACTORS

As regards physical activity and nutritional status (Table III), 70.0% of the subjects surveyed consider physical activity as a protective factor in terms of cancer risk and 75.5% of those surveyed perceive overweight and obesity as cancer risk factors.

The perception of the protective effect of regular phys-

Fewer subjects experiencing food insecurity are of the view that excessive salt consumption is a risk factor

ical activity and the risk associated with being overweight in the onset of cancer varies according to sex, age, income level, education, socioeconomic status and perceived information on the health effects of physical

TABLE IV | Factors associated with the perception of the impact of frequent consumption of certain types of foods on cancer (eight different logistic regressions)

| | | Fruit & vegetables (n=3,762) of risk | | Red meat (n=3,762) of risk | | Processed meat (n=3,762) of risk | | Salt (n=3,762) of risk | |
| | | Model 1a | | Model 2a | | Model 3a | | Model 4a | |
	n total	%	OR [95% CI]	%	OR [95% CI]	%	OR [95% CI]	%	OR [95% CI]
SEX								*	
Male (ref.)	1,846	58.1	1	41.9	1	61.2	1	56.9	1
Female	1,918	58.1	1.1 [0.9-1.3]	43.2	1.1 [1.0-1.3]	63.2	1.0 [0.9-1.2]	52.3	0.9 [0.7-1.0]*
AGE		***		***				***	
15-24 years (ref.)	577	55.7	1	33.9	1	56.6	1	66.5	1
25-34 years	631	56.3	0.9 [0.7-1.1]	37.3	1.0 [0.8-1.2]	61.9	1.1 [0.9-1.4]	61.7	0.7 [0.6-0.9]*
35-44 years	658	55.7	0.9 [0.7-1.2]	44.4	1.4 [1.1-1.8]**	62.4	1.2 [0.6-1.5]	55.6	0.6 [0.5-0.7]***
45-54 years	667	63.8	1.5 [1.2-1.8]**	44.5	1.5 [1.2-1.9]**	64.6	1.4 [1.1-1.8]**	49.4	0.4 [0.4-0.6]***
55-64 years	598	59.8	1.3 [1.0-1.7]*	48.1	1.8 [1.4-2.2]***	64.8	1.4 [1.1-1.8]**	49.9	0.5 [0.4-0.6]***
65-74 years	370	59.7	1.2 [0.9-1.5]	51.1	1.8 [1.4-2.4]***	64.3	1.3 [1.0-1.7]	50.4	0.4 [0.3-0.6]***
75-85 years	264	53.0	0.9 [0.7-1.3]	40.3	1.3 [0.9-1.7]	59.7	1.1 [0.8-1.5]	38.0	0.3 [0.2-0.4]***
INCOME/CU IN TERCILES		**		***		***		***	
€0-1,100 (ref.)	1,190	51.5	1	33.5	1	57.5	1	50.4	1
€1,101-1,800	1,307	60.6	1.3 [1.1-1.5]**	45.1	1.5 [1.3-1.8]***	65.3	1.3 [1.1-1.5]**	57.0	1.4 [1.1-1.6]***
>€1,800	944	65.7	1.1 [0.9-1.4]	51.6	1.6 [1.3-2.0]***	67.4	1.3 [1.0-1.6]*	58.7	1.3 [1.1-1.6]*
DK/declined to answer	323	50.4	0.8 [0.7-1.1]	39.5	1.2 [0.9-1.6]	51.8	0.8 [0.6-1.0]	47.7	0.9 [0.7-1.2]
EDUCATION		***		***		***		**	
No qualifications or pre-high school diploma (ref.)	1,996	50.9	1	37.9	1	58.5	1	51.3	1
High school diploma	718	60.1	1.5 [1.2-1.8]***	40.0	1.1 [0.9-1.4]	61.7	1.1 [1.0-1.4]	53.3	0.9 [0.7-1.0]
Post-high school diploma	1,050	70.4	2.0 [1.6-2.4]***	53.2	1.7 [1.4-2.1]***	69.6	1.5 [1.3-1.9]***	61.5	1.2 [1.0-1.5]
SOCIOECONOMIC STATUS		***							
White-collar workers (ref.)	962	51.2	1	38.5	1	64.2	1	52.8	1
Blue-collar workers	896	53.1	1.2 [1.0-1.5]*	38.6	1.1 [0.9-1.4]	57.8	0.8 [0.7-1.0]*	52.3	1.0 [0.8-1.5]
Tradespeople, merchants, company directors and farmers	270	53.3	1.1 [0.8-1.5]	40.7	1.1 [0.8-1.4]	56.9	0.7 [0.6-1.0]*	53.7	1.1 [0.8-1.5]
Intermediate professions	721	67.3	1.6 [1.3-2.0]***	47.6	1.2 [0.9-1.4]	65.9	0.9 [0.7-1.1]	58.3	1.1 [0.9-1.3]
Managerial and professional occupations	717	67.9	1.6 [1.2-2.0]***	50.1	1.2 [0.9-1.5]	65.6	0.9 [0.7-1.1]	59.6	1.0 [0.8-1.3]
Other non-workers	199	51.8	1.2 [0.8-1.6]	36.7	1.2 [0.8-1.6]	54.4	0.8 [0.6-1.1]	43.0	0.7 [0.5-0.9]*
PERCEIVED INFORMATION ON THE HEALTH EFFECTS OF DIET		***		***		***		***	
Very or somewhat poorly informed (ref.)	1,278	48.4	1	37.6	1	51.9	1	46.1	1

*: p<0.05; **: p<0.01; ***: p<0.001
Adjustment variables of models 1a, 2a, 3a and 4a: sex, age, income per consumption unit in terciles, level of education, socioeconomic status and perceived information on the health effects of diet.
Abbreviations: CI = Confidence interval; DK = Don't know; OR = Odds ratio; ref. = reference; CU = Consumption unit.

TABLE IV | (continued)

	n total	%	OR [95% CI]	%	OR [95% CI]	%	OR [95% CI]	%	OR [95% CI]
Very or somewhat well informed	2,484	63.1	1.8 [1.6-2.1]***	45.1	1.4 [1.2-1.6]***	67.5	1.9 [1.7-2.2]***	58.9	1.7 [1.5-2.0]***
		Fruit & vegetables (n=3,721)			Red meat (n=3,721)		Processed meat (n=3,721)		Salt (n=3,721)	
		Model 1b			Model 2b		Model 3b		Model 4b	
	n total	%	OR [95% CI]	%	OR [95% CI]	%	OR [95% CI]	%	OR [95% CI]
FOOD INSECURITY			*						*	
You can eat all the food you want (ref.)	2,659	61.3	1	43.2	1	62.9	1	56.3	1
You have enough to eat but not always the food that you would like	918	51.9	0.8 [0.7-0.9]**	41.4	1.2 [1.0-1.4]*	62.3	1.1 [0.9-1.3]	53.2	1.0 [0.8-1.2]
At times, you do not have enough to eat	146	44.5	0.8 [0.5-1.1]	33.1	1.1 [0.8-1.6]	52.3	1.0 [0.7-1.4]	37.0	0.6 [0.4-0.9]***

*: p<0.05; **: p<0.01; ***: p<0.001
Adjustment variables of models 1b, 2b, 3b and 4b: sex, age, income per consumption unit in terciles, level of education, socioeconomic status, perceived information on the health effects of diet and food insecurity. For table size reasons, only the findings in relation to food insecurity are shown.
Abbreviations: CI = Confidence interval; OR = Odds ratio; ref. = reference.

activity (as well as perceived information on the effects of diet for the obesity/overweight risk factor) (Table V).

Overall, there is greater perception of these two fac-

70.0% of those surveyed designate physical activity as a protective factor

tors in men, the 15-24 age group, subjects with a mid-range income level (between €1,101 and €1,800/CU), those with a post-high school or high school diploma education level and those considering themselves to be well or very well-informed on the health effects of exercise or diet. The influence of professional status dif-

75.5% of those surveyed perceive overweight and obesity as risk factors

fers according to the factors. For physical activity, there is a lower perception among the "workers" and "other non-workers" categories of its protective effect than among "white-collar workers". For overweight and obesity, subjects with an intermediate occupation perceive this risk factor more than white-collar workers.

The "food insecurity variable" does not emerge as a factor modifying the perception of the influence of regular physical activity, overweight and obesity on cancer (once adjusted for sex, age, income, education, socioeconomic status and perceived information).

Furthermore, the perception of the risks associated with overweight and obesity also varies according to the body mass index (BMI)[4] and the subject's proximity to cancer[5]. More subjects of normal weight (18.5 < BMI < 25) perceive the harmful effect of overweight and obesity on cancer than those who are themselves overweight or obese (respectively: 77.6%, 73.6% and 71.3%).

POOR PERCEPTION OF BREASTFEEDING AS A PROTECTIVE FACTOR IN CANCER RISK

The fact that breastfeeding lowers the mother's breast cancer risk is poorly perceived by women. Only 34.0% of the women surveyed perceived its protective effect while over one-third of women are of the view that breastfeeding has no impact on the mother's breast cancer risk and almost one-quarter state that they do not know whether breastfeeding plays a role in the onset of cancer (Table III).

The perception of the protective effect of breastfeeding is associated with certain sociodemographic variables

4. Weight and height are reported by the participant.
5. The "body mass index" and "subject's proximity to cancer" variables were not selected in the logistic regression model.

TABLE V | Factors associated with the perception of the impact of regular physical activity, overweight and obesity on cancer

		Physical activity (n=3,764) of risk		Obesity/Overweight (n=3,762) of risk	
		Model 1a		Model 2a	
	n total	%	OR [95% CI]	%	OR [95% CI]
SEX		***		***	
Male (ref.)	1,846	72.4	1	78.7	1
Female	1,918	67.8	0.8 [0.7-0.9]***	72.6	0.7 [0.6-0.9]***
AGE		***		***	
15-24 years (ref.)	577	77.0	1	83.6	1
25-34 years	631	73.4	0.7 [0.5-0.9]**	78.0	0.6 [0.5-0.6]**
35-44 years	658	68.2	0.6 [0.4-0.7]***	71.1	0.5 [0.3-0.6]***
45-54 years	667	66.0	0.6 [0.5-0.8]***	73.3	0.5 [0.4-0.7]***
55-64 years	598	68.0	0.6 [0.5-0.9]**	76.4	0.7 [0.5-0.9]**
65-74 years	370	69.2	0.6 [0.4-0.8]**	76.2	0.6 [0.4-0.8]**
75-85 years	264	67.7	0.7 [0.5-0.9]*	66.0	0.4 [0.3-0.6]***
INCOME/CU IN TERCILES		***		*	
€0-1,100 (ref.)	1,190	63.1	1	70.8	1
€1,101-1,800	1,307	72.9	1.3 [1.1-1.7]**	77.2	1.3 [1.0-1.5]*
>€1,800	944	77.7	1.2 [0.9-1.5]	80.8	1.2 [1.0-1.6]
DK/declined to answer	323	61.6	0.8 [0.6-1.0]	71.0	0.9 [0.7-1.2]
EDUCATION		***		***	
No qualifications or pre-high school diploma (ref.)	1,996	62.0	1	70.9	1
High school diploma	718	77.4	1.7 [1.4-2.2]***	79.4	1.4 [1.1-1.7]**
Post-high school diploma	1,050	80.3	1.9 [1.6-2.4]***	81.7	1.6 [1.2-2.0]***
SOCIOECONOMIC STATUS		***		*	
White-collar workers (ref.)	962	69.8	1	72.0	1
Blue-collar workers	896	62.7	0.7 [0.6-0.9]**	74.5	1.1 [0.9-1.4]
Tradespeople, merchants, company directors and farmers	270	65.7	0.8 [0.6-1.0]	68.4	0.8 [0.6-1.1]
Intermediate professions	721	75.7	1.0 [0.8-1.3]	81.0	1.3 [1.0-1.7]*
Managerial and professional occupations	717	80.9	1.2 [0.9-1.6]	81.5	1.2 [0.9-1.5]
Other non-workers	199	50.9	0.5 [0.3-0.6]***	65.6	0.8 [0.6-1.1]
PERCEIVED INFORMATION ON THE HEALTH EFFECTS OF DIET				***	
Very or somewhat poorly informed (ref.)	1,278			68.5	1
Very or somewhat well informed	2,484			79.2	1.6 [1.4-1.9]***
PERCEIVED INFORMATION ON THE EFFECTS OF PHYSICAL ACTIVITY		***		**	
Very or somewhat poorly informed (ref.)	845	57.8	1	68.6	1
Very or somewhat well informed	2,919	73.6	2.0 [1.7-2.3]***	77.6	1.3 [1.1-1.6]**

*: p<0.05; **: p<0.01; ***: p<0.001

Adjustment variables of models 1a and 2a: sex, age, income per consumption unit in terciles, level of education, socioeconomic status and perceived information on the health effects of diet (for model 2a only) and of physical activity.

Abbreviations: CI = Confidence interval; DK = Don't know; OR = Odds ratio; ref. = reference; CU = Consumption unit.

TABLE V | (continued)

| | Physical activity (n=3,722) | | | Obesity/Overweight (n=3,721) | | |
| | | Model 1b | | | Model 2b | |
	n total	%	OR [95% CI]	%	OR [95% CI]
FOOD INSECURITY					
You can eat all the food you want (ref.)	2,659	72.8	1	76.9	1
You have enough to eat but not always the food that you would like	918	67.0	1.0 [0.8-1.2]	74.5	1.1 [0.9-1.3]
At times, you do not have enough to eat	146	45.3	0.7 [0.5-0.9]	60.6	0.8 [0.5-1.1]

Adjustment variables of models 1b and 2b: sex, age, income per consumption unit in terciles, level of education, socioeconomic status, perceived information and food insecurity. For table size reasons, only the findings in relation to food insecurity are shown.
Abbreviations: CI = Confidence interval; OR = Odds ratio; ref. = reference.

(Table VI). More women over 25 years of age than those in the 15 to 24 age group state that breastfeeding lowers the risk of breast cancer. Similarly, the higher their level of education, the higher the rate of perception of the protective effect of breastfeeding.

As regards socioeconomic status, more blue-collar workers than white-collar workers are of the view that breastfeeding is beneficial, whereas fewer non-working women hold this view. No trend is observed based on income, other than the fact that two times more women who do not know their household income or who do not wish to declare their income than those with the lowest incomes (<€1100/CU) are unaware of the protective effect of breastfeeding on breast cancer.

Furthermore, fewer women experiencing food insecurity attribute a protective effect against cancer to breastfeeding than women who are able to eat all the food they want.

CHANGES BETWEEN 2010 AND 2015: GREATER PERCEPTION OF THE ROLE OF DIET IN THE ONSET OF CANCER

For the first time, this Cancer Barometer has provided an opportunity to measure the changes in the French population's perception of the role of various nutritional factors (diet, physical activity, build, breastfeeding) in the onset of cancers through a comparative analysis of the responses obtained in 2010 and 2015. Those surveyed are increasingly aware of the importance of the role played by diet in the onset of cancer (Figure 1). In 2010, 86.7% of participants attributed a very important or somewhat important role to diet. In 2015, 90.6% of subjects are of the view that diet has an important role in the onset of cancer.

CHANGES IN FIVE YEARS OF THE PERCEPTION OF THE RISK OR PROTECTIVE EFFECT ASSOCIATED

In 2015, 90.6% of subjects are of the view that diet has an important role in the onset of cancer

WITH CERTAIN NUTRITIONAL FACTORS

The findings for the perception of the risk or protective effect associated with certain nutritional factors are shown in figures 2, 3 and 4. The analysis of these figures demonstrates that, regardless of the factor in question, those surveyed have a more definite opinion in 2015 than in 2010 on the nutrition questions asked. Indeed, the proportion of subjects responding "don't know" decreases by at least half between 2010 and 2015.

In the case of known dietary risk factors, the level of their perception increased between 2010 and 2015. Figure 2

TABLE VI | Factors associated with the perception of the impact of breastfeeding on cancer

| | Breastfeeding (women only, n=1,918)   of risk | | |
| | | Model 1a | |
	n total	%	OR [95% CI]
AGE		*	
15-24 years (ref.)	284	23.8	1
25-34 years	320	38.6	1.7 [1.2-2.4]**
35-44 years	333	36.6	1.6 [1.1-2.4]**
45-54 years	328	39.2	2.0 [1.4-2.9]***
55-64 years	307	32.8	1.6 [1.1-2.4]*
65-74 years	190	31.9	1.6 [1.0-2.4]*
75-85 years	156	32.0	1.9 [1.2-2.9]**
INCOME/CU IN TERCILES		*	
€0-1,100 (ref.)	692	32.3	1
€1,101-1,800	639	35.4	0.9 [0.7-1.1]
>€1,800	409	40.8	1.0 [0.7-1.3]
DK/declined to answer	178	20.7	0.5 [0.3-0.8]**
EDUCATION		***	
No qualifications or pre-high school diploma (ref.)	1,032	28.4	1
High school diploma	362	37.0	1.6 [1.2-2.1]**
Post-high school diploma	524	43.1	1.8 [1.3-2.4]***
SOCIOECONOMIC STATUS		**	
White-collar workers (ref.)	722	31.5	1
Blue-collar workers	290	37.0	1.4 [1.1-1.9]*
Tradespeople, merchants, company directors and farmers	121	30.6	1.0 [0.7-1.5]
Intermediate professions	382	40.4	1.2 [0.9-1.6]
Managerial and professional occupations	269	38.6	1.1 [0.8-1.5]
Other non-workers	134	17.1	0.5 [0.3-0.8]**

| | Breastfeeding (women only, n=1,896) | | |
| | | Model 1b | |
	n total	%	OR [95% CI]
FOOD INSECURITY		*	
You can eat all the food you want (ref.)	1,297	61.3	1
You have enough to eat but not always the food that you would like	516	51.9	0.9 [0.7-1.1]
At times, you do not have enough to eat	83	44.5	0.4 [0.2-0.8]**

*: p<0.05; **: p<0.01; ***: p<0.001
Adjustment variables of model 1a: age, income per consumption unit in terciles, level of education and socioeconomic status.
Adjustment variables of model 1b: sex, age, income per consumption unit in terciles, level of education, socioeconomic status and food insecurity. For table size reasons, only the findings in relation to food insecurity are shown.
Abbreviations: CI = Confidence interval; DK = Don't know; OR = Odds ratio; ref. = reference; CU = Consumption unit.

FIGURE 1 | Progression of perceived importance of the role of diet
in the onset of cancer between 2010 and 2015 (n = 6,843) (p <0.0001)
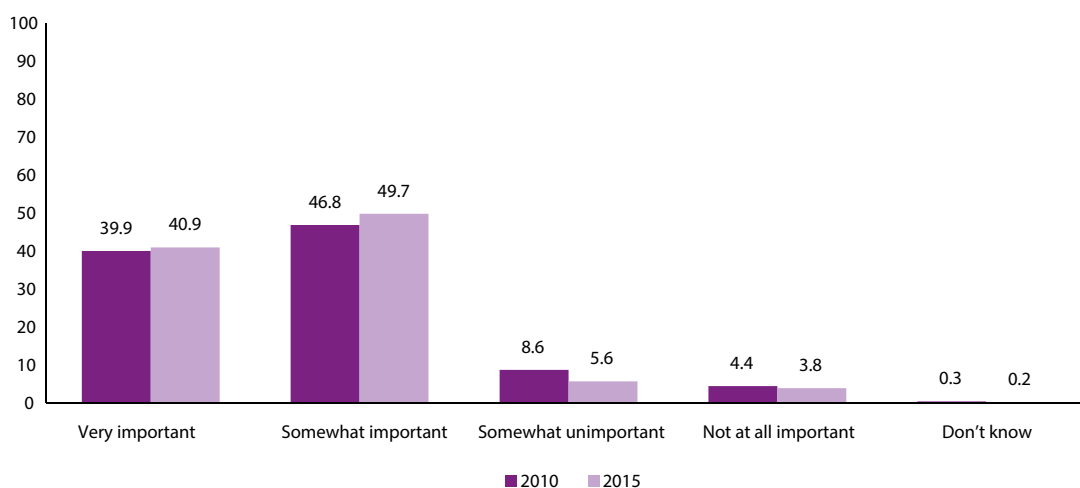
Abbreviation: DK = Don't know.

shows a change of over 11 points in the perception of the cancer risk associated with red meat consumption, up from 31.0% to 42.7%. For processed meat, the rates have risen from 47.9% to 62.3%. In the case of salt and salty foods, the change is 18.5 points (up from 37.1% to 55.6%). Overweight and obesity are perceived as a risk factor in cancer by 63.9% of those surveyed in 2010 and by 76.0% in 2015. However, while a majority of subjects are of the view that these factors can increase the onset of cancer, the number of subjects who think that these foods have no impact on cancer risk also increased between 2010 and 2015. This rate increased two-fold for red meat and salt and salty foods, and even more for processed meat.

Those surveyed have a more definite opinion in 2015 than in 2010 on the nutrition questions asked

For known protective factors (Figure 3), opinions are once again more definite than in 2010, with a halving of the number of subjects answering "don't know" for each factor as regards the impact of these nutritional factors on the onset of cancer.

The proportion of subjects perceiving the protective role of physical activity increased to 70.3% in 2015. In the case of breastfeeding, this percentage also increased, but an increasing number of women are of

the view that breastfeeding has no impact on the onset of cancer (27.4% in 2010 and 37.9% in 2015). For fruit and vegetables, the percentage of subjects perceiving their protective role remained more or less stable (58.4% in 2015) but a greater proportion of the population are of the view that they have no impact on cancer risk (+ 11.8 points between 2010 and 2015).

As regards milk consumption, in 2015, the majority of those surveyed (52.9%) are of the view that milk consumption has no impact on the onset of cancer while this percentage was 30.1% in 2010. However, milk, like dairy products in general, lowers the risk of colorectal cancer [7].

For the other factors studied (Figure 4), a decrease for each factor by over half of the number of subjects answering "don't know" as regards the impact of the nutritional factors on the onset of cancer is observed between 2010 and 2015. This decrease resulted in an increase in the number of subjects stating that the various factors have no impact on cancer risk.

In relation to fish consumption, the number of subjects who were of the view that it lowers cancer risk remained stable between 2010 and 2015. However, the proportion of those who are of the view, on the other hand, that fish consumption increases cancer risk doubled between 2010 and 2015 (3.3% versus 7.8%). A similar trend is observed for those who are of the view that it has no impact on cancer risk (21.4% in 2010, 39.3% in 2015).

FIGURE 2 | Progression of the perception of known risk factors in relation to cancer risk between 2010 and 2015 (n = 6,843)
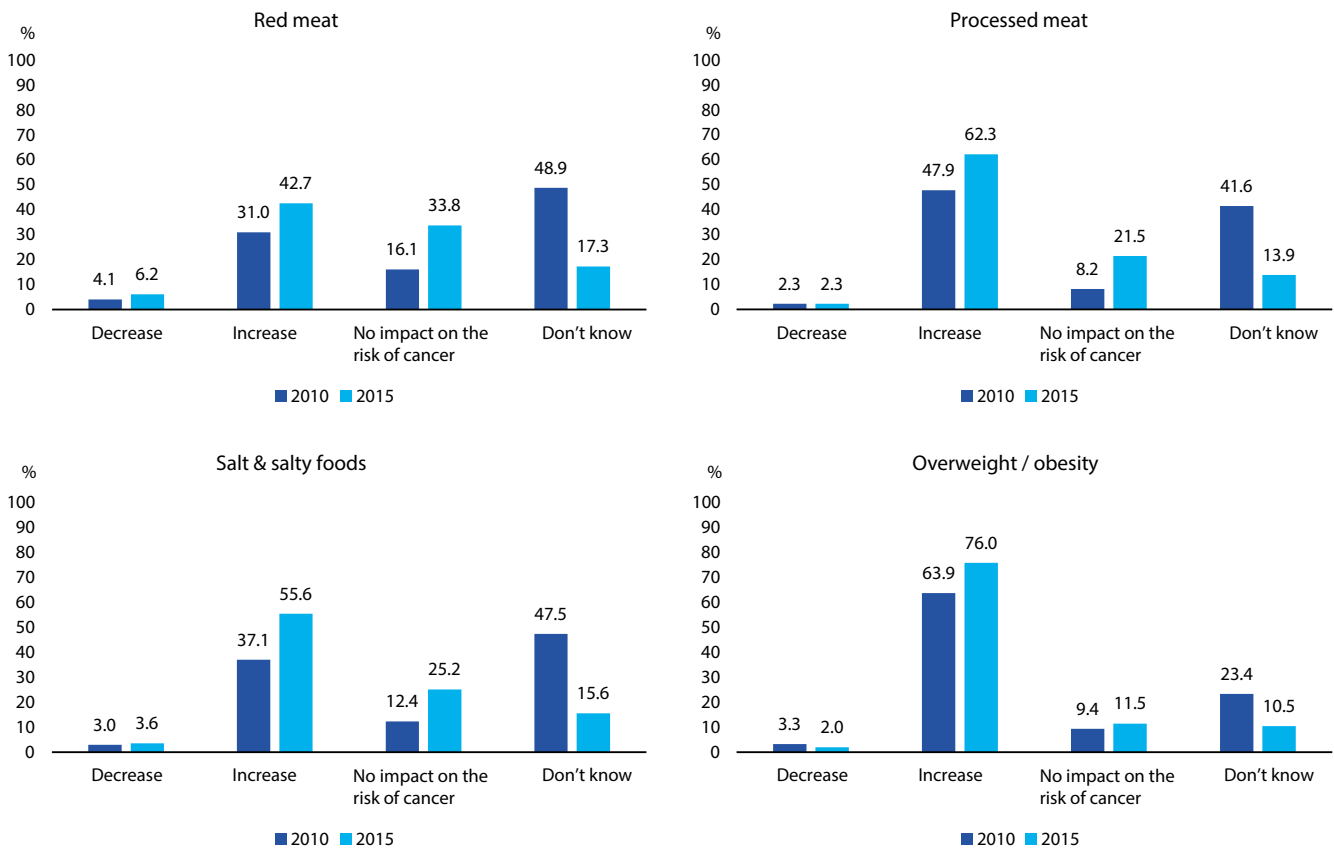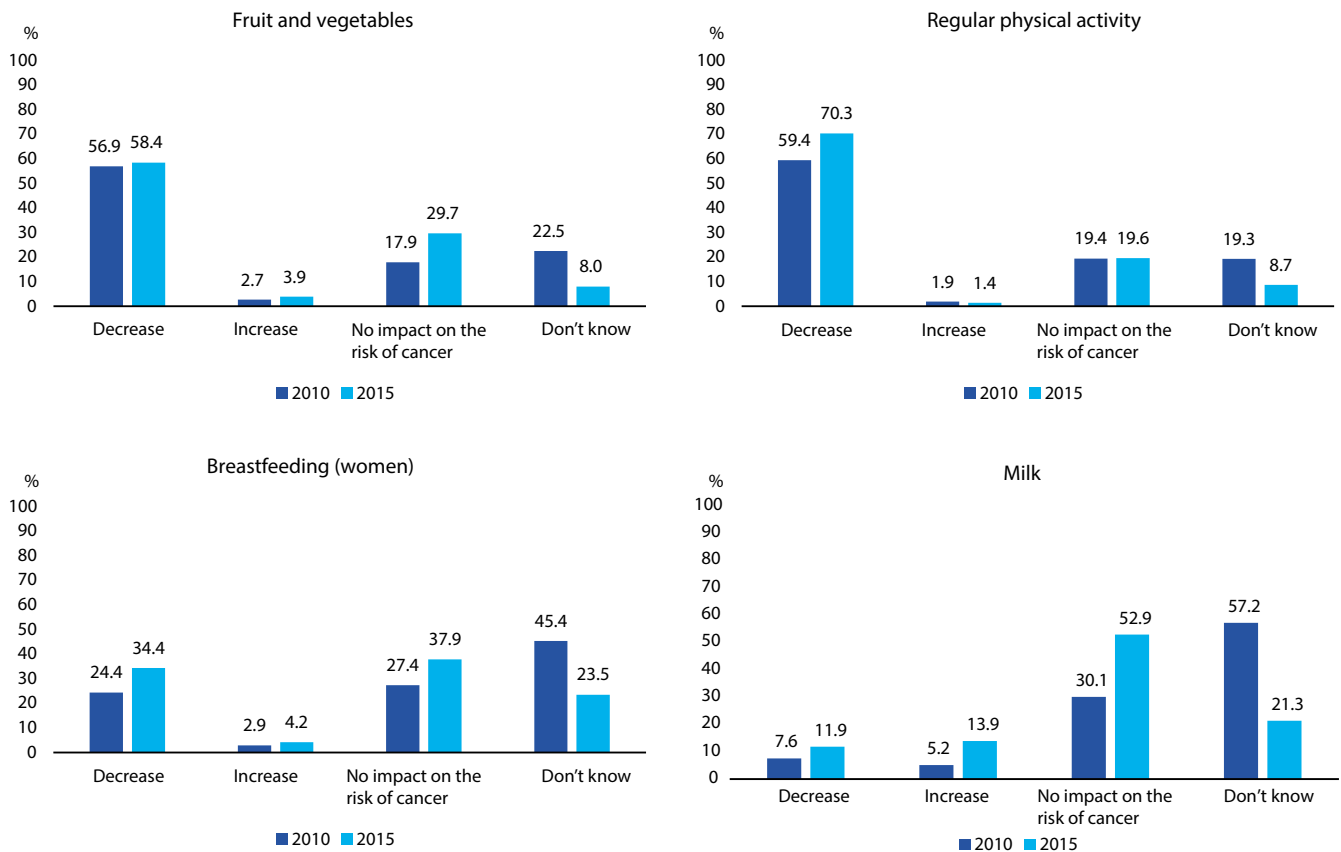

Abbreviation: DK = Don't know.

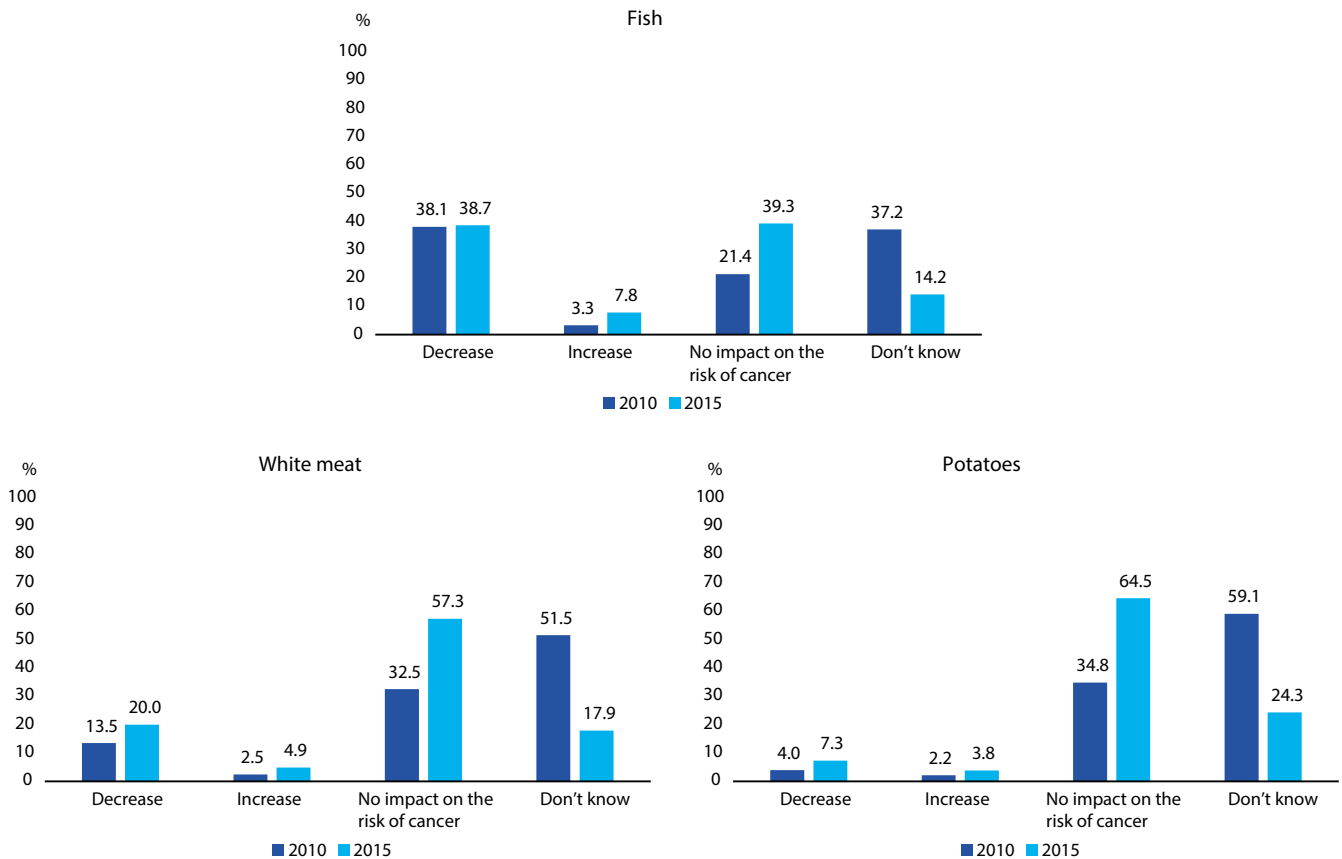## In 2015, the majority of those surveyed are of the view that milk consumption has no impact on the onset of cancer

In the case of the consumption of white meat and potatoes, an increased number of subjects claim that consumption of these foods has no impact on the onset of cancer as only 32.5% stated this view in 2010 as opposed to 57.3% in 2015 for white meat. For potatoes, one-third expressed this opinion in 2010 as opposed to two-thirds in 2015.

DISCUSSION

The aim of the Cancer Barometers is to analyse the representations of representative samples of the French population in relation to cancers at a given time and their changes over time. For the first time in the case of nutrition, this tool provides us with five years of follow-up on trends in perceptions. For ease of reading, it has been chosen to compile the main findings under major themes and discuss them on the basis of the data from the literature and some assumptions made: the structure of the survey tool used is not always suitable for obtaining a full understanding of the significance of the responses of those surveyed.

FIGURE 3 | Progression of the perception of known protective factors in relation to cancer risk between 2010 and 2015 (n = 6,843; women n = 3,465)

Fruit and vegetables

	Decrease	Increase	No impact on the risk of cancer	Don't know
2010	56.9	2.7	17.9	22.5
2015	58.4	3.9	29.7	8.0

■ 2010 ■ 2015

Regular physical activity

	Decrease	Increase	No impact on the risk of cancer	Don't know
2010	59.4	1.9	19.4	19.3
2015	70.3	1.4	19.6	8.7

■ 2010 ■ 2015

Breastfeeding (women)

	Decrease	Increase	No impact on the risk of cancer	Don't know
2010	24.4	2.9	27.4	45.4
2015	34.4	4.2	37.9	23.5

■ 2010 ■ 2015

Milk

	Decrease	Increase	No impact on the risk of cancer	Don't know
2010	7.6	5.2	30.1	57.2
2015	11.9	13.9	52.9	21.3

■ 2010 ■ 2015

Abbreviation: DK = Don't know.

DIET IS PERCEIVED AS HAVING A SIGNIFICANT IMPACT ON THE RISK OF ONSET OF CANCER

In 2015, even more than in 2010, a predominant majority of subjects (90.8%) are aware of the important role played by diet in the risk of onset of cancer. Differences are however observed according to sex, age, education and place of residence. While in 2010, the Cancer Barometer highlighted that there was no difference in perception according to sex[6], this changed in 2015: more women now perceive the importance of diet in the risk of onset of cancer (92.4% versus 89.2% for men).

A similar finding emerged from a study of the Health Nutrition Barometer in 2008 [16]. A possible explanation could be that women are more knowledgeable on nutrition than men [16], that they are more interested in having a healthy diet [17] and have healthier dietary habits overall [18]. Nevertheless, in our survey, when subjects were questioned more specifically on the benefits or risks of certain foods (red meat, fruit and vegetables, etc.) in relation to cancer, no significant difference is observed based on the food type and the subject's sex, except for salty food consumption. This lack of significant difference could be correlated with perceived information on the health effects of diet

6. The data collected in 2010 and 2015 are comparable, as the questions asked were identical.

FIGURE 4 | Progression of the perception of other factors considered between 2010 and 2015 (n = 6,843)

Fish

	Decrease	Increase	No impact on the risk of cancer	Don't know
2010	38.1	3.3	21.4	37.2
2015	38.7	7.8	39.3	14.2

■ 2010 ■ 2015

White meat

	Decrease	Increase	No impact on the risk of cancer	Don't know
2010	13.5	2.5	32.5	51.5
2015	20.0	4.9	57.3	17.9

■ 2010 ■ 2015

Potatoes

	Decrease	Increase	No impact on the risk of cancer	Don't know
2010	4.0	2.2	34.8	59.1
2015	7.3	3.8	64.5	24.3

■ 2010 ■ 2015

Abbreviation: DK = Don't know.

which has a significant impact in each model tested, and was not included in the model on diet as a whole. Moreover, further sociodemographic variables such as the level of education and income play a significant role in the perception of the positive and negative effects of diet in relation to cancer, regardless of the nutritional factor in question, thereby highlighting the need to develop health communication and education strategies accounting for these variables. To our knowledge, no recent study with a robust methodology examining populations' perceptions, attitudes or knowledge on the links between diet and cancer according to sociodemographic characteristics is available. As such, the findings of Cancer Barometer 2015 are the most recent data on the matter and are consistent with the findings of the Health Nutrition Barometer of 2008 in which the links between knowledge of nutrition and sociodemographic characteristics were explored [16]. However,

these findings require confirmation via studies particularly accounting for the impact that subjects' knowledge and dietary habits may have on their perceptions.

MODERATE PERCEPTION OF THE RISKS AND BENEFITS OF CERTAIN FOODS IN RELATION TO CANCER

The foods representing a probable risk of onset of cancer (red meat and salt or salty foods) are moderately perceived as increasing cancer risk (by 42.6% and 54.6% of subjects, respectively). These findings could be explained by the fact that communication on nutritional guidelines does not specifically make the connection with potential cancer onset risks. In the case of

salt and salty products more specifically, subjects may have a greater perception of the risk of developing cardiovascular diseases [19] rather than cancer. As regards red meat, no communication had been hitherto aimed at the general public on the risks associated with its consumption in particular. The guideline was to consume meat, fish or eggs once to twice a day to ensure adequate protein intake, without specifying the type of meat to be preferred. In its review published in 2018, the French Public Health Council (HCSP) [20] recommends not exceeding a consumption of 500 g of red meat per week, particularly in the light of the probable level of evidence on the increase in cancer risk associated with red meat consumption [7]. Nevertheless, while the Barometer data suggest the potential benefit of better informing the population on the risks of such consumption, these findings on subjects' perceptions should be compared to their actual consumption. Indeed, the findings of the INCA3 study [21] indicate that the average meat (other than poultry) consumption which matches the definition of red meat is 47.3 g/day in adults, or approximately 330 g/week, which is below the guideline. It should also be noted that the French population's meat consumption has declined continuously since the late 1990s [22, 23]. The risk represented by processed meat consumption appears to be better identified by those surveyed (62.2%). As for red meat, the guidelines changed recently: since 2018, HCSP recommends limiting the portions consumed to 150 g/week [20]. However, the messages conveyed in recent years, in the context of communication on high-fat and salty products, have recommended limiting processed meat consumption as much as possible, which could potentially explain the better perception of the risks associated with the consumption of this food group.

Moreover, it is important to note that foods representing a convincing or probable risk of onset of cancer are better perceived in 2015 compared to the findings of Cancer Barometer 2010. The report published by INCa in June 2015 on nutrition and cancer prevention [24] may have influenced these results. As a reminder, in our survey, the subjects were interviewed between May and October 2015. As such, these subjects may have consulted the findings released in this report, available via open access, or be aware of the main findings of these report through the media.

The benefits of fruit and vegetable consumption are moderately perceived by those surveyed (58.1%). Subjects over 45 years of age perceive their beneficial effects more than younger subjects. Prevention campaigns recommending eating five fruit and vegetables a day have been frequent and visible nationally. However, these campaigns do not state the benefits associated with the consumption of these products on the risk of developing a disease such as cancer, which could explain why almost 30% of those surveyed perceive a lack of beneficial effect of fruit and vegetable consumption on the risk of onset of cancer (and why 8% do not state any opinion). A further hypothesis is that the risk of contamination of these products by pesticides [25] limits the perception of their health benefits for a certain number of subjects. In keeping with this idea, according to Agence Bio, in 2017, 59% of French people consumed organic fruit and vegetables regularly and, as a general rule, organic products were consumed essentially to protect their health (for 69% of consumers) [26].

In the case of foods for which there is no evidence of a link with cancer (white meat, potatoes and fish), the majority of participants state that these foods have no impact or that they do not know whether these foods represent a risk or a benefit in relation to cancer. These findings appear to be consistent with the current data from research on the protective and risk factors of onset of cancer. However, for fish consumption, the respondents are more divided between a perception of a beneficial effect or a lack of impact. Indeed, HCSP [20] recommends eating fish twice a week, alternating with meat and egg consumption, to vary the sources of protein. However, messages on the possible contamination of fish (by heavy metals for example) could explain why participants are divided on the health risks and benefits of this food.

Finally, the majority of respondents perceive milk consumption, for which protective effects have been observed, as having no impact on cancer risk. This finding could be explained by the contradictory messages conveyed in the media and changes in the level of evidence in relation to this food in recent years. For example, some TV adverts highlight the benefits of the consumption of dairy products, which are rich in calcium, whereas "anti-dairy" campaigns, particularly those broadcast by the association Pour une Éthique dans le Traitement des Animaux (PETA, For Ethical Treatment of Animals) or conveyed in publications aimed at the general public, encourage lactose-free product consumption, pointing out the health risks of dairy product consumption. This finding requires further investigation within the framework of a qualitative study.

OVERWEIGHT AND OBESITY ARE PERCEIVED AS RISK FACTORS, BUT LESS SO BY THOSE MOST CONCERNED

The majority of those surveyed (75.5%) state that being overweight or obese increases the risk of developing cancer. This risk factor seems to be particularly well-known to men, young people (15-24 years), subjects with a midrange income or those with post-high school diploma education. On the other hand, blue-collar workers and non-workers seem to be less aware of this cancer risk factor. Similarly, subjects who are overweight (73.6%) or obese (71.3%) are less likely to perceive the risk represented by their nutritional status in relation to the onset of cancer, than those with a "normal" BMI (77.6%). Yet, in the long term, overweight and obesity prove to be harmful for health and increase the risks of onset of a large number of cancers (oesophagus, endometrium, kidney, colon-rectum, liver, pancreas, breast post-menopause, etc.) [7] and other chronic diseases [27]. In the case of obese subjects, we can assume that these responses are expressions of a coping strategy [28]. This means that these subjects have a lower perception of the risks represented by their weight status for their health as they appear to be adopting a positive attitude allowing them to have a good quality of life and fewer emotional or body image-related problems.

In France, the Esteban study demonstrated that the prevalence of overweight in 2015 was 54% in men and 44% in women and that obesity affects 17% of French adults, with no changes in the last 10 years [29]. Nevertheless, the prevalence of overweight (including obesity) has remained higher in subjects with the lowest level of education, who are also those with the lowest perception of the risk of overweight/obesity on the onset of cancer. Therefore, these findings raise the importance of adapting public health policies to reduce social health inequalities on this subject.

GOOD PERCEPTION OF THE BENEFITS OF PHYSICAL ACTIVITY

The benefits of physical activity in relation to cancer are reported by 70.0% of participants. Different findings are reported according to age, sex, socioeconomic status and income or education. More young people (15-24 age group) report the benefits of physical activity in relation to cancer prevention. We can assume that subjects who are physically active have a greater perception of the protective effect of physical activity. In keeping with this idea, the findings of the Esteban study [30] show that younger subjects (18-39 age group) are more likely

to have a "high" level of physical activity and that prevalence decreases with age, for both men and women. On the other hand, for men, "moderate" physical activity increases with age. Therefore, it would be of interest to conduct a more refined assessment of the congruence between practice of physical activity and perception of the benefits of such activity. While the majority report the beneficial effect of physical activity, almost 20% of those surveyed are of the view that there is no effect, despite the many campaigns on the benefits of physical activity.

In France, Manger Bouger is a national programme aimed at raising awareness in the population of the general health benefits of physical activity and diet [31]. As such, the current prevention campaigns do not provide specific information on cancer-related nutritional risks. However, a majority of those surveyed perceive physical activity as helping lower the risk of onset of cancer although the level of evidence is only high for a few cancer sites [7]. At the present time, studies indicate that regular physical activity lowers the risk of developing cancer of the colon and would appear to have a probable effect on the risk of developing breast or endometrial cancer. No effect has been demonstrated on other cancers [7]. Among the reasons stated by those who practise physical activity and sports, the health benefits are generally highlighted as one of the main motivations [32-34]. Indeed, regular physical activity helps lower the risk of developing certain chronic diseases, such as cardiovascular diseases [35]. We can thus assume that the participants in our study view physical activity as beneficial for health overall.

POOR PERCEPTION OF THE BENEFITS OF BREASTFEEDING

When surveyed on their perception of the effect of breastfeeding on cancer risk, only 34.0% of women mention the protective effect of breastfeeding. This protective factor is primarily reported by women from 45 to 54 years of age, blue-collar workers, with a high level of education, who do not know the household income or who have a relative affected by cancer. However, according to the French National Institute of Statistics and Economic Studies (INSEE) [36], in France, the average age at which women have their first child is 28.5 years. This indicates that women of breastfeeding age have a lower perception of the benefits that breastfeeding represents for their own health. It is however important to note that, in 2015, women have a higher perception of the benefits of breastfeeding for their health than in 2010. This tends to show that women are increasingly aware of this issue.

The benefits of breastfeeding for mothers and their children are highlighted by the World Cancer Research Fund and the American Institute for Cancer Research [7]. Women are advised to breastfeed their child for six months or more. The Collaborative Group on Hormonal Factors in Breast Cancer even states that breastfeeding for as long as possible (up to six years) continues to lower the risk of onset of breast cancer significantly [37]. According to the data from the French Longitudinal Study of Children (ELFE) [38], half of French women breastfeed their child for seventeen weeks or less, which is less than the international guidelines, particularly due to returning to work less than ten weeks post-partum. These findings suggest the interest of conducting a detailed survey of women's knowledge of the benefits of breastfeeding for their health and that of their child, particularly in view of current prevention campaigns. In France, breastfeeding promotion campaigns focus more on the benefits for the child than for the mother. More general communication on the benefits that breastfeeding represents could have an impact on women's perceptions of breastfeeding and provide potential leverage for promoting this practice. Studies are needed to assess this point.

CONCLUSION

As in 2010, diet is perceived in 2015 by the majority of subjects as an important factor in the onset of cancer. Furthermore, regardless of the nutritional factor in question, perceptions of the risks and benefits have improved between 2010 and 2015. Fewer subjects state that they do not know the links with the risk of developing cancer and subjects tend to identify protective and harmful factors better. As the study is based on specific questions, it is not possible to explain the underlying reason for the responses to the questions or for their changes over the years of the Cancer Barometer

surveys. Nevertheless, in this section, we have put forward hypotheses which would require further research.

The impact of certain nutritional factors is perceived in line with the scientific data. The benefits of physical activity and the risk represented by overweight/obesity are well perceived. For food groups having a positive or negative effect on cancer risk, the percentage of subjects perceiving these effects varies between 42.7% for red meat and 62.3% for processed meat. The benefits of breastfeeding are for their part perceived by merely one-third of women. The findings of this barometer can guide prevention strategies by targeting certain nutritional factors (breastfeeding, salt or salty foods, etc.) and certain groups of subjects (young people, those with less qualifications, etc.). When setting up these prevention campaigns, it would appear to be necessary to measure the potentially alarming impact of communication targeted at the general public on the links between diet and cancer risk and to assess the value of such communication compared to other sources of leverage that may have been studied such as well-being or enjoyment. Moreover, these findings should be looked at against French dietary consumption patterns as it is advisable to prioritise food groups for which consumption is far removed from the guidelines rather than those for which the perception of health benefits is not necessary adequate. Indeed, while some of these findings could give cause for querying the need to increase the population's perceptions of the links between nutrition and cancer, it is important to note that, besides perceptions of risk, a large number of parameters not measured in this barometer affect behaviour (knowledge, attitudes, price, accessibility, tastes, etc.).

Finally, in the light of trends in processed food consumption and the increasing range of organic products available, it would appear to be of interest to assess the perception of the links between cancer and highly processed foods, on one hand, and products obtained from organic farming, on the other, in a future survey.

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