

# CANCER BAROMETER 2015

## CANCER AND RISK FACTORS

### Opinions and perceptions of the French population

#### INTRODUCTION

In recent decades, the number of new cancer cases has seen a continuous rise in Europe. In France, despite the decline in prevalence observed in men and the slowing down of the rise in women, due to demographic trends and exposure to risk factors, the incidence of cancer has doubled in the last thirty years [1, 2]. In the early 2000s<sup>1</sup>, cancer represented the second leading cause of mortality after cardiovascular disease. At the present time, although an improvement in five-year survival has been observed [3], cancer remains the leading cause of premature mortality in France. Faced with this major public health challenge, France has adopted a proactive policy through the different cancer plans. One of the actions of the 2014-19 Cancer Plan (action 9.17) relates to the recurrence of the Cancer Barometer, the national study aimed at analysing the population's representations/beliefs with respect to cancers and their changes over time.

Because our behaviour, both with regard to patients and disease prevention, can be guided by the social representations developed in relation to cancer and risk factors, studying these representations is key. Indeed, representations form a functional world view enabling an individual to guide their behaviour, give it meaning and understand their environment through their own reference system [4]. These forms of knowledge referring particularly to opinions, perceptions, and more broadly to "lay theories", are neither true nor false, and neither right nor wrong;

they are conceptions other than those of science: they are a guide for individual action and social relationships [5]. In this sense, the social nature of representations stems from the system whereby they are developed and shared and their functions in the relationship with others and with the environment [6]: examining representations of cancer and risk factors therefore is not a matter of measuring the subjects' scientific knowledge/objective knowledge, but of revealing how subjects perceive this disease and its determinants. In terms of representations, the fundamental nature of beliefs is established by their vital presence in social life. The strength of beliefs is the driving force whereby representations are viewed as truths by individuals [7]. As such, the manner in which an individual will envision cancer and risk factors will impact their behaviour; on one hand – if for example an individual believes cancer to be hereditary and that nothing can be done to prevent it, why would they adopt health protective behaviours? – and their social interactions, on the other – thinking that cancer is contagious could give rise to behaviour stigmatising or isolating patients [8]. Also, many models demonstrate the role of representations and health beliefs on individual behaviour [health belief model [9], theory of planned behaviour] [10, 11], and highlight that these representations change over time [12].

There is an abundance of scientific literature on the representations of cancer patients and subjects at a high risk of cancer [13-16]. Studies on the general population, conducted in various countries, are also

1. In France, cancer is now the leading cause of death ahead of cardiovascular disease, as of 1988 for men and as of 2002 for women.

found in the literature [17, 18]. In France, the Cancer Barometer of the French National Cancer Institute (INCa) and Santé Publique France is the only recurrent study carried out on this population. This study concerns a very broad spectrum of domains in the field of cancer. This paper relates to data obtained from the Cancer Barometers of 2015, 2010 and 2005. It is aimed at highlighting the representations of the general population and of subjects who have or have had cancer in relation to this disease and the perception of risk factors. The findings of the 2015

survey conducted will be presented, followed by a comparative analysis with the 2010 and 2005 data. The aim is to highlight changes during these periods. In conclusion, channels to be studied will be proposed to be able to challenge policies and bring about appropriate changes in practices.

## Methodology

The data are sourced from the 2005, 2010 and 2015 Cancer Barometers. The methodology of the 2015 survey is described in a dedicated section (19).

### Population

The sample of the 2015 edition includes 4,139 subjects from 15 to 85 years of age, of whom 375 have previously been treated for cancer. The questions concerning the perception of cancer risk factors were put to subjects not currently or never previously treated for cancer. One-third of the sample selected at random were asked an open question\* on the term "cancer".

### 2005- 2010-2015 comparisons

Those surveyed aged over 85 years (surveyed in 2005 only), and those aged 15 years (surveyed in 2010 and 2015 only) were not included in the comparisons. The sample of subjects aged 16-75 years for 2005, 2010 and 2015 included 3,736, 3,392 and 3,817 subjects, respectively. Only questions asked in strictly the same way between 2005 and 2015 or 2010 and 2015 were used for the comparative section.

### Statistical analyses

SAS Enterprise Guide 7.13 software was used for the statistical analyses.

Chi<sup>2</sup> tests were carried out, with a view to comparing the differences in proportions in relation to perceptions based on the study population's characteristics. Odds ratios were calculated to measure the effect of sociodemographic variables and behaviours; the variables were adjusted for age and sex. To calculate the

odds ratios, the "don't knows", in view of their low representation, were considered as missing data.

### Qualitative analysis

A thematic analysis was carried out on all of the first words cited for the open question by those surveyed, in order to select only the most accessible term.

### Variables

The questions relating to the perception of cancer risk factors were asked in random order. Those surveyed were requested to state whether they thought that these factors could promote the onset of cancer ("definitely", "probably", "probably not", "definitely not", "don't know / no opinion").

The questions relating to their general opinion of cancers were also asked in random order and the interviewees responded whether they "completely agreed", "somewhat agreed", "somewhat disagreed", "completely disagreed", "don't know" with the proposed opinion.

Occupations and socioeconomic status: given that farmers only represent 1.6% of the sample in 2015, they were grouped together with tradespeople, merchants and company directors. Retired people and unemployed people were assigned their most recent socioeconomic status.

Marital status: the status "cohabiting" included those who were married and remarried, in a civil or common-law partnership or living together.

\* The question put to the subjects is "When I say the word cancer to you, which three words does this bring to mind? "

## FINDINGS

### OPINIONS ON CANCER

The subjects from the sample were surveyed on their conceptions of the most serious diseases, on their agreement with various widespread ideas on cancer and an analysis of changes in support for these ideas in recent years was conducted. Furthermore, questions on their perceptions of the most frequent and most serious cancer sites were asked. Similarly, their semantic universes in relation to cancer were highlighted. Finally, one item helped examine French people's perception of their risk of developing cancer.

#### Perceived as one of the most serious diseases

When those surveyed were asked to list the three diseases that they considered to be the most serious (Figure 1), it is observed that 96% mention cancer, well ahead of HIV-AIDS (40.5%), cardiovascular disease (31.5%), Alzheimer's disease (22.2%) and diabetes (10.2%). Listing cancer as one of the three

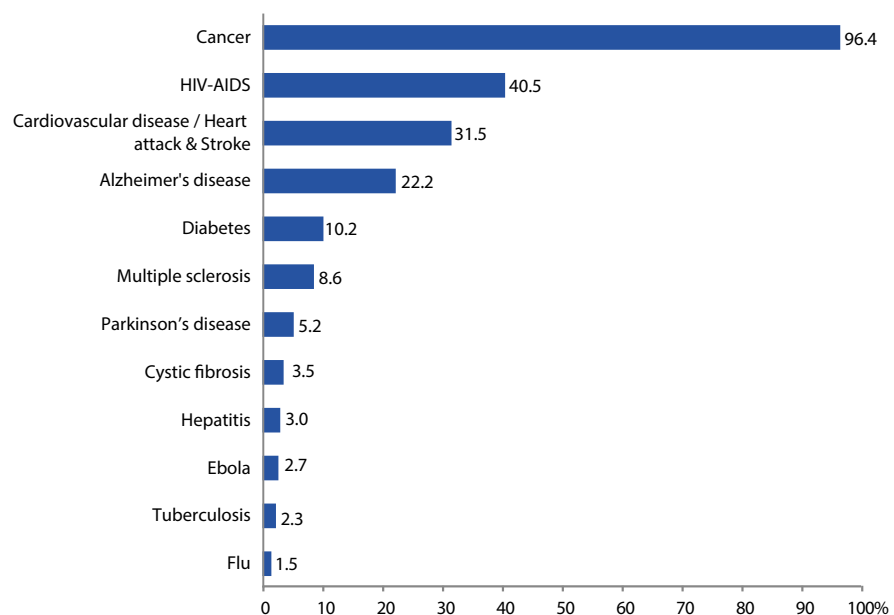
most serious diseases does not vary according to personal experience or that of a relative affected by cancer (previous or current experience, for oneself or a relative); moreover, this perception of the seriousness of cancer is homogeneous among all age groups. On the other hand, the perception of the seriousness of cancer is correlated with sex, with women being more inclined to list cancer as one of the three most serious diseases. Similarly, it is observed that significantly fewer subjects who have no qualifications, are unemployed or have a monthly income of less than €1,500 list cancer as one of the three most serious diseases.

#### A disease that affects everyone

To study representations in relation to cancer, those surveyed were provided with proposed statements: based on the previous versions of the INCa/Santé publique France Cancer Barometer, these are presented in figure 2. The analysis of this figure shows broad agreement with three statements: "no-one is safe from cancer", "when you have cancer, you are better off talking to your loved ones about it as much as possible" and "when you have had cancer, you can still lead a normal life". Conversely, the statement "some cancers are contagious" is broadly rejected as approximately 90% of those surveyed are of the view that cancer is not contagious.

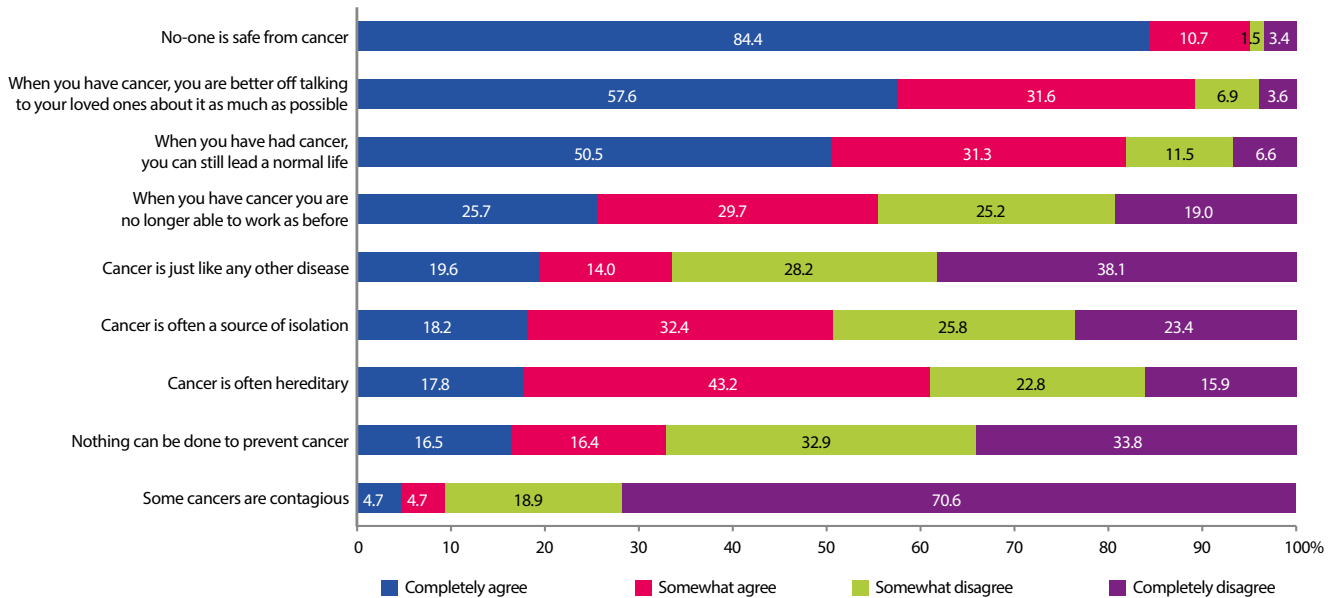
### More than 96% of French people list cancer as the most serious disease

FIGURE 1 | Diseases listed as among the three most serious disease (n = 4,139)



Note to the reader: only the top twelve results are shown for clearer reading. Three are not shown (malaria, chikungunya and hospital-acquired infections): they represent less than 0.60% of respondents.

FIGURE 2 | General opinions on cancer 2015 (n = 3,764)



61.0% of those surveyed are of the view that it is a hereditary disease and most of those surveyed reject the idea that nothing can be done to prevent cancer or that cancer is just like any other disease (66.7% and 66.3%). Opinions are more divided on the impact of cancer on work and social life: 55.4% of those surveyed are of the view that, after having had cancer, you are no longer able to work as you did before and 50.6% feel that cancer is a source of isolation.

### Changes in ten years on the hereditary aspect, sense of isolation and contagiousness

The changes in agreement with the statements presented below were almost all analysed over a ten-year period (Figure 3). Of these nine statements, three emerged as consensual and are found to be the most stable over time. From 2010 to 2015, a majority and stable rejection of the representation "nothing can be done to prevent cancer" is observed. In other words, over two out of every three people think that action can be taken to prevent cancer.

On the other hand, in the case of the five other statements, the differences observed are statistically significant. In 2015, almost 10% of subjects are of the view that "some cancers are contagious"; this percentage was 6.4% in 2010 and 7.7% in 2005, respectively. Furthermore, it has emerged that approximately 32% of those surveyed are of the view that "cancer is just like any other disease", which means that 68% are

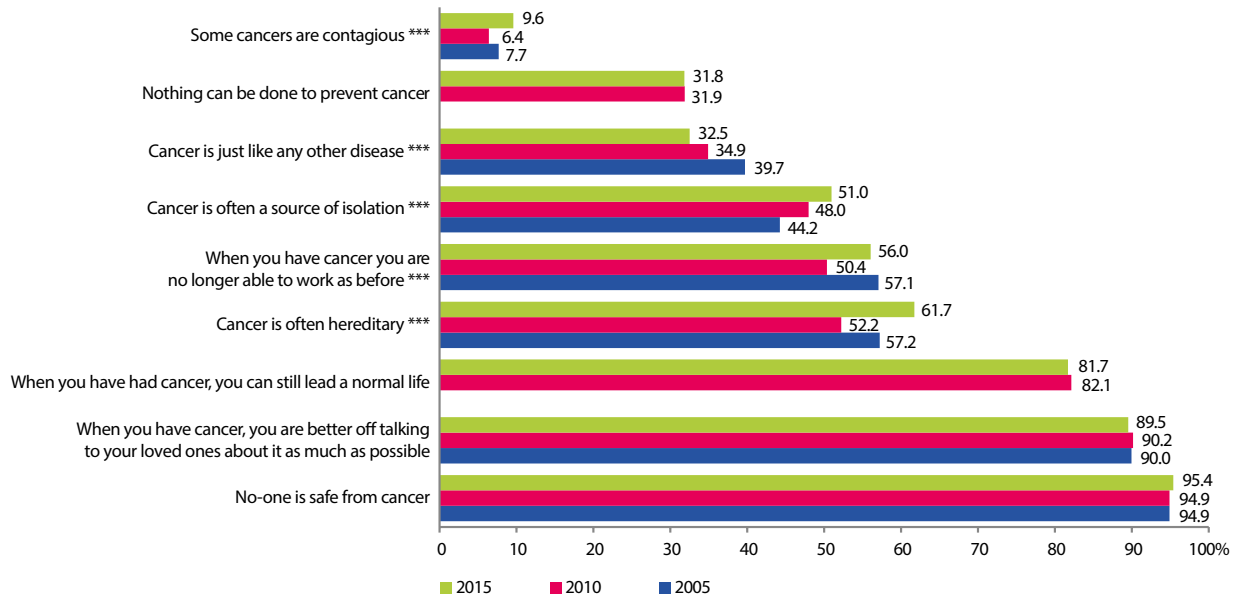
of the view overall that it is not just any disease. Stability in this representation over the period studied is observed: approximately 65% in 2010 and 60% in 2005. A majority of those surveyed think that "when you have cancer, you tend to be excluded". This perception of isolation of cancer patients has increased progressively from 2005 to 2015 (44.2% in 2005, 48.0% in 2010, 50.6% in 2015, meaning that it is up almost 7 points). As regards the opinion that "when you have cancer, you are no longer able to work as you did before", the proportion in 2015 (56.0%) is similar to that in 2005 (57.1%), whereas it was down approximately 5 points in 2010. As such, at the present time, the effects of cancer on work life are perceived as just as important as they were ten years ago. Finally, the idea that cancer is often hereditary is currently subject to a high level of agreement with 61.0% of those surveyed agreeing with this statement; this agreement is up almost 10 points from 2010 when perceptions appeared to be more divided.

Over two out of every three people think that action can be taken to prevent cancer

Almost 10% of subjects are of the view that "some cancers are contagious"

The effects of cancer on work life are perceived as being just as significant as they were ten years ago

FIGURE 3 | General opinions on cancer 2005-10-15 (Percentages responding agree and somewhat agree)



### Breast cancer perceived as the most common cancer and lung cancer as the most serious

As regards the most common sites, 65.3% of those surveyed (Table I)<sup>2</sup> cite breast cancer, followed by lung cancer (58.4%), then prostate cancer (27.4%). In terms of seriousness, Table I shows that 57.6% of those surveyed cited lung cancer, 27.0% breast

cancer and 22.1% pancreatic cancer. Cross-tabulation of these responses with the "sex" variable shows a significant difference for most of the cancers cited. For both questions, female cancers are cited more frequently by women and male cancers by men. More men cite lung cancer as one of the three most common and most serious cancers (65.2% and 62.1%, respectively) than women (52.1% and 53.3%, respectively).

TABLE I | Proportions of most common and most serious cancer sites according to sex of those surveyed (n = 4,139)

	TOTAL		MALE		FEMALE		Chi <sup>2</sup>
	n	%	n	%	n	%	
In your opinion, which are the three most common cancer sites?							
Cervix	691	16.7	65	3.3	626	29.2	<0.0001
Colorectal / Colon / Rectum	844	20.4	437	21.9	407	19.0	0.0191
Prostate	1,024	24.7	653	32.7	371	17.3	<0.0001
<b>BREAST</b>	<b>2,702</b>	<b>65.3</b>	<b>902</b>	<b>45.2</b>	<b>1,800</b>	<b>84.0</b>	<b>&lt;0.0001</b>
Skin, cutaneous melanoma	398	9.6	222	11.1	176	8.2	0.0014
Lung	2,417	58.4	1,300	65.2	1,117	52.1	<0.0001
Pancreas	328	7.9	177	8.9	151	7.0	0.0289
In your opinion, which are the three most serious cancer sites?							
Cervix	308	7.4	43	2.2	265	12.3	<0.0001
Colorectal / Colon / Rectum	549	13.3	282	14.1	267	12.5	0.1192
Prostate	475	11.5	323	16.2	152	7.1	<0.0001
Breast	1,117	27.0	398	19.9	719	33.5	<0.0001
Skin, cutaneous melanoma	303	7.3	148	7.4	155	7.2	0.7907
<b>LUNG</b>	<b>2,382</b>	<b>57.6</b>	<b>1,239</b>	<b>62.1</b>	<b>1,143</b>	<b>53.3</b>	<b>&lt;0.0001</b>
Pancreas	913	22.1	401	20.1	512	23.9	0.0035

2. To improve the readability of the graphs, the items have been abbreviated, retaining the basic ideas.

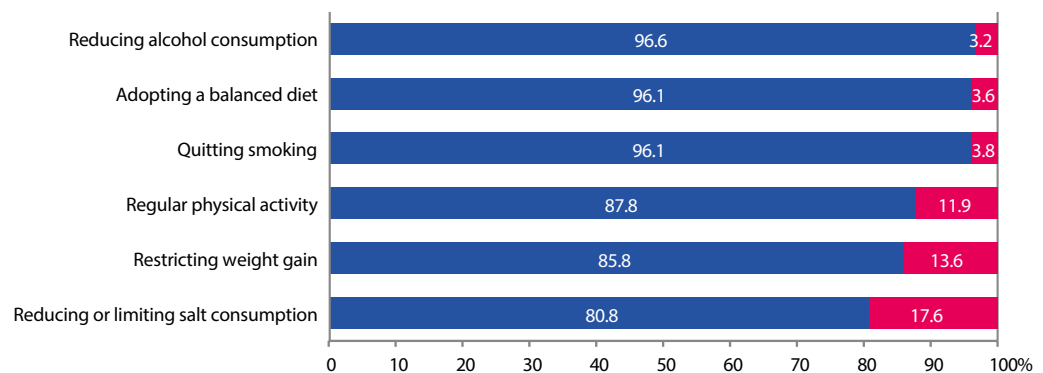
## Consensus on representations of behaviour and tertiary prevention

While most of those surveyed believe that it is possible to resume a normal life after having had cancer, it is worth noting that a large majority consider it important to adopt preventive behaviour post-cancer (Figure 4): reducing alcohol consumption (96.6%), adopting a balanced diet (96.1%), quitting smoking

(96.1%), regular physical activity (87.8%), restricting weight gain (85.8%) and reducing salt consumption (80.8%), for example.

The majority of those surveyed are of the view that it is possible to return to a normal life after having cancer

FIGURE 4 | Opinions on actions to be taken when affected by cancer



## A disease associated with the semantic fields of medicine and death

In order to analyse the representations of cancer of those surveyed, free associations were put to a quarter of the sample selected at random. These subjects were requested to name the first three words that the word "cancer" brought to mind for them. The thematic analysis made it possible to obtain nineteen subcategories grouped into seven higher categories: these are shown in figure 5 and analysed below in order of significance. Twelve terms could not be classified and nineteen subjects declined to answer this question.

The most common theme is made up of terms linking cancer with the medical field: either with reference to its definition as a "disease" (most commonly cited term in our sample) associated with a "tumour", or by referring to specific examples linked with the various possible sites of the disease, with the terms "breast cancer", "colorectal cancer" and "lung cancer" being mentioned most often.

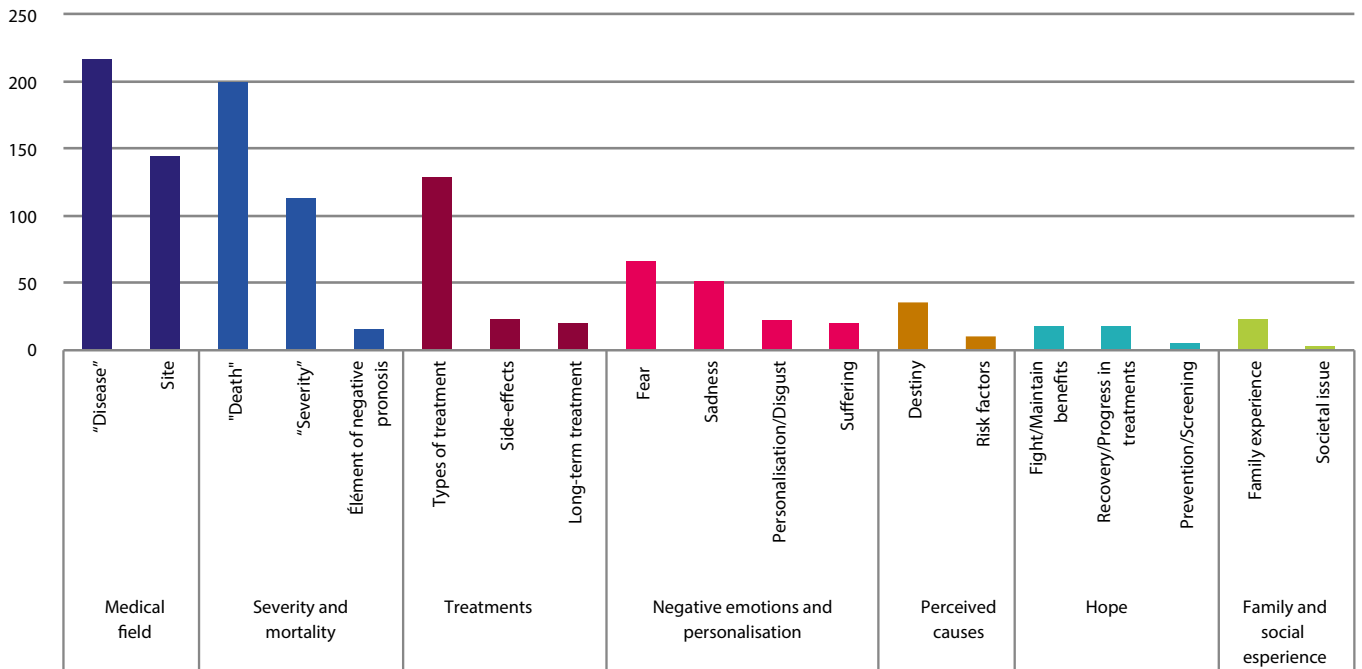
The second most common theme mentioned is that referring to cancer as a severe and potentially

life-threatening disease. The association between cancer and death or end of life is very pervading ("death", "passing", "incurable"), the word "death" being the second most common word among the surveyed population. The severity of the disease ("serious", "serious disease"), as well as its potentially negative outcome ("metastasis", "generalised") also highlight that the threat associated with cancer remains very present.

The third theme refers to the methods for treating the disease and their implications. Many references are made to treatments ("chemotherapy", "radiotherapy", "surgery"); it is worth pointing out that chemotherapy is the prototypical item and is one of the terms most frequently cited in the population surveyed. These treatments are perceived as being associated with significant side-effects ("heavy-going treatments", "fatigue", "debilitating"), and also with long-lasting side-effects and result in cancer being viewed as a long-term condition ("long-lasting", "long-term illness").

The negative emotions triggered by mentioning cancer are also mentioned: they are included in the fourth theme. These emotions can take a number of forms: fear ("fear", "apprehension", "dread"),

**FIGURE 5** | Breakdown of responses to the mention of the word cancer (n = 1,178 with at least one response to the question)



sadness ("tough", "sadness"), aversion associated with this personalised condition ("poison", "the Big C", "evil disease") and pain ("suffering", "pain").

The fifth theme concerns the perceived causes. Though cited less often, these arise in two forms: cancer as a misfortune ("unlucky", "why me?", "random") or as being associated with risk factors ("smoking", "pollution", "junk food"). This theme arises more often among men than women.

The sixth theme includes positive terms referring to sources of hope. Even though cancer tends to be seen as a disease giving cause for concern, positive items are nonetheless found: the fight against the disease which refers to the expected mindset of cancer patients ("fight", "battle", "undergo treatment"), recovery and progress in treatments ("remission", "recovery", "research"), and also disease prevention ("screening", "prevention").

Finally, cancer may, though more rarely, be associated with a family or personal experience ("family", "father") or even take on a social dimension ("wide-spread", "societal phenomenon").

### Perceived vulnerability to cancer: a majority of subjects perceive themselves as being at-risk

Finally, the study aimed to identify the perception of those surveyed of the risk, during their lifetime, of being affected by cancer. In keeping with the findings set out below, only one-quarter of those surveyed considered themselves not to be at a risk of being affected by cancer in their lifetime.

Age is a factor associated with believing oneself to be at a risk of being personally affected by cancer (Table II). Indeed, fewer of those surveyed under 25 see themselves as being at-risk than those older than them. Once adjusted for age and sex, it is found that smoking status, socioeconomic status, occupational status, education, and marital status are found to be factors associated with this perceived vulnerability<sup>3</sup>.

3. The term perceived vulnerability refers to the subjective assessment of the risk of developing a health problem, as defined by Rosenstock in 1974. It is a key component in various health behaviour models.

**TABLE II | Proportion of those surveyed who consider themselves to be at a risk of being affected by cancer in their lifetime**

Do you personally consider yourself to be at a risk of being affected by cancer in your lifetime?

	Yes		No		Total N	OR	CI
	n	%	n	%			
<b>SEX</b>							
Male	1,343	69.7	584	30.3	1,928	ref	
Female	1,499	71.8	589	28.2	2,089	0.90	[0.79-1.04]
<b>AGE ***</b>							
15-24 years	339	59.4	232	40.6	570	ref	
25-34 years	468	73.4	170	26.6	638	1.89	[1.48-2.41] ***
35-44 years	507	75.3	167	24.7	674	2.09	[1.64-2.66] ***
45-54 years	527	75.1	174	24.9	701	2.07	[1.63-2.63] ***
55-64 years	482	74.8	162	25.2	644	2.04	[1.60-2.60] ***
65-74 years	324	70.1	138	29.9	462	1.61	[1.24-2.09] ***
75-85 years	195	59.9	131	40.1	326	1.02	[0.77-1.35]
<b>SMOKING STATUS ***</b>							
ADJUSTED FOR AGE AND SEX							
Occasional smoker	163	72.3	62	27.7	225	1.56	[1.14-2.14] **
Regular / daily smoker	847	77.5	245	22.5	1,092	2.04	[1.71-2.45] ***
Ex-smoker	920	72.4	351	27.6	1,270	1.48	[1.25-1.76] ***
Never or just to try	910	63.9	514	36.1	1,424	ref	
<b>SOCIOECONOMIC STATUS *</b>							
ADJUSTED FOR AGE AND SEX							
Farmers, tradespeople, merchants	197	67.2	96	32.8	293	0.83	[0.63-1.10]
Managerial and professional occupations	539	72.1	208	27.9	748	1.04	[0.84-2.28]
Intermediate professions	582	74.0	205	26.0	787	1.14	[0.93-1.41]
White-collar workers	735	71.3	296	28.7	1,031	ref	
Blue-collar workers	658	69.5	289	30.5	947	0.92	[0.76-1.11]
Other non-workers	131	62.3	79	37.7	211	0.67	[0.49-0.91] *
<b>OCCUPATIONAL STATUS ***</b>							
ADJUSTED FOR AGE AND SEX							
In employment	1,493	74.5	511	25.5	2,004	ref	
Student	252	60.0	168	40.0	421	0.50	[0.39-0.65] ***
Unemployed	209	66.6	105	33.4	314	0.68	[0.53-0.88] **
Retired	668	68.7	305	31.3	973	0.77	[0.60-0.99] *
Other non-workers	220	72.3	84	27.7	305	0.87	[0.66-1.15]
<b>LEVEL OF EDUCATION ***</b>							
ADJUSTED FOR AGE AND SEX							
Pre-high school diploma	1,478	67.5	711	32.5	2,189	ref	
High school diploma	524	70.6	218	29.4	743	1.19	[0.99-1.43]
Post-high school diploma	840	77.5	245	22.5	1,084	1.69	[1.43-2.01] ***
<b>TYPE OF COMMUNITY</b>							
ADJUSTED FOR AGE AND SEX							
Rural	656	70.6	274	29.4	930	1.03	[0.82-1.31]
<20,000	487	73.4	177	26.6	664	1.18	[0.92-1.53]
[20,000; 100,000[	360	69.9	155	30.1	514	ref	
≥100,000	912	71.1	371	28.9	1,283	1.06	[0.84-1.32]
Paris region	428	68.4	197	31.6	625	0.94	[0.72-1.21]
<b>MARITAL STATUS ***</b>							
ADJUSTED FOR AGE AND SEX							
Other	1,026	66.2	523	33.7	1,550	ref	
Cohabiting	1,813	73.7	645	26.2	2,459	1.45	[1.25-1.67] ***

\*: p&lt;0.05; \*\*: p&lt;0.01; \*\*\*: p&lt;0.001



## PERCEPTION OF CANCER RISK FACTORS

This study also explored the representations of those surveyed in respect of certain cancer risk factors. A list of twenty-three factors was provided to those surveyed, who responded whether, in their opinion, the factors proposed could promote the onset of cancer. A comparative analysis was conducted between different periods for fourteen of these. Finally, a specific analysis was carried out on representations in relation to radon (a little-known risk factor for French people in 2010). Similarly, an analysis was carried out on the perception of exposure to risk scenarios or factors in a work setting. The issue in relation to cancer and employment is present in the media and targeted by one objective of Cancer Plan 3: this item has been included in a Cancer Barometer for the first time.

Almost all of the sample are of the view that smoking tobacco and unprotected sun exposure can cause cancer

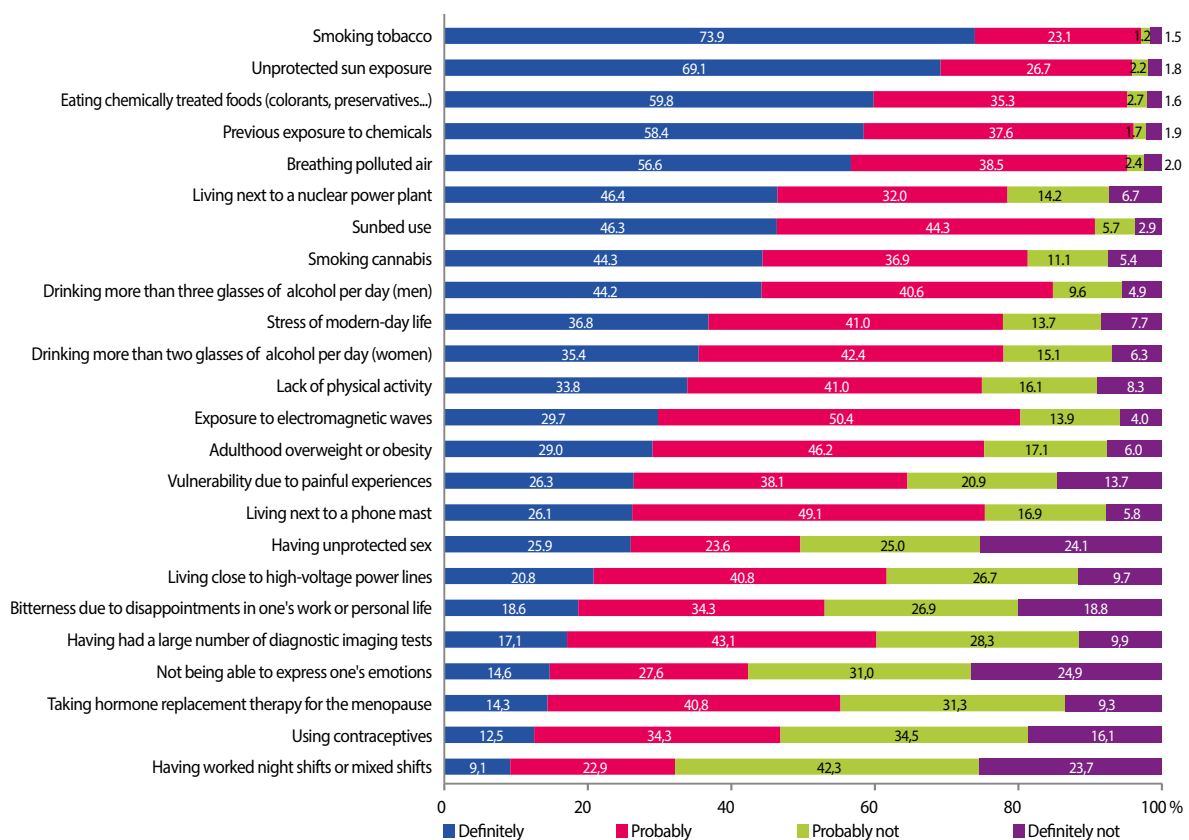
## Many factors perceived as promoting the onset of cancer

Figure 6 shows the list of proposed factors. They consist of behavioural, environmental or psychological factors referring in some people's opinion to known risks which are the subject of consistent media attention (e.g. tobacco, alcohol, unprotected sun exposure), in the view of others to risks with an established impact but which are not widely broadcast to the population (e.g. smoking cannabis), which are debated in public and scientific spheres (e.g. living next to a nuclear power plant) or for which "the carcinogenic effect" has no scientific basis (e.g. disappointments or painful experiences).

The analysis demonstrates that almost all of those surveyed expressed an opinion on the statements provided: very few responded that they were not aware of or did not know the proposed factor. The opinions compiled can be classified into five categories.

In the first category, two factors widely considered as definitely carcinogenic are found: "smoking tobacco"

FIGURE 6 | Perception of factors liable to promote the onset of cancer (as a percentage)



Note to the reader: due to the low rate of "Don't know the proposed factor" responses, these responses have been removed for improved readability.

and "unprotected sun exposure", which approximately 74% and 70% of subjects, respectively, consider to be definitely carcinogenic. If these rates are combined with those of subjects who consider them as a probable cause of cancer, it is observed that almost all of the sample considers smoking tobacco and unprotected sun exposure to be capable of causing cancer (97.0% and 95.8%).

The second category includes factors that at least 44.0% of those surveyed think are definitely liable to promote the onset of cancer. When added to the responses of "probably", the rates are between 78.4% and 96.0%. The opinions in question are: "previous exposure to chemicals" (96.0%), "eating treated foods" (95.1%), "breathing polluted air" (95.1%), "sunbed use" (90.6%), "drinking more than three glasses of alcohol per day"<sup>4</sup> (84.8%), "smoking cannabis" (81.2%) and "living next to a nuclear power plant" (78.4%); and it is worth noting that slightly over 16% of the sample do not consider cannabis to be a cancer risk factor.

The third category includes factors considered by a majority to be at-risk (definitely and probably, the combined rates vary between 74.9% and 77.9%), but with a lower expressed certainty, i.e. between 29.0% and 36.8% for the response of "definitely", the response of "probably" being preferred by those surveyed. This concerns the following risk factors: "exposure to electromagnetic waves" (80.1%), consuming "more than two glasses of alcohol per day" (77.8%)<sup>5</sup>, "stress of modern-day life" (77.8%), "adulthood overweight or obesity" (75.2%) and "lack of physical activity" (74.8%). Almost a quarter of those surveyed are of the view that a lack of physical activity probably/definitely does not promote the onset of cancer. 21.4% of women think that consuming more than two glasses of alcohol per day is not a cancer risk factor. This category also includes the items "living close to high-voltage power lines" (61.6%) and "having had a large number of diagnostic imaging tests" (60.2%).

The fourth category includes the statements for which opinions were most mixed, providing further evidence of less definite beliefs with a greater number of responses of "probably/probably not" In this category, two environmental factors and three psychological factors are cited. As such, one out of every two subjects thinks that "living next to a phone mast" probably promotes the onset of cancer and a quarter of the subjects (approximately 26%) consider

the link between this factor and the onset of cancer to be definite, giving a combined rate of 75.2%. The second environmental factor relates to the work environment: 66.0% of those surveyed think that working night shifts or mixed shifts definitely/probably does not promote the onset of cancer. The effects of psychological factors on the onset of cancers are the least definite for those surveyed. Indeed, slightly over a quarter of those surveyed, i.e. 26.3%, consider that "vulnerability due to painful experiences" can definitely promote the onset of cancer; if this rate is added to the responses of "probably" for this item, a majority of subjects are in agreement with this idea (approximately 65%). 18.6% and 14.6% of those surveyed, respectively, express certainty that "bitterness due to disappointments in one's work or personal life" and "not being able to express one's emotions" may cause the onset of cancer. In total, one out of every two (52.9%) and four out of ten (42.2%) subjects, respectively, think that disappointments and difficulty expressing one's emotions definitely/probably promote the onset of cancer.

The final category includes three factors associated with sexuality and hormone therapy. The responses to these factors are divided. As such, for the item "unprotected sex", the responses are divided evenly among the four response options. In the view of 55.1% of those surveyed, hormone replacement therapy for the menopause is definitely/probably carcinogenic. Half of the sample (50.6%) think that contraceptive use is definitely/probably not linked with the onset of cancer.

### Perception of cancer risk factors: trends in impact of phone masts, physical activity and stress of modern-day life

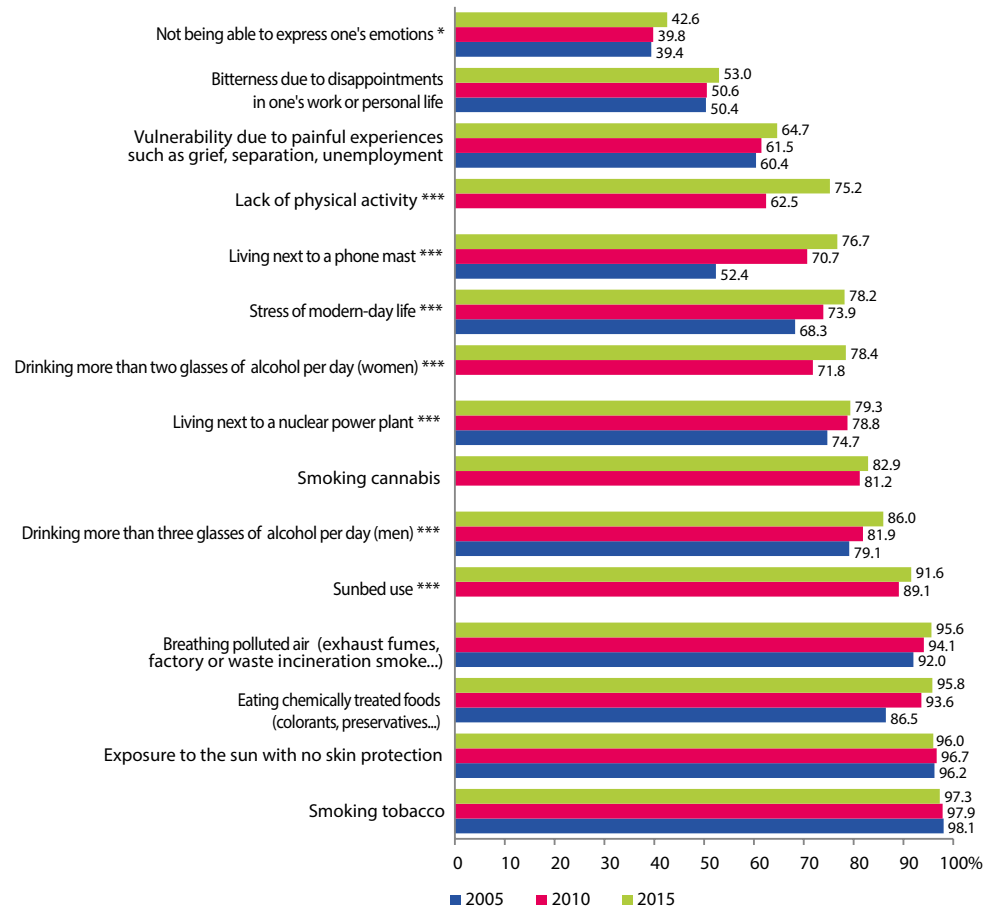
From the list given above, fifteen of the twenty-four items were analysed over ten years (Figure 7). As above, the analysis of the responses shows that two proposed factors are very widely associated with cancer risk, with a stable proportion over time: sun exposure and tobacco consumption. For the other items, significant differences and increases in the rates of up to 25 points are observed.

Three factors are considered "carcinogenic" by at least 80% of those surveyed and rates have progressed over the last ten years. Firstly, the belief that "eating chemically treated foods" is associated with

4. This question was adapted based on sex and the response in this case only applies to men.

5. This question was adapted based on sex and these responses are those of women.

FIGURE 7 | Perceived cancer risk factors, in 2005, 2010 and 2015



a cancer risk increased by 9.3 points between 2005 and 2015. The rate of those surveyed who considered "breathing polluted air" as a risk factor was already 92.0% in 2005 and reached 95.6% in 2015, similar to the rates observed for tobacco. For the first time, a threshold has been exceeded for alcohol consumption (more than three glasses for men): over 85% of those surveyed consider it to "probably/definitely" involve a cancer risk. For this item, it is worth noting an increase of 4.1 points between 2010 and 2015 and of 2.8 points between 2005 and 2010.

Three other items have response rates of "probably/definitely" involving a cancer risk of between 75% and 79%. Of these, "living next to a nuclear power plant" ranks first, considered to involve a risk by an increasing proportion of those surveyed since 2005: almost 80% in 2015, and while the difference is less than 1 point between 2010 and 2015, it is 4.6 points in ten years (2005 and 2015). An increasing number of those surveyed think that "stress of modern-day life" represents a cancer risk factor (regular increase of 10 points between 2005 and 2015). Finally, 76.7%

of those surveyed consider "living next to a phone mast" to be a cancer risk factor, with an increase of almost 25 points since 2005: in fact, this is the item that has seen the greatest progression.

Three items that could be described as "emotional" have seen an increase in the proportion of those surveyed who consider them to be cancer risk factors. However, the responses remain more unequivocal than for the items mentioned above. As such, in 2005, 60.4% of those surveyed were of the view that "vulnerability due to painful experiences such as bereavement, separation, unemployment" could cause cancer; this rate is 64.7% in 2015. "Bitterness due to disappointments in one's personal or work

The belief that "eating chemically treated foods" is associated with a cancer risk increased by 9.3 points between 2005 and 2015

At the present time, 76% of subjects consider living next to a phone mast to be a cancer risk factor, versus 52.4% in 2005

life" is also considered more as a cancer risk factor in 2015 than in 2005 and 2010, with an increase in the region of 2 points. In 2005, 60.6% of those surveyed did not consider "not being able to express one's emotions" to be a cancer risk factor; this rate is down in 2015 (57.3%). Failure to express one's emotions is therefore more strongly associated with cancer risks than it was ten years previously.

Finally, a final group of four factors analysed for the 2010-2015 period has emerged (questions not asked in 2005). Apart from the item in relation to cannabis, they all show statistically significant progressions. First of all, 91.6% of those surveyed in 2015 consider "sunbed use" to be a cancer risk factor, versus 89.1% in 2010. An increasing number of men (4.5 point increase) and women (6.6 point increase) think that "drinking more than two glasses of alcohol per day (women)" represents a cancer risk factor. Finally, "lack of physical activity" is one of the factors that has seen the greatest progression: 62.5% of those surveyed considered it to be a risk factor in 2010 versus 75.2% in 2015.

### Radon: a risk factor that has little meaning and gives rise to mixed representations

Radon is a naturally occurring radioactive gas, produced from the disintegration of uranium present in the ground\*. This odourless, colourless and tasteless gas can infiltrate and build up in poorly ventilated rooms on lower levels of homes. Inhaling this gas is carcinogenic: radon exposure is the second leading cause of lung cancer after smoking (20).

\* In France, the following administrative districts are exposed to the radon hazard due to their geological characteristics: Allier, Ardèche, Ariège, Aveyron, Calvados, Cantal, Corrèze, Corse du Sud, Côtes d'Armor, Creuse, Deux-Sèvres, Doubs, Finistère, Haute-Corse, Haute-Loire, Haute-Marne, Haute-Saône, Haute-Vienne, Hautes-Alpes, Hautes-Pyrénées, Indre, Loire, Lozère, Morbihan, Nièvre, Puy-de-Dôme, Rhône, Saône et Loire, Savoie, Territoire de Belfort, Vosges.

Three-quarters of those surveyed (73.2%) state that they have never heard of radon. Of those who have already heard of it, 78.0% are aware that it is a natural gas found in the ground, 14.9% think that it is a chemical used in paints, 4.4% think that it is a form of bacteria found in pipes. As such, 20.7% of those surveyed are correct in their definition of radon. Over three-quarters of those surveyed (78.4%) consider themselves to be somewhat poorly or very poorly informed on health matters in relation to the presence of radon in homes.

Of the 1,097 subjects who have heard of radon, only 23.4% think that radon can represent a high or somewhat high health risk in their district. On the other hand, 70.0% of these 23.4% are of the view that the presence of radon in homes can promote the onset of lung cancer. Once again, of those who have already heard of radon, 77.3% do not consider themselves to be personally affected by a radon risk in their homes or don't know, whereas only 4.4% have already had their home tested for radon.

### Work environment: a potential source of exposure to harmful substances liable to promote the onset of cancer

Also with a view to analysing the representations of those surveyed in relation to cancer risk factors, and more specifically in a work setting, they were requested whether, in their current or previous jobs, they thought that they had been exposed to harmful substances liable to promote the onset of cancer.

TABLE III | Proportion of those surveyed who believe that they have previously been exposed to harmful substances liable to promote the onset of cancer in their job

Belief of having been exposed to harmful substances liable to promote the onset of cancer

	n	%
Yes	1,183	39.1
No	1,830	60.5
DK	8	0.2

Question put to workers who have never been treated for cancer.

Among the workers in employment, i.e. 3,013 respondents, two-thirds believe that they have previously been exposed to harmful substances liable to promote the onset of cancer as part of their job (Table III). The belief of having been exposed to these harmful substances appears to be strongly correlated with sex (men feel more exposed than women), age (the 26-64 age group feel more exposed than the over 65 age group) and socioeconomic status (blue-collar workers, farmers and intermediate professions feel more exposed than managerial professions). The type of community also appears to be a factor: those surveyed living in rural areas or in a municipality of less than 20,000 inhabitants

Three-quarters of those surveyed (73.2%) state that they have never heard of radon

feel more exposed at work than those residing in the Paris region.

## DISCUSSION

Given the volume of data, it has been chosen to discuss the main items and group them together under main themes. 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, we have made some conclusions which are not exhaustive and will require further studies.

### CANCER: A DISEASE THAT CONTINUES TO BE PERCEIVED AS SERIOUS AND AFFECTS EVERYONE

Cancer has been viewed by French people as the most serious disease for over ten years. It is thus observed that, when those surveyed are asked what cancer evokes for them, the theme of death remains strongly represented in the sample, with the word "death" being the second most cited word after "disease". For this item, little change has been observed in the last three decades since, as Saillant stated as early as 1988, "it has become commonplace to state that cancer is associated, stereotypically, with death" [21]. As such, according to Sarrandon [22], "although medical discourse and mass culture no longer convey the image of a plague that cancer embodied until the 1970s, in popular opinion, it remains a fatal disease". The perception of the seriousness of cancer is also very deep-rooted, as indicated by the large number of participants referring to possible negative outcomes of the disease, in the form of "recurrence" or "metastasis", for example. The frequent mention of terms associated with negative emotions such as fear, sadness, suffering or aversion reinforce the description of cancer as a particularly dreaded disease, although participants also mention cancer treatments, essentially chemotherapy, and their side-effects, very often. This representation of cancer that continues to be negative is in contrast with the significant increase in survival rates observed for the most common sites and with medical progress: the literature review shows advances both in the understanding of cancer and in treatments over the last ten years [23]. This study thus helps reveal the gap between the population's representations and concrete scientific progress. This gap would be

appear to be explained, on one hand, by the difference in perspective of these two realms (the public do not perceive these advances in the same way as researchers or clinicians) and, on the other, by the imbalance between the broadcasting of scientific progress that remains limited and communication on proven or unproven risk factors.

Those surveyed perceive breast cancer as the most widespread cancer and lung cancer as the most serious. The aim of this study is not to compare right and wrong answers, but it is worth pointing out that these representations are in part consistent with the epidemiological data if the mortality for all sites combined is considered as a criterion [1]. On this question of severity, besides differences in perception between men and women observed for the first time in Cancer Barometer 2015, income-related differences were revealed in previous versions [20, 24] along with differences linked with social inequalities. The latter are also reported in a recent study conducted in the United Kingdom [25]. This issue of inequalities is at the heart of the national health strategy and all the research highlights the need to adopt a differentiated approach for low social gradient populations by targeting the equity paradigm. As regards cancer sites, the representations observed are in part similar to epidemiological survival analyses, with lung cancer being the deadliest for men, whereas breast cancer is the deadliest for women followed closely by lung cancer [2]. These data show that the impact of survival is greater than prevalence since prostate cancer is the most common in men and breast cancer in women [2].

While cancer is perceived as a serious disease, it is also a disease that people feel is relevant to them, as indicated by the fact that almost all of those surveyed think that no-one is safe from cancer. This finding is consistent with the data from previous Barometers [20, 24]. This representation of cancer is to be compared to the perceived vulnerability to this disease (26-28), which was analysed for this first time in this Cancer Barometer with the item "do you personally consider yourself to be at a risk of being affected by cancer in your lifetime". While this perception is observed among over 70% of the sample in all age groups from 25 to 64 years, it is lower in the 15-25 age group (almost 60%). This could be explained by the low prevalence of cancers in adolescents and young adults and the difficulty that this population have in envisioning the future. Interestingly, this perception decreases after the age of 75, although age represents a significant risk factor in most cancers. An explanation of this observation could be found in the age limits of the various screening policies (breast

and colon) and cervical smear guidelines targeting subjects aged from 50 to 74 years and women aged from 25 to 65 years respectively, which may suggest that cancer risk is lower beyond this age group [29, 30]. The smoker population, regardless of age, feels more vulnerable to cancer. This confirms the findings of a previous edition of the Cancer Barometer and other publications [31] and thus highlights the validity of information campaigns. However, the findings also show that approximately 74% of French people have a high degree of certainty as regards the link between tobacco and cancer.

This perception in relation to cancer risk is possibly the result of the multitude of risk factors perceived as being of equal importance by the participants, whether these factors are behavioural, environmental or psychological: indeed, it seems difficult to believe oneself completely safe if all of these factors are taken into consideration. It is observed that, in the participants' opinion, practically all of the factors proposed are considered as potentially causing the onset of cancers. This may be explained by the fact that the multitude of epidemiological studies reported in the media highlighting many risk factors not only fail to explain how they affect our health, but also fail to point out that they are not always carcinogenic, having, on the contrary, minor health effects [32]. In anticipation of a future Cancer Barometer, it will be necessary to envisage analysing the explanation for these representations and introducing the analysis of representations of other factors such as exposure to pesticides and endocrine disruptors, which were not investigated in Cancer Barometer 2015.

Preventive messages concerning at-risk behaviour (quitting smoking, vaccination, sun exposure, etc.), and also those promoting screening (breast cancer, colorectal cancer, mole monitoring, etc.), appear to be well-known. However, there remains considerable variability in how these messages are understood according to a number of psychosocial and cultural factors such as the level of education [33].

Although those surveyed confirm that the risk factors presented in the survey can cause the onset of cancer, they are more hesitant as to their carcinogenicity. For the items "vulnerability due to painful experiences", "bitterness" and "not being able to express one's emotions", these opinions do not appear to be based on scientific arguments but

rather on an older, lay representation of the emotions or "humours" as a cause of cancer [34].

## CANCER: A DISEASE PERCEIVED AS HEREDITARY AND/OR CONTAGIOUS

It would appear that a majority of those surveyed think that cancer is hereditary (18% are certain of this, i.e. 1% more than in 2010) and 70% are sure that cancer is not contagious.

The idea that cancer is hereditary emerged from the 19<sup>th</sup> Century. It remains very strong today: 61% of those surveyed think that cancer is often hereditary, whereas this rate was 52% in 2010 and 57% in 2005 (sum of responses of "probably" and "definitely"). The high prevalence of this perception has never been so strong, while the most representative research on this topic dates back to the 1980s. One explanation of this trend could be found in the development of the national oncogenetics programme and the "Angelina Jolie effect" observed in Great Britain and France [35, 36]: the American actress publicised her preventive mastectomy procedures in 2013 and 2015 after discovering that she carried the BRCA 1 gene. A further explanation lies in common parlance when referring to the genetic modifications and mutations associated with cancers: the concept of "genetics" is very often associated with that of "heredity".

At the present time, this perception of French people about heredity and cancer must be taken into account to develop clearer communication on the term "genetic" and exogenous cancer risk factors: thinking that cancer is hereditary could result in the population considering preventive behaviour to be superfluous given that cancer would be transmitted in the family gene pool.

As regards the perception of the contagious nature of cancers, for the first time in 2015, almost 10% of people are of the view that "some cancers are contagious"; this percentage was 6.4% in 2010 and 7.7% in 2005, respectively. The idea of cancers being contagious has been observed in various medical treatises and "public policies" since the 18<sup>th</sup> Century [37]. This idea is possibly fostered by the use of terminology that tends to be more associated with infectious

diseases, such as "the cancer epidemic" <sup>6</sup> [38]. The vaccination campaigns against hepatitis B or human papillomavirus (HPV) infections in place since 2010 are also likely factors to be taken into consideration. This finding also spurs the need to improve communication on the role of viruses in causing cancers.

Despite the sense of vulnerability reported by those surveyed, due to their awareness of the diversity of risk factors and their representation of the disease perceived as being hereditary, they are nonetheless in no way fatalistic: an equal number reject the idea that nothing can be done to prevent cancer. This rejection of powerlessness in relation to the disease includes the prevention of potential recurrences of cancer as demonstrated by the size of the proportion of those surveyed who are of the view that it is important to adopt tertiary preventive behaviour post-cancer, such as reducing alcohol and tobacco consumption or indeed adopting a balanced diet. Indeed, this value of tertiary preventive behaviour is in line with the concerns of those affected by cancer (39-41). This rejection of fatalism and this emphasis placed on the need to adopt health behaviours is rooted in a context of increasing health democracy [42], whereby the individual, considered as the first link in the care chain, is increasingly aware of their responsibilities in relation to their health [5].

## CANCER: A CAUSE OF ISOLATION AND CHANGES IN CAREER PATHS

In 2015, most of those surveyed are of the view that it is possible to return to a normal life post-cancer and that it is important to talk to one's loved ones about it. This study demonstrates the strength and stability of these representations. Stating that it seems possible to return to a normal life could imply that cancer appears to no longer be completely perceived as representing a "biographic disruption" [43]. However, the perceptions of effects of cancer on one's social and work life are mixed among those surveyed. For the first time, the sense of isolation caused by cancer is observed in over 50% of the population. This impact appears to have increased progressively from 2005 to 2015 (44.2% in 2005, 48% in 2010, 51% in 2015). As regards the opinion

that "when you have cancer, you are no longer able to work as you did before", the proportion in 2015 (56%) is similar to that in 2005 (57.1%), whereas it was down approximately 5 points in 2010. As such, at the present time, those surveyed perceive the effects of cancer on work life as just as considerable as they did ten years ago. This link between cancer and isolation is a constant concern which appears to have increased with the inclusion of the impact of cancer on patients' employability: preventing the "double penalty" (disease and exclusion from the employment market) associated with cancer is one of the major considerations of the third Cancer Plan (2014-2019). This representation of the impact of cancer on one's career and the isolation that is liable to result confirms the data from the scientific literature. A U.S. meta-analysis has shown that the risk of unemployment among cancer survivors is equal to 1.37 with reference to a healthy population [44]. In France, a mere two-thirds of those in employment at the time of diagnosis are still in employment two years later [45]. Recent studies carried out in France confirm these findings with a five-year follow-up period and indicate that the impact is greater for older subjects [46]. The negative effect of cancer on career paths appears to be mostly attributable to physical restrictions [46, 47], but also to bouts of depression [48].

It is interesting to note that, regarding representations of cancer and employment, almost 40% of those surveyed believe themselves to have already been exposed to harmful substances liable to promote the onset of cancer as part of their job. Although this representation appears to be more pronounced among agricultural professions and blue-collar workers (approximately 24% of the total sample), who are known to be subject to exposure to the main carcinogens in a work setting<sup>7</sup>, it is also found in other professions which are however subject to little exposure to known or suspected agents. Further studies are needed to reveal the factors giving rise to this perception.

6. Le Monde has used the concept of "cancer epidemic" in titles of articles on several occasions: [https://www.lemonde.fr/idees/article/2008/10/07/arretons-l-epidemie-de-cancer-par-david-servan-schreiber\\_1104156\\_3232.html](https://www.lemonde.fr/idees/article/2008/10/07/arretons-l-epidemie-de-cancer-par-david-servan-schreiber_1104156_3232.html). It can also be found in BEH [45].

7. The factors recognised as carcinogenic (IARC group 1) subject to targeted monitoring on tumour forms are asbestos (lung cancers, pleural mesothelioma, laryngeal and ovarian cancers), wood dust (sinonasal cancers), ionising radiation (malignant blood disorders, lung, breast and thyroid cancers), radon (bronchial and lung cancers), silica (lung cancers), metals - cadmium, chromium VI, nickel, cobalt - (lung cancers), benzene (malignant blood disorders), strong inorganic acid mists (laryngeal cancers), polycyclic aromatic hydrocarbons - PAHs - (lung, skin and bladder cancers, suggested link with breast cancers).

## CONCLUSIONS

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 this tool provides us with ten years of follow-up.

In the opinion of French people, cancer remains the disease perceived as being the most serious, which can affect everyone and, for the most part, a disease for which actions can be taken to prevent it. It also emerges that French people have quite a clear idea of the prevalence and severity of cancers according to their sites, and are aware of the behaviour to adopt to prevent cancer or a recurrence. These observations suggest that the "health culture" in relation to cancer has been maintained in the surveyed population over the last ten years. The effects of cancer on work life are now perceived as being just as significant as they were ten years ago.

This study particularly helped identify new or persisting perceptions which will require further studies and new interventions to be validated. These interventions apply to certain perceptions that vary according to social status, "the contagious and

In sum, this study suggests the need to develop research in order to identify and assess new approaches to enable the French population to take known risk factors on board; this research particularly concerns the field of health communication and education, so as to be even more effective in future policies.

hereditary nature" of cancer, the lack of relativity between risk factors and the belief of being exposed to carcinogenic substances in the work setting. This study shows that information based on rumours is used just as much as probative data, thus establishing a worthwhile area of future research.



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