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## Are dietary reports in a case-control study on thyroid cancer biased by risk perception of Chernobyl fallout?

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### Abstract

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Disclosure of interest

The authors declare that they have no competing interest.

**Background.** —In retrospective case-control studies performed following nuclear tests or nuclear accidents, individual thyroid radiation dose reconstructions are based on fallout and meteorological data from the residential area, demographic characteristics, and lifestyle as well as dietary information. Collecting the latter is a controversial step, as dietary declarations may be affected by the subjects' beliefs about their risk behavior. This report analyses the potential for such bias in a case-control study performed in eastern France.

**Methods.** —The study included 765 cases of differentiated thyroid carcinoma matched with 831 controls. Risk perceptions and beliefs of cases and controls were compared using Chi<sup>2</sup> tests and differences in dietary reports were analyzed using a two-way ANOVA.

**Results.** —In general, atmospheric pollution and living near a nuclear power plant were the two major risks that may influence thyroid cancer occurrence cited by cases and controls. When focusing in particular on the consequences of the Chernobyl accident, cases were more likely to think that the consequences were responsible for thyroid cancer occurrence than controls. Vegetable consumption during the two months after the Chernobyl accident was correlated with the status of subjects, but not to their beliefs. Conversely, consumption of fresh dairy products was not correlated with the status or beliefs of subjects.

**Conclusion.** —We found no evidence of systematic bias in dietary reports according to the status or beliefs held by subjects about the link between thyroid cancer occurrence and Chernobyl fallout. As such, these dietary reports may be used in further studies involving individual dosimetric reconstructions.

## Résumé

Dans les études cas-témoins rétrospectives menées à la suite d'essais ou d'accidents nucléaires, les reconstructions individuelles de doses de rayonnements ionisants reçues à la thyroïde sont basées sur les retombées et les données météorologiques dans la zone d'habitation, les caractéristiques démographiques, le mode de vie et le comportement alimentaire. L'utilisation de ce dernier est controversée, car les déclarations alimentaires peuvent être affectées par les croyances des sujets concernant leurs comportements à risque. Nous rapportons ici une analyse de ce biais potentiel dans une étude cas-témoins réalisée dans l'est de la France.

L'étude comporte 765 cas de cancer différencié de la thyroïde appariés avec 831 témoins. Les perceptions des risques ainsi que les croyances des cas et des témoins ont été comparées en utilisant des tests du Chi<sup>2</sup> et les consommations de légumes et de produits laitiers ont été analysées à l'aide d'une analyse de variance à deux facteurs.

D'une manière générale, la pollution atmosphérique et habiter à proximité d'une centrale nucléaire ont été les deux risques majeurs cités par les cas et les témoins pouvant influencer l'occurrence du cancer de la thyroïde. Lorsqu'on s'est intéressé aux croyances liées aux conséquences de l'accident de Tchernobyl, les cas ont été plus nombreux que les témoins à penser que les cancers de la thyroïde dans leur région étaient dus à ces conséquences. Enfin, les déclarations des consommations de légumes frais pendant les deux mois qui ont suivi l'accident étaient corrélées au statut des sujets mais pas à leurs croyances. En revanche, les déclarations de consommation de produits laitiers n'étaient pas corrélées aux croyances ou au statut des sujets.

Nous n'avons pas été en mesure d'identifier de biais systématiques dans les déclarations alimentaires en fonction du statut des sujets ou de leurs croyances concernant le lien entre

l'occurrence des cancers de la thyroïde et les retombées de Tchernobyl. Par conséquent, ces déclarations alimentaires pourraient être utilisées dans des études reconstruisant les dosimétries individuelles.

## Keywords

Radiation risk perception; Thyroid cancer; Dosimetric reconstruction; Case-control study

## Mots-clés

Perception des risques; Cancer de la thyroïde; Reconstructions dosimétriques; Étude cas-témoins

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## 1. Introduction

Thyroid cancer, the most common malignancy of the endocrine system, accounts for less than 2% of all cancers diagnosed worldwide [1]. However, in recent decades, its incidence has grown rapidly in many countries, including many in Europe [2,3]. This trend over time is mostly due to an increase in the incidence of differentiated thyroid carcinoma (DTC), which can be attributed, in part, to improvements in monitoring thyroid nodules [4–6], but also to a likely increase in environmental or lifestyle factors [5].

The Chernobyl nuclear power plant accident occurred in Ukraine on 26 April 1986. In France, the radioactive fallout and thyroid radiation doses were much lower compared with highly contaminated areas, such as Ukraine, Belarus, and Russia. A number of risk projections, using a risk coefficient estimated for moderate and high doses, suggested that a small excess in thyroid cancer might occur in eastern France due to this low-level fallout [7]. Moreover, large-scale studies examining radiation doses from CT scans have reported that for breast and brain cancers, risk coefficients for a low dose may be higher than for a high dose [8,9]. However, no such studies have been performed on thyroid cancer risk.

No post-accident large-scale cohort has been set up in France to investigate the potential impact of radioactive fallout on DTC incidence. To this end, we performed a case-control study on DTC incidence in young people living in eastern France in the period following the Chernobyl accident.

Exposure to ionising radiation during childhood or adolescence is known to increase the risk of thyroid cancer [10,11]. However, measuring the radiation dose received by the thyroid for cases and controls presents a number of challenges: individual thyroid radiation dose reconstruction has to be based not only on radioactive fallout, meteorological data in the residential area, and demographic characteristics, but also on a number of lifestyle and diet parameters [12].

The main source of potential contamination after the Chernobyl accident was contaminated food intake (70%), especially from fresh milk or dairy products, as well as from leafy vegetables. The two other alleged sources were due to external exposure (20%) and radioactive dust inhalation (less than 10%) [12].

Accordingly, before a radiation dose assessment is performed, further investigation is required into the possibility of systematically biased answers provided by cases and controls to dietary questionnaires in relation to beliefs or perceptions about radiation risks and cancer occurrence.

This last part is the most difficult and controversial step, particularly when performed 30 years after the accident in western countries, where diet is varied and difficult to trace. These difficulties are increased by popular beliefs about diet or lifestyle. These prejudices may also affect reports relating to behaviour that can be clearly identified as playing a role in potential radioactive contamination.

Since it has been reported that human behaviour is primarily driven by perception rather than facts [13], further investigation into potential systematic interrelations between dietary reports and risk perceptions in both cases and controls was required to avoid bias in individual dose reconstructions.

Our analysis therefore focused on the perception of general perceived risk factors, and more precisely on the perception of radiation exposure risks following the Chernobyl accident and DTC occurrence. To this end, we followed several objectives. Firstly, we compared the perceptions of generally cited perceived risks between DTC cases and controls. Secondly, we focused more precisely on the perceived risks associated with Chernobyl fallout by looking at their associations with a number of subject characteristics. We subsequently tested whether or not these beliefs could have biased subject reports of specific dietary behaviour during the two months following the Chernobyl accident. This last objective is particularly important due to the use of dietary reports in dosimetric reconstructions.

## 2. Methods

### 2.1. Study population

The study design has already been reported in detail elsewhere [14]. In brief, the study was conducted with subjects diagnosed with DTC between 1 January 2002 and 31 December 2006 who were younger than 35 years of age. Subjects who were older than 15 at the time of the Chernobyl accident were excluded. Cases resided in the eastern part of France (Alsace, Champagne-Ardenne, Corse, Franche-Comté, Lorraine, Rhône-Alpes, or Provence-Alpes-Côte d'Azur) at the time of the diagnosis.

Controls were randomly selected from the general population using a landline telephone directory. Each control was individually matched to a single case of the same sex, year of birth (within one year), and region of residence during the year when the case was diagnosed with thyroid cancer. Potential controls were asked to confirm that they were free of thyroid cancer, but they did not undergo medical examination.

The study included 805 participants with DTC, matched with 876 controls. The French Data Protection Authority approved the study (agreement no. 051120, 5 April 2005). Written informed consent was obtained from all participants.

## 2.2. Data collection

Between July 2005 and October 2010, a trained interviewer interviewed the cases and control participants using a structured questionnaire. The same interviewer systematically interviewed all participants in the same strata (i.e. same sex, age, and region). The questionnaire included items on ethnicity, anthropometry, personal and family history of thyroid disease and cancer, places of residence, educational level, smoking status, alcohol consumption, gynaecological and reproductive factors, medical X-ray exposure, and diet.

## 2.3. Consumption of potentially contaminated foods

Part of the questionnaire focused exclusively on reporting the consumption of food items known to be at risk of contamination by <sup>131</sup>I as a result of nuclear fallout during the two months following the Chernobyl accident (from 26 April to 30 June 1986). The consumption report questions investigated frequency and quantity of cow milk, cow milk products, goat or sheep milk, goat or sheep milk products and leafy vegetables of known origin (mostly the city of residence). Frequency was classified as daily, weekly or monthly. Consumption of fresh dairy products and leafy vegetables was measured in g/day.

## 2.4. Risk perception questionnaire

The questionnaire on risk perception was received by 765 cases and 831 controls because initially, the first interviews did not contain this part of the questionnaire. This questionnaire included a number of items about factors with the potential to influence DTC occurrence. Part of this questionnaire was specifically designed for radiation and Chernobyl fallout perceptions. However, it did not include any questions about changes in the subjects' dietary habits during the months following the Chernobyl accident due to their own beliefs or information provided by the media.

## 2.5. Statistical analysis

The answering categories for all questions about risk perception were 'no', 'yes partially', 'yes fully', and 'I don't know'. To make the questionnaires more robust, risk perception answers were also aggregated into only two categories ('I don't know' and 'no' vs. 'yes fully' and 'yes partially') when analyses were performed according to different subject characteristics.

Chi-squared tests were used to investigate potential differences between risk perceptions and subject status, and inside cases or controls subgroups were used to compare beliefs with certain subject characteristics.

Chi<sup>2</sup> tests and a two-way ANOVA were used to assess differences in qualitative and quantitative consumption reports of potentially contaminated food according to status and subject beliefs. A significance level of 0.05 was adopted. The data were analysed using SAS, version 9.3 (SAS Institute, Inc., Cary, North Carolina, United States).

### 3. Results

#### 3.1. Subject characteristics

The characteristics of the 765 cases and 831 controls included in this study are described in Table 1. Among cases, papillary carcinoma was the most frequent histological type (684 cases, 89.4%), while 126 (18.4%) of these cases were non-aggressive microcarcinomas (< 10 mm without tumour extension and only a unifocal tumour).

#### 3.2. Perception of general risk factors

More controls than cases thought that the following factors played a role in the incidence of thyroid cancer: alcohol consumption, smoking habits, living near a nuclear power plant, mobile phone antennae, high-voltage lines, consumption of food with genetically modified organisms, environmental exposure to pesticides, intensive sport activity, and reproductive life. The difference between cases and controls was much greater for alcohol consumption and smoking habits than for the other items (Table 2). Conversely, there was no difference between cases and controls for beliefs concerning diet, atmospheric pollution, and stress. However, when ranking the main important risk factor, cases reported most frequently about atmospheric pollution (70%) and controls about living near a nuclear power plant (67%).

#### 3.3. Opinions about the role of Chernobyl accident fallout on thyroid cancer incidence

Cases and controls did not share the same opinions about the role of the Chernobyl accident in thyroid cancer incidence ( $P < 0.01$ ) (Table 3). Although more than 85% of cases and controls thought that the consequences of the Chernobyl accident affected the incidence of thyroid cancer, the belief of cases was stronger than that of controls (26% “yes fully” in cases vs. 8% in controls), whereas there was no difference in the proportions of cases and controls who answered “no” or “I don’t know”.

#### 3.4. Differences in Chernobyl fallout risk perception according to multiple subject characteristics

Among all subjects, educational level ( $P < 0.01$ ), area of residence ( $P < 0.01$ ), ethnicity ( $P < 0.01$ ), and number of pregnancies ( $P = 0.03$ ) were associated with differences in beliefs about the role of the Chernobyl accident on the incidence of thyroid cancer in France. Among cases, these factors were also associated with beliefs, except for the area of residence. Among controls, only ethnicity ( $P < 0.01$ ) and the area of residence ( $P < 0.01$ ) remained associated (Table 4).

#### 3.5. Dietary statements in April 1986 and risk perceptions

Only 436 subjects (27%) reported consumption of fresh dairy products; conversely, 1005 subjects (63%) reported consumption of leafy vegetables (Table 5). For fresh dairy product consumption, the report, or lack thereof, of consumption was not associated with beliefs among all subjects ( $P = 0.08$ ), neither in cases ( $P = 0.23$ ) nor in controls ( $P = 0.41$ ). Consumption of leafy vegetables was associated with belief among cases ( $P = 0.01$ ), but not among controls ( $P = 0.53$ ) or among all subjects ( $P = 0.08$ ).



Among subjects who reported any consumption of fresh dairy products, the two-way ANOVA did not provide evidence of any statistically significant associations with status ( $P = 0.08$ ) or with beliefs ( $P = 0.30$ ) (Fig. 1A). Conversely, among subjects who reported any consumption of leafy vegetables, the two-way ANOVA found an association with subject status ( $P < 0.01$ ) but not with beliefs ( $P = 0.19$ ) (Fig. 1B). However, for both dairy product and leafy vegetable consumption, interactions between status and beliefs were not statistically significant ( $P = 0.99$  and  $P = 0.72$ , respectively).

For leafy vegetable consumption, the power of this analysis was 80% for detecting differences with a significant level of 0.05 between the 484 cases and 521 controls who reported any consumption. However, for dairy product consumption, the power was rather low (40%), mainly because only a relatively low number of subjects (194 cases and 242 controls) reported any dairy product consumption.

## 4. Discussion

### 4.1. Differences in perceptions of general risk factors

In the first part of the study, the analysis showed that controls thought more often than cases that thyroid cancers could be due to the factors suggested by the questionnaire. Cases may get more adequate medical information, whereas controls may be more likely to follow popular beliefs. For example, smoking was almost never reported by cases as a risk factor, contrary to controls.

In our study, the two major risks cited by cases and controls that might influence cancer occurrence were air pollution and nuclear power plants. In 2010, a nationally representative study conducted in France comprising over 3000 subjects reported that 94% and 79%, respectively, of subjects considered air pollution and living near a nuclear power plant to be cancer risk factors [15]. Even though the subjects of our study were young (less than 35 years old), the results reported elsewhere were close to ours and indicated that the opinion of these subjects was in line with the majority of opinion within the French population.

### 4.2. Perceptions of the consequences of the Chernobyl accident on the occurrence of thyroid cancers in France

In general, risk perceptions arising from a nuclear accident are often associated with fears about developing cancer [16]. Moreover, ionising radiation is now known to induce leukaemia and thyroid cancer [17]. In our study, cases were more likely than controls to think that thyroid cancers occurring in their area were due to the consequences of the Chernobyl accident. The major difference was observed in the proportion of 'yes partially' and 'yes fully' responses, whereas the proportion of 'no' and 'I don't know' responses were similar for both groups. It appears from the results that the controls were more moderate in their responses, while the cases were probably looking for the factor responsible for their cancer.



### 4.3. Differences in the perception of Chernobyl consequences with respect to various subject characteristics

Perceived risks from radiation and nuclear exposure vary when comparing physicians, scientists, and the general public [18]. More broadly, risk perceptions are known to differ according to socio-economic and cultural factors [19]. In our study, the perceptions of Chernobyl consequences on thyroid cancer occurrence varied by specific characteristics in all subjects (ethnicity, educational level and number of pregnancies for women), among cases (ethnicity, educational level, number of pregnancies for women and BMI) and among controls (ethnicity and area of residence). The influence of socio-cultural background (which is approximated with educational level) on risk perceptions was observed among all subjects. The proportion of 'yes' responses increased, along with educational level.

The answers provided also varied with respect to the number of pregnancies for female participants (this difference remained significant even after adjustment for age), especially among cases. Women who had have children more often answered 'no' or 'I don't know' compared with nulliparous women. In contrast to our results, the author of a study conducted in Japan found that mothers are more concerned about the health effect of nuclear contamination [20].

Only a small number of studies have been conducted on risk perceptions of cancer occurrence associated with radiation exposure. Different populations clearly react according to their perceptions of radiation risk, although other factors may also be involved, such as age, gender and socio-cultural environment [17]. For example, in other studies conducted on opinions held by different people, laypeople have shown a higher risk perception of nuclear risks (waste or accident) than experts in radiation [13,18]. However, it is difficult to compare the results of these studies with our study, in which subjects were young and were mostly still students.

### 4.4. Uncertainties in diet declarations

Concerning the association between Chernobyl fallout and thyroid cancer occurrence, subject status and reports of potentially contaminated food, we found no evidence of differences for fresh dairy product consumption. This may suggest that there is no bias related to subject beliefs in the dietary reports, despite the uncertainties due to the low power arising from the small number of subjects who reported dairy product consumption.

Conversely, leafy vegetable consumption was greater in cases than in controls, but is not associated with subject beliefs, although this could be due to different levels of consumption between cases and controls (as ingestion of contaminated vegetables may be a risk factor for thyroid cancer). Nevertheless, there are also other likely sources of uncertainties in dietary reports, as recall of past diet is strongly influenced by present dietary habits [21,22], but not according to the subject beliefs.

In conclusion, it would seem that dietary reports may be considered as a second step when performing dosimetric reconstructions, using models specifically developed for taking uncertainties into account [12].

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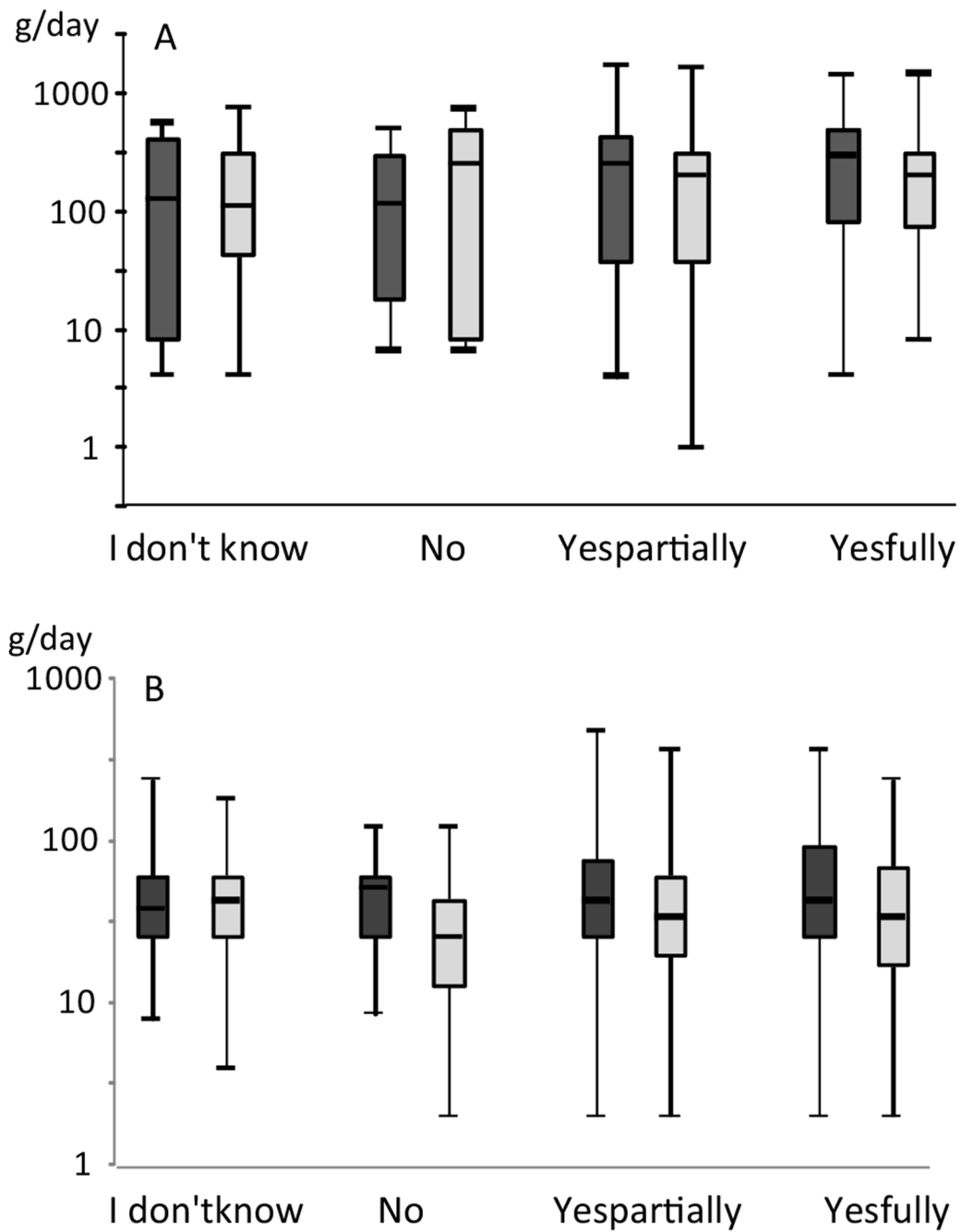
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**Figure 1.** Box plot for fresh dairy product (A) and leafy vegetable (B) consumption in g/day from April to June 1986 according to subject status and to answers to the question ‘Do you believe that thyroid cancers in your region are due to the Chernobyl accident fallout?’ Cases are represented in dark grey and controls in light grey.

**Table 1**

Subject characteristics.

	<u>Cases (n = 765)</u>		<u>Controls (n = 831)</u>	
	<i>n</i>	%	<i>n</i>	%
Sex				
Female	601	78.6	644	77.5
Male	164	21.4	187	22.5
Age class at diagnosis or at reference year				
< 16	18	2.4	21	2.5
16–20	79	10.3	83	10.0
21–25	173	22.6	182	21.9
26–30	280	36.6	309	37.2
31–35	215	28.1	236	28.4
Age category at time of Chernobyl accident				
Not yet conceived	39	5.1	45	5.4
In utero	15	2.0	9	1.1
0–4	132	17.3	138	16.6
5–9	213	27.8	239	28.8
10–15	366	47.8	400	48.1
Year of diagnosis				
2002	115	15.0		
2003	157	20.5		
2004	153	20.0		
2005	165	21.6		
2006	175	22.9		
Histological type				
Papillary	684	89.4		
Follicular	69	9.0		
Oncocytic	2	0.3		
Unknown	10	1.3		

**Table 2**

Perceived risk factors that may influence thyroid cancer occurrence by subject status.

	Cases ( <i>n</i> = 765), <i>n</i> (%)	Control ( <i>n</i> = 831), <i>n</i> (%)	<i>P</i> -value <sup><i>a</i></sup>
Diet	431 (73)	524 (75)	0.53
Alcohol	129 (18)	362 (48)	< 0.01
Tobacco	275 (39)	541 (71)	< 0.01
Nuclear power plant	651 (89)	733 (94)	< 0.01
Atmospheric pollution	631 (86)	666 (86)	0.79
Genetically modified organisms	360 (65)	451 (70)	0.03
Stress	466 (64)	497 (65)	0.55
Exposure to pesticides	504 (71)	658 (85)	< 0.01
Intensive sport activity	22 (3)	48 (6)	< 0.01
Mobile phone antennae	234 (33)	317 (42)	< 0.01
High-voltage lines	237 (34)	330 (44)	< 0.01
Reproductive life	166 (24)	250 (33)	< 0.01

<sup>*a*</sup>Chi<sup>2</sup> test between the beliefs of cases and controls.

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Answers to the question 'Do you believe that thyroid cancers in your region are due to the Chernobyl accident fallout?' by status (cases or controls).

**Table 3**

	I don't know	No	Yes partially	Yes fully	P-value <sup>a</sup>
Cases ( <i>n</i> = 765), <i>n</i> (%)	77 (10.06)	32 (4.18)	457 (59.74)	199 (26.01)	< 0.01
Controls ( <i>n</i> = 831), <i>n</i> (%)	96 (11.55)	34 (4.09)	630 (75.81)	71 (8.54)	

<sup>a</sup> Chi<sup>2</sup> test between answers from cases and controls.



**Table 4**

Answers to the question ‘Do you believe that thyroid cancers in your region are due to the Chernobyl accident fallout?’ by different characteristics in cases and controls.

	Cases (n = 765)			Controls (n = 831)			Overall P-value <sup>c</sup>
	I don't know/No, n (%)	Yes partially/Yes fully, n (%)	P-value <sup>a</sup>	I don't know/No, n (%)	Yes partially/Yes fully, n (%)	P-value <sup>b</sup>	
Sex							
Female	85 (14.1)	516 (85.9)	0.87	99 (15.4)	545 (84.6)	0.69	0.68
Male	24 (14.6)	140 (85.4)		31 (16.6)	156 (83.4)		
Family history							
Yes	7 (15.6)	38 (84.4)	0.79	5 (18.5)	22 (81.5)	0.68	0.68
No	102 (14.2)	618 (85.8)		125 (15.5)	679 (84.5)		
Educational level							
Secondary school level and below	47 (20.6)	181 (79.4)	0.04	36 (20.7)	138 (79.3)	0.11	< 0.01
High school diploma	17 (10.8)	141 (89.2)		22 (13.3)	143 (86.7)		
University	45 (11.9)	334 (88.1)		72 (14.6)	420 (85.4)		
Area of residence							
Alsace	8 (21.1)	30 (78.9)	0.13	5 (12.2)	36 (87.8)	< 0.01	< 0.01
Champagne	11 (19.0)	47 (81.0)		2 (2.9)	68 (97.1)		
Corse	4 (17.4)	19 (82.6)		2 (8.7)	21 (91.3)		
Franche-Comté	10 (23.3)	33 (76.7)		4 (8.7)	42 (91.3)		
Lorraine	5 (6.8)	69 (93.2)		3 (3.8)	76 (96.2)		
Provence-Alpes-Côte d'Azur	31 (15.0)	175 (85.0)		52 (25.1)	155 (74.9)		
Rhône-Alpes	40 (12.4)	283 (87.6)		62 (17.0)	303 (83.0)		
Age							
< 16	6 (33.3)	12 (66.7)	0.06	3 (14.3)	18 (85.7)	0.53	0.32
16-20	8 (10.1)	71 (89.9)		18 (21.7)	65 (78.3)		
21-25	18 (10.4)	155 (89.6)		25 (13.7)	157 (86.3)		
26-30	42 (15.0)	238 (85.0)		50 (16.2)	259 (83.8)		
31-35	35 (16.3)	180 (83.7)		34 (14.4)	202 (85.6)		
Ethnicity							

	Cases ( <i>n</i> = 765)			Controls ( <i>n</i> = 831)			Overall <i>P</i> -value <sup>c</sup>
	I don't know/No, <i>n</i> (%)	Yes partially/Yes fully, <i>n</i> (%)	<i>P</i> -value <sup>a</sup>	I don't know/No, <i>n</i> (%)	Yes partially/Yes fully, <i>n</i> (%)	<i>P</i> -value <sup>b</sup>	
European	75 (11.5)	577 (88.5)	< 0.01	110 (14.3)	660 (85.7)	< 0.01	< 0.01
African	12 (24.0)	38 (76.0)		8 (21.6)	29 (78.4)		
Other	22 (34.9)	41 (65.1)		12 (50.0)	12 (50.0)		
Alcohol consumption							
0	86 (14.9)	491 (85.1)	0.25	92 (16.2)	476 (83.8)	0.57	0.58
1–10 glasses/week	18 (10.9)	147 (89.1)		35 (15.2)	196 (84.8)		
> 10 glasses/week	5 (21.7)	18 (78.3)		3 (9.4)	29 (90.6)		
BMI > 25							
Yes	38 (18.4)	169 (81.6)	0.05	25 (13.2)	165 (86.8)	0.28	0.56
No	71 (12.7)	487 (87.3)		105 (16.4)	536 (83.6)		
Ever smoked							
Yes	50 (13.5)	321 (86.5)	0.55	63 (14.4)	373 (85.6)	0.32	0.27
No	59 (15.0)	335 (85.0)		67 (17.0)	328 (83.0)		
Number of pregnancies (in women)							
Nulliparous	35 (10.6)	294 (89.4)	< 0.01	62 (16.1)	323 (83.9)	0.49	0.03
1–2	33 (16.1)	172 (83.9)		29 (13.3)	189 (86.7)		
3 and over	17 (25.4)	50 (74.6)		8 (19.5)	33 (80.5)		

BMI: body mass index.

<sup>a</sup> Chi<sup>2</sup> tests among cases, with answers categorised into two groups (“No” and “I don't know” vs. “Yes partially” and “Yes fully”).

<sup>b</sup> Chi<sup>2</sup> tests among controls, with answers categorised into two groups (“No” and “I don't know” vs. “Yes partially” and “Yes fully”).

<sup>c</sup> Overall Chi<sup>2</sup> test for all subjects, with answers categorised into two groups (“No” and “I don't know” vs. “Yes partially” and “Yes fully”).

**Table 5**

Answers to the question ‘Do you believe that thyroid cancers in your region are due to the Chernobyl accident fallout?’ by dietary reports in cases and controls.

	Cases ( <i>n</i> = 765)				Controls ( <i>n</i> = 831)				<i>P</i> -value <sup>c</sup>	
	I don't know	No	Yes partially	Yes fully	<i>P</i> -value <sup>a</sup>	I don't know	No	Yes partially		Yes fully
Fresh dairy product consumption										
Yes	13	6	121	54	0.23	23	7	191	21	0.41
No	64	26	336	145		73	27	439	50	
Leafy vegetable consumption										
Yes	44	13	302	132	0.01	54	23	399	45	0.53
No	33	19	155	67		42	11	231	26	0.08

<sup>a</sup>Chi<sup>2</sup> tests among cases.

<sup>b</sup>Chi<sup>2</sup> tests among controls.

<sup>c</sup>Overall Chi<sup>2</sup> test for all subjects.