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Prevalence of main cancer lifestyle risk factors in Europe in 2000

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ABSTRACT

Background: Estimation of changes in cancer incidence possibly induced by primary prevention policies requires knowledge of the level of exposure to risk factors targeted by these policies.

Materials and methods: We collected comparable exposure data from 30 European countries for five lifestyle cancer risk factors: tobacco smoking, alcohol drinking, overweight and obesity, physical activity and fruit and vegetable consumption. We obtained original reports for years 1995–2005 and the present manuscript reports results around year 2000.

Results: This work revealed the important heterogeneity in the quality and possibility to compare data between and within countries. Overall, we observed a clustering of lifestyle factors: highest tobacco consumption in Eastern Europe up to 61.6% in men in Latvia; high alcohol consumption in central Europe, particularly in Czech Republic in which the average daily consumption was 56.9 g/l in men and 14.6 g/l in women; low fruit and vegetable consumption (less than 150 g/d) in Finland, Sweden, Norway and United Kingdom. Obesity was the most prevalent and exceeded 18% for men in United Kingdom, Malta and Greece; and for women in UK, Greece, Luxembourg and Hungary.

Conclusion: We conclude that data on tobacco smoking and alcohol consumption are reasonably comparable and match the pattern of cancer incidence. Interpretation of data related to physical activity and fruit and vegetable consumption should be cautious because of considerable between-country variations in the way these data were collected. Recent efforts for harmonisation of health survey questionnaires and sampling methods across European countries should be pursued in order to increase comparability of results.

1. Introduction

Data on exposure of populations to cancer risk factors are necessary for appropriate tailoring of public health policies, for instance in estimating the current and future burden of cancer[1–4] or for planning and evaluating prevention activities. Temporal trends in cancer incidence and mortality may inform of the impact of prevention policies, but in general, these statistics provide information only many years after these policies were implemented.[5]

Having a better knowledge of the prevalence of exposure to lifestyle risk factors allows us to anticipate likely changes in the cancer burden due to primary prevention programmes.[5]

The Eurocadet project aims to estimate future changes in the cancer burden in Europe which could be induced by changes in exposure to the most common cancer risk factors (http://www.eurocadet.org).

Estimation of changes in cancer incidence possibly induced by primary prevention activities requires knowledge

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of the population attributable fraction (PAF) that is the proportion of cancer in a population that can be attributed to a risk factor.[1] Calculation of a PAF requires two parameters: the relative risk, which is the cancer risk associated with being exposed to a risk factor, and the 'exposure prevalence', which is the amount of exposure of a population to a specific risk factor at a given time. Whereas relative risks are often available from the epidemiology literature, mainly from meta-analyses, exposure prevalence data require an extensive search of a large variety of documents, a large part of which are not being published in peer-reviewed journals.

In this article we present prevalence exposure for four established lifestyle cancer risk factors including tobacco smoking, alcohol drinking, obesity and physical activity. In addition, we also collected data for fruit and vegetable consumption, although the association of this factor with cancer occurrence is weak.[6,7]

2. Materials and methods

Countries included in the study were the 27 European Union member states as of 1st January 2007, as well as Iceland, Norway, and Switzerland.

We primarily looked for surveys conducted in the general population that gathered exposure prevalence data from 1995 to 2005. The overall method used for data collection is described in the additional material [Web annex]. In brief, we conducted a systematic search in the literature and in three major databases: Medline, the WHO Global InfoBase on line (http://www.who.int/infobase/), and Eurostat (http://epp.eurostat.ec.europa.eu/). These three databases mainly served for identification of data sources in countries. We completed this search by systematic contact with ministries of health, national statistic institutes, and other specialised academic or non-governmental institutions. This latter search provided the majority of data on exposure prevalence selected for the Eurocadet project.

Overall, we gathered data for at least 1 year between the period 1995–2005, for all the countries and all the risk factors. In this article we present a summary data for around the year 2000 to enable European comparisons. We selected this year as it was one whereby a majority of prevalence data were available. All raw data, by age group and by year are available on Eurocadet's website (http://www.eurocadet.org).

2.1. Handling of data

For each country we predominantly received several sets of data gathered by different institutions. These are the 'primary data sources' in the tables of Section 3. Each year of data from 1990 to 2005 was considered as a single primary data source; thus a study reporting data on a specific factor with 10 successive years was considered as equivalent to 10 primary sources of data.

The number of sources used should not be compared used with the total number of sources to compute a proportion of good quality data.

When two or more data sources were available for a given year, only one source of data was included. Selection of the data source to be included in the Eurocadet project followed pre-established criteria:

- Priority was given to surveys based on multi-stage sampling procedures or cluster sampling and surveys conducted on large samples.
- Information on the studied population, with age and sex distributions and geographical extent, had to be available. Data was not used if it concerned a part of a nation, for example only the capital or a region or a specific population group.
- Clear indication of the metric, (i.e., the method used for assessment of exposure), used had to be indicated so that we could evaluate the possibility to make appropriate comparisons with data of other countries.
- Data must be reported separately for men and women except for fruit and vegetable (see description later in Section 2.2).

In the tables of the Section 3, the column 'sources used' indicate the number of datasets from primary data sources that provided the most adequate information for years falling in the 1995–2005 period.

2.2. Data processing

Table 1 presents the different metrics used for each risk factor.

2.2.1. Tobacco smoking

Data on tobacco smoking was included when data were reported as the percentages of current and of former smokers, with clear distinction between these two categories. The 'current smoker' category included subjects that reported being daily smokers, occasional (not every day) smokers or either daily or occasional smokers who stopped smoking in the last 11 months. The 'former smoker' category included daily and occasional smokers who stopped smoking at least 12 months ago.

Surveys reporting only the percentage of individuals smoking more than one cigarette per day were not included. For surveys including both 'smokers of more than one cigarette a day' and 'occasional smokers' we aggregated the two to estimate the prevalence of current smoking.

2.2.2. Alcohol drinking

Alcohol consumption is notoriously under reported by interviewed subjects and estimates of consumption based on survey data are systematically lower than estimates based on sales statistics,[1,2,8,9] with 40–60% of alcohol from sales statistics being captured by self-reported surveys.[10] We thus used a re-scaling of self-reported consumption in surveys using sales statistics from the WHO WHOSIS database (http://www.who.int/whosis) which registers sales of alcohol, accounting for imports, exports, stocks and a correction for unregistered alcohol consumption per capita. This data is expressed for each country in litres of pure alcohol per capita, per year. To estimate the alcohol consumption expressed as 'glasses per day' we used a standard average amount of 10 g

Table 1 – Metrics for the assessment of lifestyle-related risk factors prevalence for cancers used by the Eurocadet project.

Exposure	Categories (metrics)	Description
Tobacco smoking	Current smoker	
		– Daily smoker
		– Occasional (not every day) smoker
		– Daily or occasional smokers who stopped smoking in the last 11 months
	Former smoker	Daily or occasional smoker who stopped smoking at least 12 months ago
	Never smoker	
Alcohol consumption	Average alcohol consumption per person (g/d)	– Grams per day from surveys weighted for age-groups and sex by alcohol sales statistics (liters/capita) to estimate the average individual intake
Physical activity	Average vigorous activity (minutes/week)	
		– Practice of sport
		– Lifting heavy loads
		– Aerobics gymnastics
Excess weight	Obesity	$\geqslant 30.0\ kg/m^2$
	Overweight	$25.0–29.9\ kg/m^2$
Fruit and vegetables consumption	Fruit intake (g/d)	Any fruits
	Vegetables intake (g/d)	Any vegetables

pure alcohol, per glass.[8] To redistribute the average consumption between genders and age-groups, we derived from self-reported alcohol consumption in surveys the relative weights by gender and age that we then applied on alcohol consumption estimated from sales statistics.

2.2.3. *Physical activity*

Surveys used many different definitions of physical activity; some surveys defined physical activity as any activity of the body including walking during the day (for instance walking from the house to the bus station); other surveys defined physical activity as any activity after which individuals were at least 'a little out of breath'. Most studies collected data on physical activity duration by type of activity. To limit misclassification biases and to secure best match with definitions used in epidemiological studies that estimated cancer risk, we only considered vigorous physical activities such as practice of sports, lifting heavy loads, or aerobic gymnastics.

For the intensity of physical activity we took the most commonly used definition: the duration of physical activity per week.

A special Eurobarometer survey was conducted in Europe by TNS Opinion in November–December 2005 with a focus on physical activity.[11] The original report did not provide data separated by gender. TNS Opinion provided us with raw data from which we extracted prevalence of physical activity for each country by gender and age groups.

2.2.4. *Obesity and overweight*

Overweight and obesity were defined using WHO's definition as a body mass index (BMI) between 25 and 29.9 for overweight, and equal or greater than 30 for obesity. The method utilised for assessing height and weight was not systematically reported by surveys. We included statistics regardless of whether the height and weight were self-reported or actually measured. For surveys with reported methods, the comparison of prevalence from self-reports or actual measurements did not reveal any major impact on the prevalence of obesity and overweight (data not shown).

2.2.5. *Fruit and vegetable consumption*

We gathered data on the average daily consumption of fruit and vegetables expressed in grams per day. We included any prevalence data described as 'fruit' and 'vegetable' whatever the definition given in the surveys. Because of the difficulty to assess food intakes by questionnaire surveys,limited data were available. Despite gender differences observed in studies on fruit and vegetable consumption, many surveys grouped results for men and women. To avoid having to exclude the majority of surveys, we also presented results for both sexes combined.

3. Results

3.1. *Tobacco smoking*

We received data from 1110 sources, of which we used 225 (20%) to estimate prevalence (Table 2). Fig. 1 is a geographical display of data in Table 2; for men it shows a marked West-to-East gradient in current smokers and an East-to-West gradient in former smokers. Current smoking in men ranged from

Table 2 – Prevalence of tobacco smoking (current and former smokers) expressed as a percentage of the population aged 15 years and more around year 2000.

Country	Year	Men		Women		Sources identified[a]	Sources used[a]
		Current	Former	Current	Former		
Austria	2000	42.3	20.6	26.6	13.18	26	4
Belgium	2000	35.2	26.3	24.6	17.2	57	8
Bulgaria	2001	51.3	17.8	29.7	9.6	10	3
Cyprus	2002	41.5	21.5	12.7	4.8	9	3
Czech Republic	2000	38.4	24.1	24.4	16.2	23	6
Denmark	2000	40.2	24.3	35.1	23.1	44	4
Estonia	2000	55.1	23.6	29.1	16.6	30	10
Finland	2000	39.4	17.9	29.1	12.3	71	15
France	2000	29.6	27.4	19.0	15.5	45	13
Germany	2000	36.2	28.4	27.8	18.9	68	7
Greece	2004	50.6	14.9	35.6	6.3	26	4
Hungary	2001	40.3	26.1	26.6	13.7	21	4
Iceland	2000	32.4	25.3	31.4	21.9	21	11
Ireland	2005	33.0	21.1	28.8	17.1	26	3
Italy	2000	32.3	28.7	17.4	14.1	61	15
Latvia	2000	61.6	11.4	26.9	4.2	16	6
Lithuania	2000	58.8	10.9	22.3	3.3	26	8
Luxembourg	2001	38.7	7.3	26.0	5.8	22	7
Malta	2003	30.3	26.1	21.3	14.0	9	3
Netherlands	2000	34.3	26.5	27.2	21.2	62	18
Norway	2000	40.1	20.6	38.7	16.3	99	17
Poland	2000	44.9	20.2	25.2	13.4	42	4
Portugal	2000	32.8	22.9	10.4	5.2	19	4
Romania	2000	44.2	15.6	17.4	5.0	24	3
Slovakia	2005	37.8	20.8	20.5	15.1	8	2
Slovenia	2000	31.2	26.3	20.6	14.6	13	4
Spain	2000	42.1	24.2	26.1	9.5	34	7
Sweden	2000	28.2	27.9	27.8	21.2	76	4
Switzerland	2000	37.1	21.2	28.5	17.1	36	9
United Kingdom	2005	33.3	25.4	26.2	25.2	5	2
UK–Great Britain	2000	27.4	28.8	25.0	20.6	63	12
UK–Northern Ireland	2000	30.4	31.8	28.4	24.5	18	5

[a]See Section 2 for definition.

27% in Great Britain to 62% in Latvia, and in women, from 10% in Portugal to 38% in Norway. Current smoking in women was also quite prevalent in Denmark and Greece.

3.2. *Alcohol drinking*

We received data from 582 sources, of which we used 131 (23%) to estimate average daily alcohol consumption (Table 3). Fig. 2 is a geographical display of data in Table 3; it shows a great variability in alcohol consumption between countries. In men, a 3.6-fold difference in average alcohol intake was noted between Iceland and the Czech Republic. A 4-fold difference was noted between Maltese or Romanian women and Luxembourgish women. Alcohol intake by both genders seemed particularly high in Luxembourg and in Ireland, however Luxembourg statistics based on sales may be biased (see Section 4). Western and Central European countries such as France, Germany, Czech Republic, Slovakia and Hungary showed a clustering of relatively high alcohol consumption for both men and women. Danish women rank third for alcohol consumption (after Luxembourg and Ireland) although alcohol consumption by Danish men is in the European average.

3.3. *Physical activity*

We received data from 283 sources, of which we used 72 (25%) to estimate average physical activity (Table 4). Fig. 3 is a geographical display of data in Table 4. Vigorous physical activity seemed highly prevalent in both genders in Germany, Austria, Greece and Slovakia. In these four countries men would engage in vigorous physical activity for more than 10 h per week. An 11-fold difference in vigorous physical activity would exist between Hungarian and Slovakian men. A difference of similar magnitude would exist between Hungarian and German women. For the majority of countries, physical activity in men was twice that of women. Results were also heterogeneous within countries; for example, in Slovenia the duration of vigorous physical activities in men was estimated at 131.3 min per week (min/week) in 1999, 119 min/week in 2000–2001, and 320.9 min/week in 2005.

3.4. *Obesity and overweight*

We received data from 220 sources, of which we used 95 (43%) to estimate the prevalence of obesity and overweight (Table 5). Fig. 4 is a geographical display of data in Table 5. The

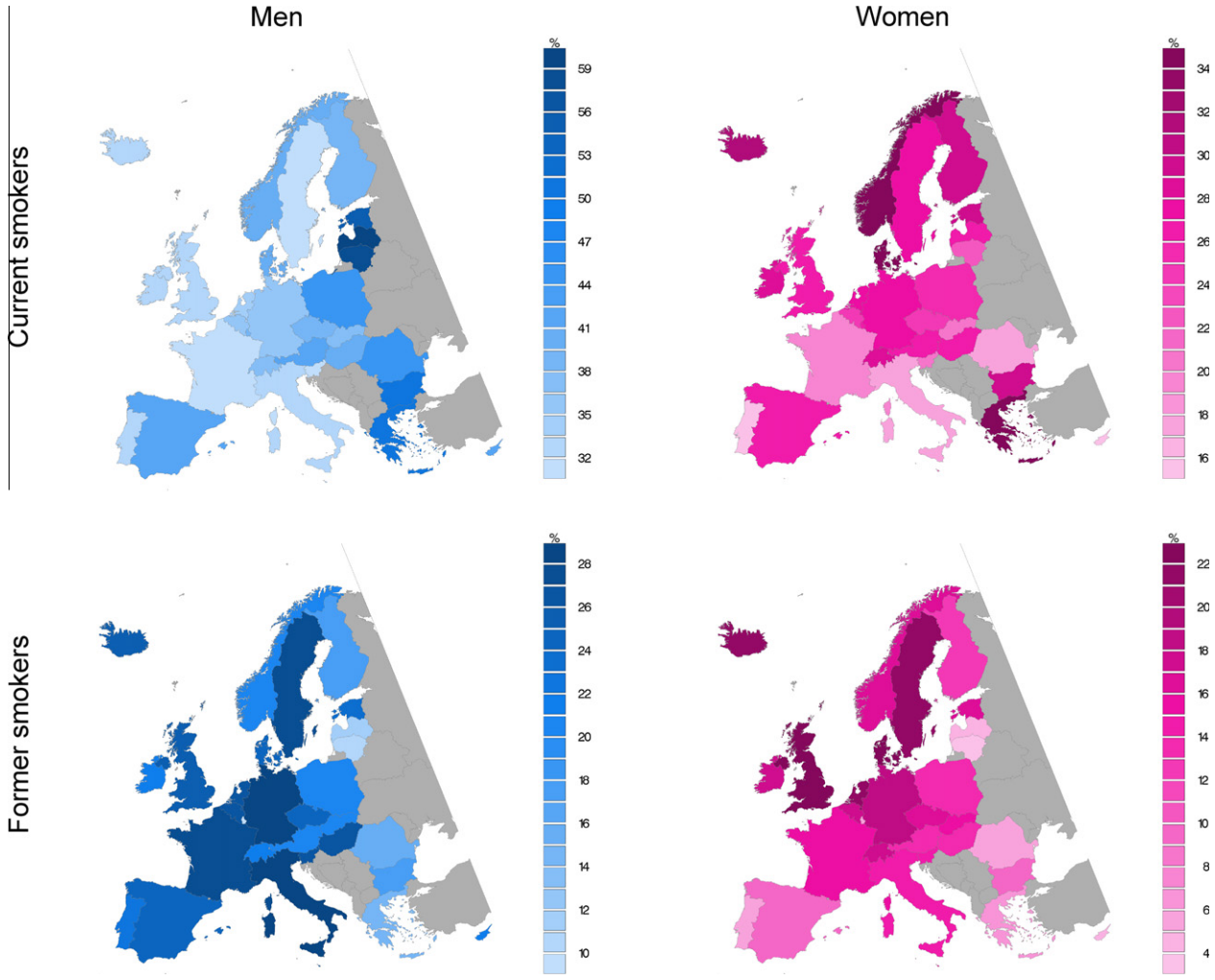

Fig. 1 – Prevalence (in %) of current and of former smokers in European adult populations around year 2000.

prevalence of obesity in men ranged from 7% in Norway and Switzerland to 25% in the United Kingdom. In women, it ranged from 7% in Switzerland to 23% in Northern Ireland. Obesity in both genders seemed most prevalent in the UK, Malta and Greece. We computed the prevalence of abnormal high BMI by pooling overweight and obesity. Seven countries had a prevalence of overweight and obesity lower than 50% for men and lower than 40% for women: Switzerland (44.1% of men and 28.6% of women), Norway (47% of men and 31.3% of women), Netherlands (47.2% of men and 38% of women), France (48.2% of men and 34.3% of women), Denmark (48.7% of men and 32.9% of women), Sweden (48.9% of men and 35.7% of women) and Belgium (49.8% of men and 36.5% of women).

3.5. *Fruit and vegetable consumption*

We received data from 131 sources, of which we used 61 (47%) to estimate fruit and vegetable consumption (Table 6). No data sources were identified for Romania or Northern Ireland. Finland, Norway, Sweden and the UK showed relatively low consumption of fruit and vegetables; the highest daily averages of fruit and vegetable consumption were observed in southern and eastern countries including Bulgaria, Cyprus, Greece, Italy and Malta.

4. Discussion

In this study we reported the prevalence of lifestyle-related risk factors for cancer in 30 European countries.

4.1. *Summary of results*

Overall, we observed highest tobacco consumption in Eastern Europe up to 61.6% in men in Latvia. Alcohol consumption was particularly high in central Europe, such as in Czech Republic with a daily average consumption of 56.9 g/l in men and 14.6 g/l in women. Vigorous physical activity was highly prevalent in both genders in Germany, Austria, Greece and Slovakia. Obesity was the most prevalent and exceeded 18% for men in UK, Malta and Greece; and for women in UK, Greece, Luxembourg and Hungary. The lowest consumption of fruit and vegetable (less than 150 g/d) was observed in Northern countries such as in Finland, Sweden, Norway and the United Kingdom.

Table 3 – Average daily consumption of alcohol per capita (in grams per day) around year 2000 in Europe.

	Year	Men	Women	Sources identified[a]	Sources used[a]
Austria	2000	43.5	13.1	12	3
Belgium	2000	32.4	12.4	21	5
Bulgaria	2000	26.9	7.2	6	1
Cyprus	2000	23.3	5.7	3	2
Czech Republic	2000	56.9	14.6	13	5
Denmark	2000	34.5	18.1	73	4
Estonia	2000	29.3	10.0	21	8
Finland	2000	30.3	13.6	39	17
France	2000	45.6	13.2	16	5
Germany	2000	43.4	13.5	28	3
Greece	1999	37.6	6.8	16	2
Hungary	2000	46.1	6.2	8	4
Iceland	2000	16.0	8.0	5	3
Ireland	2000	41.4	20.9	9	3
Italy	2000	28.8	12.1	24	8
Latvia	2000	27.5	13.8	13	4
Lithuania	2000	39.1	14.9	18	7
Luxembourg	2000	53.3	28.1	4	1
Malta	2003	24.1	5.4	4	2
Netherlands	2000	28.7	14.4	34	6
Norway	2000	18.4	7.4	32	4
Poland	2006	29.2	8.9	5	1
Portugal	2000	44.0	12.1	10	1
Romania	2000	27.6	5.4	7	1
Slovakia	2000	43.3	11.3	19	1
Slovenia	2000	42.0	8.8	8	6
Spain	2000	39.6	12.6	19	1
Sweden	2000	21.2	9.36	32	8
Switzerland	2000	38.9	13.4	6	3
United Kingdom	2000	32.0	12.8	7	2
UK–Great Britain	2000	31.9	13.0	36	9
UK–Northern Ireland	2006	31.9	13.7	14	1

[a]See Section 2 for definition.

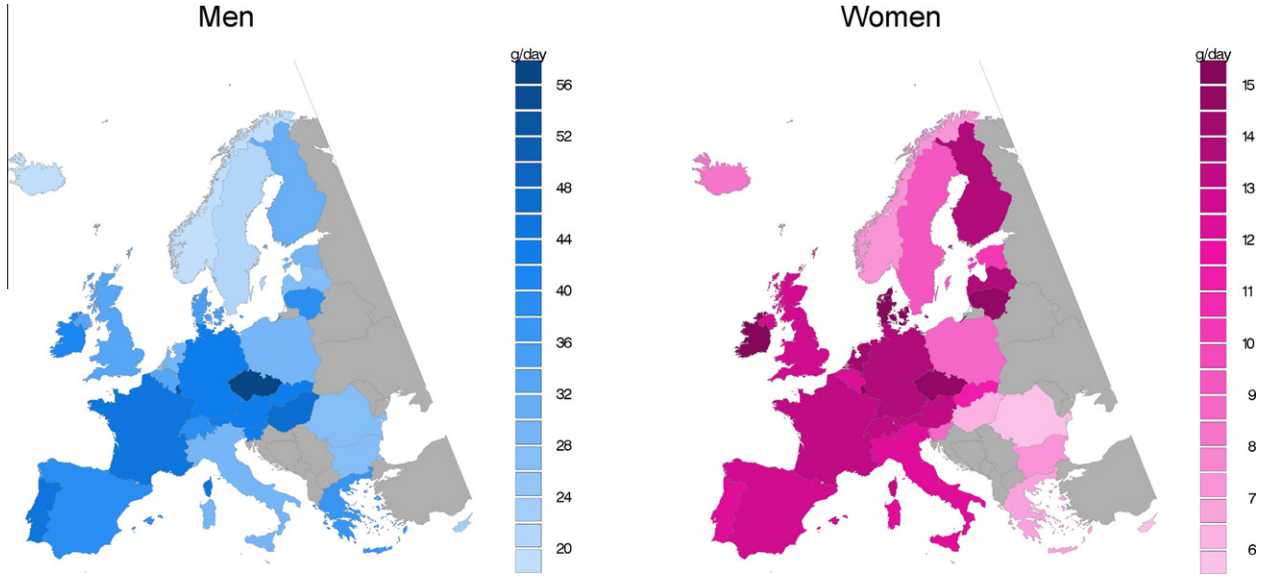

Fig. 2 – Daily average alcohol consumption (in g per day) per capita in European countries around year 2000.

4.2. *Notes on interpretation of prevalence data*

From the prevalence data around the year 2000 we identified clustering of countries with particularly high or low exposure to lifestyle cancer risk factors. Nordic countries presented low tobacco consumption whereas Central European countries had high tobacco consumption. Central European countries still have a low prevalence of former smokers indicating that

Table 4 – Average amount of vigorous physical activity per capita (in number of minutes per week) around year 2000 in Europe.

	Year	Men	Women	Sources identified[a]	Sources used[a]
Austria	2004	323	233	5	1
Belgium	1999	70	35	11	2
Bulgaria	2001	70	21	2	2
Cyprus	2005	239	107	3	1
Czech Republic	2002	119	28	6	1
Denmark	2005	268	106	8	1
Estonia	2000	69	63	15	8
Finland	1999	175	105	24	2
France	1998	119	42	12	2
Germany	2001	210	196	9	4
Greece	2005	390	142	7	2
Hungary	2000	42	14	5	3
Iceland	2002	192	179	1	1
Ireland	2005	172	20	7	1
Italy	2002	105	42	19	3
Latvia	2003	133	42	10	2
Lithuania	2003	91	35	10	3
Luxembourg	2005	226	111	6	1
Malta	2003	140	120	4	2
Netherlands	2000	152	98	18	10
Norway	2000	140	98	17	1
Poland	2003	84	28	4	3
Portugal	2006	124	54	7	1
Romania	2005	414	92	2	1
Slovakia	2005	520	184	3	1
Slovenia	2000	119	56	10	3
Spain	2002	98	42	13	2
Sweden	2001	161	91	17	2
Switzerland	2002	125	95	2	2
United Kingdom	2001	98	49	6	2
UK–Great Britain	2005	91	49	13	1
UK–Northern Ireland	2005	156	34	7	1

[a]See method section for definition.

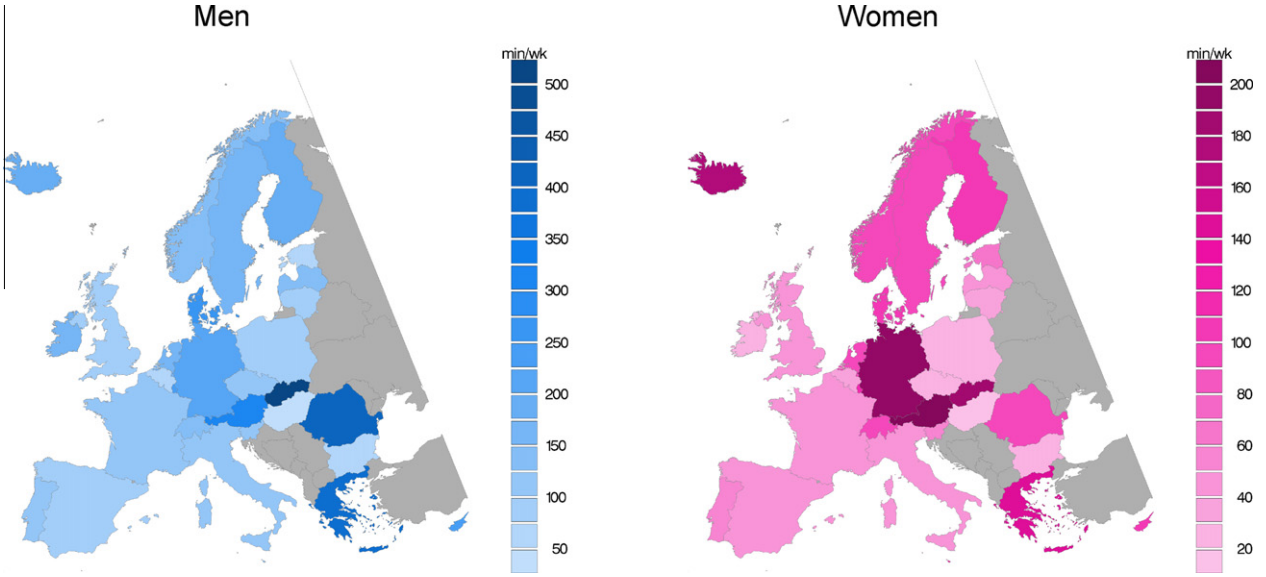

Fig. 3 – Average physical activity (in minutes per week) per capita in European countries around year 2000.

the shift from current smokers to former smokers due to successful smoking cessation has not started yet. This exposure data correlates well with the known, and still increasing incidence of cancers of the respiratory tract in Central European

Table 5 – Prevalence (in %) of obesity and overweight around year 2000 in Europe.

	Year	Men		Women		Sources identified[a]	Sources used[a]
		Overweight	Obesity	Overweight	Obesity		
Austria	1999	54.3	9.1	21.3	9.1	8	1
Belgium	2000	38.3	11.5	24.6	11.9	3	1
Bulgaria	2001	38.8	11.3	28.8	13.5	6	1
Cyprus	2003	41.1	12.9	26.9	11.8	3	1
Czech Republic	2000	42.2	12.1	29.5	15.0	2	1
Denmark	2000	38.8	9.9	23.8	9.1	6	4
Estonia	2000	33.0	11.9	25.7	14.8	6	2
Finland	2000	39.7	11.6	25.2	10.9	5	2
France	2000	37.8	10.4	23.7	10.6	12	2
Germany	2000	44.1	12.5	28.8	11.3	7	5
Greece	2000	41.1	26.0	29.9	18.2	11	1
Hungary	2000	38.3	18.3	28.7	18.9	5	2
Iceland	2000	42.1	13.0	27.3	12.6	4	3
Ireland	2000	40.8	12.9	25.7	10.6	4	2
Italy	2000	41.9	8.6	25.5	8.1	9	6
Latvia	2000	30.7	9.3	26.7	17.1	8	6
Lithuania	2000	38.4	13.6	29.9	17.5	12	6
Luxembourg	1985	44.5	13.6	34.2	18.3	4	1
Malta	2003	46.5	22.9	34.3	16.9	6	3
Netherlands	2000	39.2	8.0	27.8	10.2	17	10
Norway	2000	39.6	7.4	24.3	7.0	8	4
Poland	2000	38.5	11.5	26.5	12.5	5	2
Portugal	2003	36.9	14.8	45.5	15.4	6	1
Romania	2000	38.1	7.7	28.8	9.3	3	1
Slovakia	1999	39.6	15.4	30.0	15.0	3	1
Slovenia	2001	44.2	13.1	29.6	12.2	7	4
Spain	2000	44.3	12.5	28.6	13.2	13	6
Sweden	2000	40.0	8.9	26.7	9.0	10	5
Switzerland	2000	36.7	7.4	21.4	7.2	6	3
United Kingdom	1992	42.6	12.6	28.5	15.8	5	3
UK–Great Britain	2001	42.5	24.6	32.0	20.0	15	4
UK–Northern Ireland	2005	39.0	25.0	30.3	23.2	1	1

[a] See Section 2 for definition.

countries, whilst the incidence of such cancers is decreasing (at least in men) in the rest of Europe.

A high consumption of alcohol was observed for many Central European and Western European countries: France, Germany, Austria, Czech Republic, Slovakia and Hungary. The combination of high consumption of tobacco and alcohol in Slovakia and Hungary are in line with the high incidence and mortality of oral cavity and pharyngeal cancers observed in these two countries.[12,13]

Obesity was most prevalent in the UK, Malta and Greece. The pattern of obesity and overweight prevalence in Europe was not correlated to low physical activity or low fruit and vegetable consumption in our data; this observation supports studies showing that focussing on lowering fat and/or sugar intakes might be more efficient for decreasing obesity in Europe.[14]

Even if the quality of prevalence data for fruit and vegetable consumption is questionable (see below), a clear clustering could be identified with low fruit and vegetable consumption in Nordic countries and the UK and a high consumption in Central and Southern European countries.

Exposure prevalence data of risk factors, for which numerous surveys have been completed or for which good economic data exists (such as tobacco smoking or alcohol consumption) were more amenable to between-country comparisons. Also, distribution patterns of these two factors across Europe somewhat correlated well with geographical clustering and incidence of cancers of the respiratory and digestive tract.[13]

Estimates of alcohol consumption,[10] and of obesity and overweight[15] from surveys are highly vulnerable to reporting bias. For alcohol consumption, we attempted to correct underreporting using sales statistics as a 'scaling' value for survey data. This method assumes that underreporting may vary between countries but that underreporting was equivalent in men and women and across age groups. This assumption may not be true and the correction could artificially increase alcohol consumption levels in population groups reporting their alcohol consumption more accurately. Alcohol consumption figures obtained from surveys required a correction since estimates of national alcohol consumption taken from data from these surveys were systematically lower than the consumption estimated from records sales statistics. Moreover, sales statistics are themselves likely to underestimate alcohol consumption due to lack of information on smuggled or privately produced alcohol (e.g. small-scale, home-distilled liquors). Consequently, actual alcohol consumption is probably higher than what we estimated in this work. A notable exception is Luxembourg, where sales

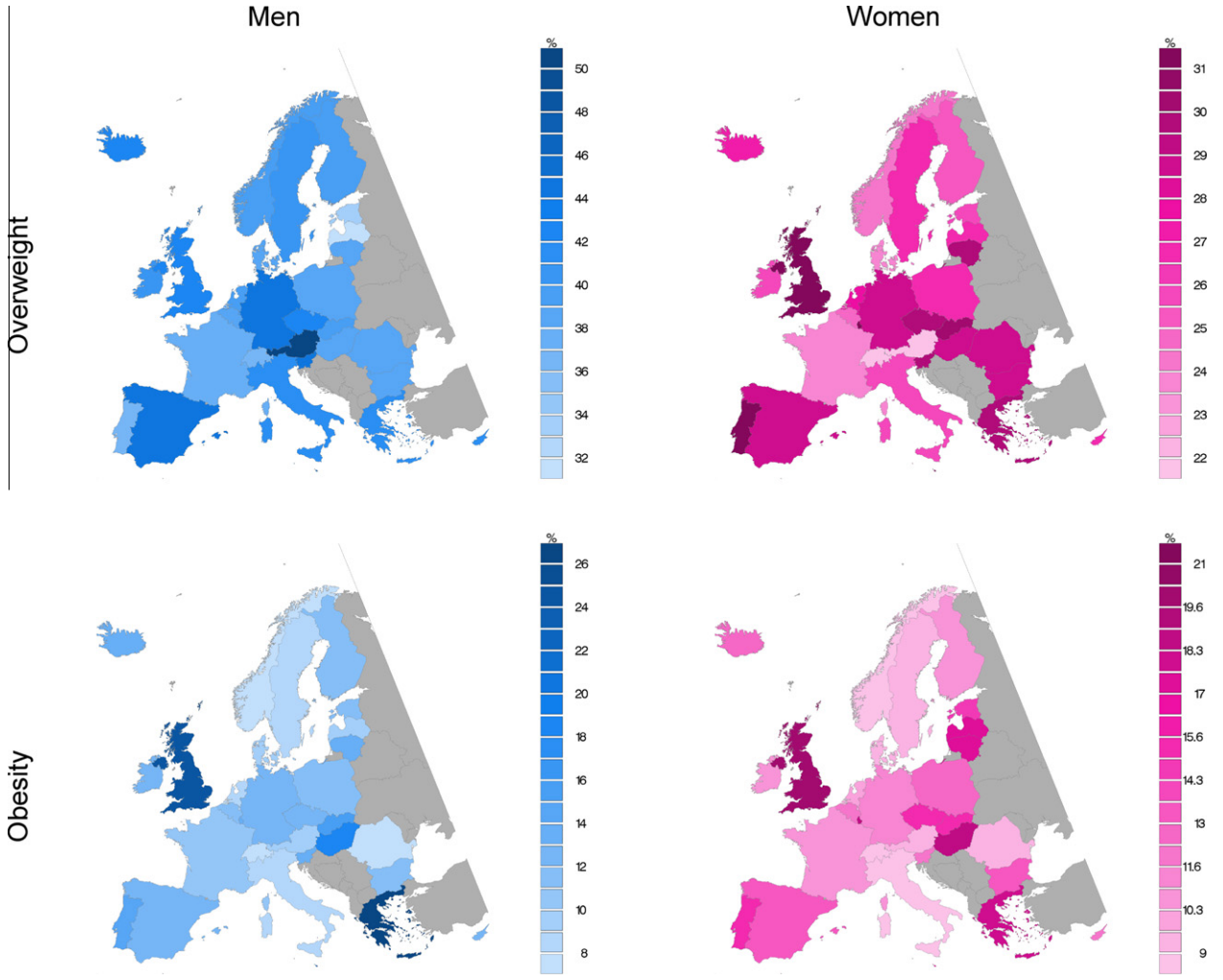

Fig. 4 – Prevalence (in %) of overweight (25 < BMI < 30) and of obesity (BMI ⩾ 30) in European adult populations around year 2000.

statistics also include substantial amounts of low-priced alcohol merchandise sold to Belgium, France and Germany.

Self-reported overweight and obesity are known to be underestimated[15]; analysis from the NHANES study showed an average decrease of 0.5 points of BMI for overweight individuals and of 1.0 point of BMI for obese individuals.[15] This underreporting is thus smaller than for alcohol consumption. As we did not observe meaningful differences between self-reported or measured BMI, we did not attempt to correct this bias.

Where less information was available, for both physical exercise and fruit and vegetable consumption, country comparisons were less reliable. The 10-fold difference in men and women might be seen as overestimated. However, when the maximum difference of minutes per week was measured in the same survey in the Special Eurobarometer 246[11], this difference magnitude was 13-fold between Slovakia and Malta. Variability in physical activities could be due to differences in survey methods, particularly in the definition of levels of physical activity. Standardised questionnaires, such as the International Physical Activity Questionnaire (IPAQ) have been developed. The IPAQ is relatively recent and even if promising correlations exist between physical activity estimated with IPAQ and measures from accelerometers, the correlation still remains imperfect with 'r' Spearman correlation coefficients in the range of 0.3.[16] In IPAQ, the test re-test reliability of the IPAQ questionnaire was reasonably high in the order of $r = 0.8$ which will allow follow-up studies in the future.

Fruit and vegetable consumption surveys were particularly poor in their assessment of consumption levels; practically no harmonisation existed between surveys and countries on exposure definition and data were seldom reported by sex or by age group. This explains why the main source of information was from the European Prospective Investigation into Cancer (EPIC) cohort that harmonised the recording of food consumption in Europe. Indeed, in the EPIC cohort the food questionnaire accurately recorded fruit and vegetable consumption: the spearman correlation coefficient between food questionnaires and 12 24-h diet recalls (which can be considered as a 'gold standard') ranged between 0.33 and 0.79 for fruit and between 0.31 and 0.60 for vegetables.[17]

Table 6 – Average daily consumption of fruit and vegetable per capita (in grams per day) in Europe around year 2000.

		Men		Women		Both sexes		Sources identified[a]	Sources used[a]
	Year	Fruit	Vegetable	Fruit	Vegetable	Fruit	Vegetable		
Austria	1999					192	142	2	1
Belgium	2004	99.4	211	134.4	231.7			6	1
Bulgaria	2002	293	243	303	291			1	1
Cyprus	1997					325	293	1	1
Czech Republic	1997					158	122	4	1
Denmark	1995	152	255	179	205			5	2
Estonia	1997	132	219	161	192			8	1
Finland	1998					157	122	2	1
France	1993	189	93	184	109			7	1
Germany	1998	179	160	207	164			7	2
Greece	1999	392.3	583.3	385	535.5			6	4
Hungary	1991					150	199	2	1
Iceland	2002	64	101	89	98			1	1
Ireland	2002	215.5	186.9	277.5	246.4	247	217.2	8	4
Italy	1996					233	184	5	3
Latvia	2002					130	236	6	4
Lithuania	1997	136.5	210.7	199.2	170	169.2	189.5	8	1
Luxembourg	1993					170	164	1	1
Malta	2000					264	263	4	3
Netherlands	1998	100	128	115	125			4	3
Norway	1998					135	109	6	2
Poland	2000					180	206	4	3
Portugal	2000					198	137	3	3
Romania								0	0
Slovakia	2000					146	123	4	3
Slovenia	2000					214	185	4	3
Spain	1999					195	121	8	3
Sweden	1998					138.6	119.3	4	3
Switzerland	2000					180	200	4	1
United Kingdom	1999					106	150	3	1
UK–Great Britain	2001	135	123	150	113	142.6	118	2	2
UK–Northern Ireland								1	0

[a] See Section 2 for definition.

The Data Food Networking (DAFNE) databank[18] was also identified as a major comprehensive source of information for statistics on food consumption in Europe.[19] However, data reported by DAFNE were for both sexes combined, which reduced the usefulness of this huge resource.

Because of the limited data and of the important, between-country and between-survey variability in the way fruit and vegetable consumption was assessed, results presented herein should be taken with caution.

4.3. *Current data collection efforts and future perspective*

The gathering of basic, comparable data on common cancer risk factors in Europe proved to be more complex than expected. This exercise revealed the important heterogeneity in the availability and format of such data, the fragmentation of data sources and duplication of data collection prevailing in many countries. It also clearly showed that in current circumstances, assembling data relevant to public health in European countries should not rely upon a single type of institution.

The major databases covering Europe[20,21] were of great utility in identifying the different institutions in that they hold the relevant data. However, a number of surveys were not incorporated and descriptions of survey methods, population sources, exposure definitions and metrics were limited.

Few attempts have been made in the past for comparing cancer risk factors between European countries. In 1999, Eurostat initiated a collection of health and health-related data in an aggregated format from Europe's various health and population surveys.[22] The aim was to summarise the key findings of these surveys into a common format and disseminate the results. Fifteen countries were included in the project, including Iceland, Norway and Switzerland. A significant limitation was the substantial variation in the wording of questions, and in the time windows explored by questions (e.g. one survey could ask about alcohol drinking over the last 12 months whilst another did not specify a period of interest). The report did not discuss the potential impact of the variability in survey methods on results. Consequently, the comparability of exposure prevalence data displayed in this report was questionable.

Recent surveys showed an improvement in the comparability of questionnaires with international studies such as Eurobarometer or the Survey of Health, Ageing and Retirement in Europe (SHARE) which developed standard questionnaires and improved harmonisation in survey methodologies. Efforts should be devoted to pursue the harmonisation of

health survey methods across European countries. We could expect that future surveys will benefit from these attempts of increasing comparability, provided that other groups would make the effort of adopting similar methodologies.

Conflict of interest statement

None declared.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ejca.2010.07.049.

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