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Review

Cancer incidence and mortality patterns in Europe: Estimates for 40 countries and 25 major cancers in 2018

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Abstract ***Introduction:*** Europe contains 9% of the world population but has a 25% share of the global cancer burden. Up-to-date cancer statistics in Europe are key to cancer planning. Cancer incidence and mortality estimates for 25 major cancers are presented for the 40 countries in the four United Nations-defined areas of Europe and for Europe and the European Union (EU-28) for 2018.

Methods: Estimates of national incidence and mortality rates for 2018 were based on statistical models applied to the most recently published data, with predictions obtained from recent trends, where possible. The estimated rates in 2018 were applied to the 2018 population estimates to obtain the estimated numbers of new cancer cases and deaths in Europe in 2018.

Results: There were an estimated 3.91 million new cases of cancer (excluding non-melanoma skin cancer) and 1.93 million deaths from cancer in Europe in 2018. The most common cancer sites were cancers of the female breast (523,000 cases), followed by colorectal (500,000), lung (470,000) and prostate cancer (450,000). These four cancers represent half of the overall burden of cancer in Europe. The most common causes of death from cancer were cancers of the lung (388,000 deaths), colorectal (243,000), breast (138,000) and pancreatic cancer (128,000). In the EU-28, the estimated number of new cases of cancer was approximately 1.6 million in males and 1.4 million in females, with 790,000 men and 620,000 women dying from the disease in the same year.

Conclusion: The present estimates of the cancer burden in Europe alongside a description of the profiles of common cancers at the national and regional level provide a basis for

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establishing priorities for cancer control actions across Europe. The estimates presented here are based on the recorded data from 145 population-based cancer registries in Europe. Their long established role in planning and evaluating national cancer plans on the continent should not be undervalued.

1. Introduction

Till date, cancer incidence and mortality data in Europe are a key resource in both planning and assessing the impact of cancer control programmes at the country and regional level. Europe carries a significant load of the global burden, with one-quarter of the estimated cancer cases in 2012 occurring on the continent despite a total population that comprises 9% of the world's population [1,2].

Through its programmes of collaboration with population-based cancer registries in Europe, members of the European Network of Cancer Registries (ENCR, http://www.encr.eu/) have provided estimates of cancer burden at the European and EU member state level over the last 30 years [3–9]. In this article, a collaboration between the ENCR, their Secretariat housed at the European Commission Joint Research Centre (JRC) and the International Agency for Research on Cancer (IARC), estimates of cancer incidence and mortality is provided for 25 most common sites in 40 European countries for the year 2018.

The reported estimates are mainly based on the incidence data provided by the European cancer registries for the *Cancer Incidence in Five Continents* Vol. XI (CI5-XI) project [10], the national mortality data available at the World Health Organisation (WHO) database [11] and the corresponding population estimates from the United Nation (UN) Population Division [2]. The results are also presented for the four European areas as defined in the UN geoscheme (e.g. Eastern, Northern, Southern and Western Europe) [2], Europe and the European Union 28 Member States (EU-28). The complete set of estimates for the 25 cancers, together with an additional breakdown by subsite is available through the European Cancer Information System web application (https://ecis.jrc.ec.europa.eu/).

2. Data sources and methods

2.1. Populations and cancer sites

Cancer incidence and mortality for the year 2018 by sex and 18 age groups (0–4, 5–9, …, 80–84, 85 and over) were estimated for each of the 39 European countries defined by the United Nations [2] and for Cyprus. Results are presented for the following cancer sites defined according to the 10th edition of the International Classification of Diseases (ICD-10, version 2010) [12]: lip, oral cavity and pharynx (ICD-10 C00-14), oesophagus (C15), stomach (C16), colorectal (including anus C18-21), liver (C22), gallbladder (including extrahepatic bile duct and ampulla of Vater, C23–24), pancreas (C25), larynx (C32), lung (including trachea, C33–34), melanoma of skin (C43), female breast (C50), cervix uteri (C53), corpus uteri (C54), ovary (C56), prostate (C61), kidney (including renal pelvis, C64–65), bladder (C67), brain and central nervous system (C70–72), thyroid (C73), Hodgkin lymphoma (C81), non-Hodgkin lymphoma (C82–86, C96), multiple myeloma (including immunoproliferative diseases C88 + C90), leukaemia (C91–95) and all cancers combined, excluding non-melanoma skin cancer (C00–97, except C44). This last category was calculated by summing the estimated counts of new cancer cases for each individual cancer site in a given country, alongside the corresponding estimates of the residual category 'other and unspecified cancers'.

2.2. Ill-defined codes (incidence and mortality data)

Wherever national or subnational data were available for the following ICD-10 unspecified cancer groupings, they were redistributed to specific categories by year, sex and age: C26.0 (intestinal tract, part unspecified), C26.8–9 (ill-defined sites within the digestive system), C39 (other and ill-defined sites in the respiratory system), C55 (uterus, unspecified, see also Mortality section), C57.8–9 (female genital organ, unspecified), C63.8–9 (male genital organ, unspecified), C68.8–9 (urinary organs, unspecified) and C75.8–9 (endocrine glands, unspecified); the three-digit C26 (other and ill-defined digestive organs) were redistributed when the 4th digit categories were not available. In the absence of clearly identified methods or rules, no attempt was made to reallocate the 'Unspecified cancers' group (ICD-10 categories C76–80 + C97) into specific categories, given a reallocation by site, sex, and age could lead for instance to an overestimation of the incidence of certain screen-detectable cancers or inflated mortality if metastatic cancers were included along with primary neoplasms.

2.3. Development of the estimates (incidence and mortality)

Where possible, recent trends in incidence and mortality rates were directly used by projecting the most recently

available country-specific rates at the national or subnational level to the year 2018, using previously validated methods [9]. For countries with at least 6, and up to 10 years of incidence or mortality data available, corresponding rates for 2018 were predicted using the short-term time-linear models proposed by Dyba and Hakulinen [13]. To reduce the prospect of erroneous predictions resulting from random variation due to small numbers (rare cancers, small populations), cancer- and sex-specific prediction models were fitted only when at least 50 cancer cases or cancer deaths (all ages) were recorded per year. Where these criteria were not satisfied, the rates for 2018 were taken as the annual average rates recorded in the most recent 3- to 5-year period for which at least 20 cases or deaths (all ages) recorded for a given cancer and sex. For countries where no historical national incidence or mortality data existed, the rates for the most recent years available were used.

Random fluctuations in the predicted age-specific incidence and mortality rates were smoothed using a loess function by country, sex and cancer site. The derived age-, sex- and site-specific rates were age-standardised (ASRs per 100,000 person-years) using the European standard population [14] allowing direct comparison with previous estimates. The number of cancer cases and deaths in 2018 was computed for each country and cancer site by multiplying the predicted 2018 age- and sex-specific incidence and mortality rates by the corresponding 2018 national population estimates from the UN Population Division (the 2017 revision) [2]. The data sources available and the methods applied to estimates incidence and mortality rates are summarised in Table 1.

2.4. Mortality

For the 40 European countries, national cancer mortality data from 2004 to 2016 were available through the WHO mortality database [11]. Corresponding populations were also extracted from this database, and where not available, the UN population estimates were used [2]. To maximise comparability across European countries, deaths coded to ill-defined categories (ICD-10, chapter XVIII) were redistributed *pro rata* across cancers (ICD-10 'C' category, malignant neoplasms) and all other causes excluding injuries, by year and sex. Death registration is also known to be incomplete during the period under study for some countries, and the source data were therefore corrected using the estimated completeness as reported by the WHO (World Health Statistics 2017) and were considered necessary (see Table 1).

There are large variations in the accuracy of death certificates related to cancer of the uterus, with many deaths recorded as 'uterus cancer, not otherwise specified' (ICD-10 C55) [15]. By default, the cancer deaths coded as 'uterus unspecified category' were reallocated to either cervix uteri or corpus uteri cancer according to the observed age-specific proportions of each when the all age proportion of uterine cancer deaths coded to the unspecified category was considered to be low (<25% of the total) [15]. For the other 15 countries (Austria, Belgium, Croatia, Denmark, France, Germany, Italy, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland and United Kingdom), we estimated the all-ages proportions of deaths from cervix and corpus uteri cancers using the recorded incidence in local or national cancer registries around 2010 and the corresponding 5-year relative survival probabilities extracted from the EUROCARE 5 study [16]. The total number of cancer deaths from uterine cancers (ICD-10 C53–55) estimated in 2018 were then partitioned into cervix and corpus uteri cancers using the proportions obtained from the survival analysis, and then further stratified by age using age-specific death counts of the two sites (C53 and C54) extracted from the WHO mortality database. For Belarus and Ukraine, the deaths from 'corpus uteri and uterus, not otherwise specified' (C54–55) were first partitioned into two components using proportions from the Ukrainian National Cancer Registry mortality data for 2013–2015 [17]. The category 'uterus cancer, not otherwise specified' (C55) was then distributed into the cervix (C53) and corpus (C54) uteri categories using the age-specific proportions from the same source.

For Belarus, the Russian Federation and Ukraine, national mortality data for several cancer sites selected for this study were not available. Thus for cancers of the gallbladder, testis, kidney, thyroid as well as Hodgkin lymphoma, the mortality rates from the Ukrainian National Cancer Registry for the period 2013–2015 [17] were applied to the national population estimates in Ukraine in 2018. For Belarus, mortality was derived from the estimated incidence in 2018 using a set of age-, sex- and site-specific incidence:mortality ratios obtained from recorded data in Ukraine [17], whereas for the Russian Federation, the 'other and unspecified sites' category in national mortality file was partitioned into sex-, site- and age-specific categories using proportions computed from the mortality files in two cancer registries (St-Petersburg and Arkhangelsk), supplied for *CI5-XI* submission [10].

As noted above, projections of national mortality rates were carried out only when a minimum threshold in the number of deaths was recorded per year for a given sex and cancer combination. Otherwise, the mortality rates from the most recent years were applied to the 2018 population (see Table 1).

2.5. Incidence

Recent regional and national incidence data were extracted from the European submissions to *CI5-XI* [10] as well as from the NORDCAN database of the Association of Nordic Cancer Registries and other published

Table 1
Completeness of national mortality data (percent), coverage of incidence data (percent) and methods of estimation.

Country	Mortality	Ill-defined (%)[a]	Method		Incidence	Method	
	Completeness (%)				Coverage (%)		
Albania	76	5/8	1	2001–2010[b] ↗ 2018	0	2B	Estimated mortality <> incidence (I/M ratios from cancer registries in Bulgaria, Romania and Serbia)
Austria	100	3/3	1	2007–2016 ↗ 2018	100	1	2003–2012 ↗ 2018
Belarus	100	4/12	1	2013–2014[c] = 2018	100	1	2003–2012 ↗ 2018
Belgium	100	6/7	1	2005–2014 ↗ 2018	100	1	2004–2013 ↗ 2018
Bosnia Herzegovina	95	9/9	1	2011, 2014 = 2018	40	2A	Estimated mortality <> incidence (I/M ratios from Republika of Srpska cancer registry)
Bulgaria	97	3/3	1	2005–2014 ↗ 2018	100	1	2004–2013 ↗ 2018
Croatia	100	1/1	1	2006–2015 ↗ 2018	100	1	2003–2012 ↗ 2018
Cyprus[d]	70	3/4	1	2005–2014 ↗ 2018	70	1	2003–2012 ↗ 2018
Czech Republic	100	2/1	1	2006–2015 ↗ 2018	100	1	2004–2013 ↗ 2018
Denmark	100	8/10	1	2006–2015 ↗ 2018	100	1	2005–2014 ↗ 2018
Estonia	100	3/3	1	2006–2015 ↗ 2018	100	1	2003–2012 ↗ 2018
Finland	100	1/1	1	2006–2015 ↗ 2018	100	1	2005–2014 ↗ 2018
France	100	10/11	1	2005–2014 ↗ 2018	18	2A	Estimated mortality <> incidence (I/M ratios from 15 French cancer registries)
Germany	100	4/3	1	2006–2015 ↗ 2018	60	1	2003–2012 ↗ 2018 (incidence from eight German cancer registries)
Greece	98	5/9	1	2005–2014 ↗ 2018	0	2B	Estimated mortality <> incidence (I/M ratios from cancer registries in Croatia, Cyprus, Italy, Malta, Slovenia and Spain)
Hungary	100	0/0	1	2006–2015 ↗ 2018	0	2B	Estimated mortality <> incidence (I/M ratios from national cancer registries of Czech Republic and Slovakia)
Iceland	100	1/1	1	2007–2016 ↗ 2018	100	1	2004–2013 ↗ 2018
Ireland	100	0/0	1	2007–2014 ↗ 2018	100	1	2003–2012 ↗ 2018
Italy	100	2/2	1	2005–2014 ↗ 2018	50	2A	Estimated mortality <> incidence (I/M ratios from 33 Italian cancer registries).
Latvia	97	1/1	1	2006–2015 ↗ 2018	100	1	2003–2012 ↗ 2018
Lithuania	97	2/1	1	2006–2015 ↗ 2018	100	1	2003–2012 ↗ 2018
Luxembourg	100	3/3	1	2006–2015 ↗ 2018	100	2B	Estimated mortality <> incidence (I/M ratios from cancer registries in Belgium and France)
FYR Macedonia	100	7/7	1	2006–2013 ↗ 2018	0	2B	Estimated mortality -↗ incidence (I/M ratios from cancer registries in Bulgaria, Romania and Serbia)
Malta	100	0/0	1	2005–2014 ↗ 2018	100	1	2004–2013 ↗ 2018
Republic of Moldova	85	1/0	1	2006–2015 ↗ 2018	0	2B	Estimated mortality <> incidence (I/M ratios from Ukrainian cancer registry)
Montenegro	92	18/17	1	2000–2009 ↗ 2018	0	2B	Estimated mortality <> incidence (I/M ratios from cancer registries in Bulgaria, Romania and Serbia)
Netherlands	100	4/4	1	2006–2015 ↗ 2018	100	1	2004–2013 ↗ 2018
Norway	100	6/6	1	2006–2015 ↗ 2018	100	1	2005–2014 ↗ 2018
Poland	99	8/7	1	2006–2015 ↗ 2018	33	2A	Estimated mortality <> incidence (I/M ratios from six Polish cancer registries).
Portugal	100	6/8	1	2007–2014 ↗ 2018	99	2A	Estimated mortality <> incidence (I/M ratios from four Portuguese cancer registries)
Romania	100	1/1	1	2006–2015 ↗ 2018	22	2B	Estimated mortality <> incidence (I/M ratios from cancer registries of Bulgaria, Romania, Slovakia and Poland)
Russian Federation[e]	92	4/5	1	2007–2016 ↗ 2018	100	1	2007–2016 ↗ 2018
Serbia	93	5/5	1	2006–2015[f] ↗ 2018	57	2B	Estimated mortality <> incidence (I/M ratios from cancer registries of Bulgaria, Romania and Serbia)
Slovakia	100	2/3	1	2005–2014 ↗ 2018	100	1	2006–2010 = 2018
Slovenia	100	3/1	1	2006–2015 ↗ 2018	100	1	2003–2012 ↗ 2018
Spain	100	2/2	1	2006–2015 ↗ 2018	27	2A	Estimated mortality <> incidence (I/M ratios from 14 Spanish cancer registries)
Sweden	100	3/4	1	2006–2015 ↗ 2018	100	1	2005–2014 ↗ 2018
Switzerland	100	4/4	1	2005–2014 ↗ 2018	62	2A	Estimated mortality <> incidence (I/M ratios from 10 Swiss cancer registries).

(*continued on next page*)

Table 1 (*continued*)

Country	Mortality	Ill-defined (%)[a]	Method	Incidence	Method
	Completeness (%)			Coverage (%)	
Ukraine	92	1/1	1 2005–2014[g] ↗ 2018	100	1 2005–2014 ↗ 2018
United Kingdom	100	1/3	1 2006–2015 ↗ 2018	100	1 2004–2013 ↗ 2018

'↗' projected to.
'<>' converted to incidence.
'=' applied to.
[a] Percentages of ill-defined causes of death, most recent year, male/female.
[b] Missing sites: average of the estimated mortality rates (2018) from Bosnia Herzegovina and Serbia.
[c] Main category (ICD-10 Tabulation List 1) only. 'Other sites category' partitioned using mortality data from Ukrainian National Cancer Registry.
[d] Incidence and mortality data cover the government-controlled area of Cyprus.
[e] Mortality: main category (ICD-10 Tabulation List 1) only. Other categories: data reported by two regional cancer registries; Incidence: data reported by national population-based registry.
[f] Mortality data from WHO excludes Kosovo.
[g] Main category (ICD-10 Tabulation List 1) only. Other categories estimated using the most recent mortality rates reported by the National Cancer Registry.

report [18,19]. For the Russian Federation, the incidence data (up to 2016) were extracted from the series of reports published by the Moscow Research Oncological Institute [20]. The methods to estimate the national sex- and age-specific incidence rates in 2018 are summarised in Table 1 and fall into one of the following categories, listed in order of priority:

1. Estimates based on national and local incidence data (24 countries, Table 1)

When incidence data were available historically with sufficient numbers of cases, recorded incidence rates were projected to 2018 using short-term prediction models. This method for predicting incidence in 2018 was used in 23 countries (22 having national cancer incidence) and had proved to be robust to estimate short-term incidence [21]. In the absence of such data, the national or local incidence rates from the most recent period (of at least 3 years and with at least 20 cases recorded) were applied to the 2018 national population. For Slovakia, where the most recently available year was 2010, the projection 8 years ahead of the incidence rates gave less robust estimates for most cancer sites, and thus the most recent incidence rates were applied to the 2018 population.

For female breast, colorectal, thyroid, and prostate cancers, the projection method potentially yielded unreasonably high/low values in the recent presence of screening programmes or PSA testing within the calendar period serving as the basis for the estimates. For these cancer sites, a careful examination of the observed and predicted trends in rates was performed. Where the predicted incidence rates for these sites were not considered sufficiently robust, the incidence rate from the most recent period was applied to the 2018 population.

2. Estimates based on local incidence data and national mortality data (16 countries, Table 1)

Where national incidence estimates were not available, national incidence (I_N) was estimated by applying a set of sex-, site- and age-specific incidence to corresponding mortality ratios (I_R/M_R) obtained from the aggregation of local registries incidence data, to the corresponding national mortality estimate for 2018 (M_N):

$$I_N = M_N * I_R / M_R \quad (1)$$

Before aggregation, each registry data set was weighted according to the square root of its population to partially take into account the relative size of the population covered. In practice, the I_R/M_R ratios were obtained from a Poisson regression model, including terms for sex and age. Depending on the accuracy and availability of local data, one of two variants of the method was used, as specified below:

2A Country-specific models were fitted for seven countries with several local cancer registries in operation: the I_R/M_R ratios were obtained from the most recent country-specific cancer registry data (generally a 5-year period centred on year 2010), under the assumption that the I_R/M_R ratios will be reasonably constant in recent years. This assumption is likely to be violated for some cancer sites following the introduction of screening programmes, which may have resulted in a marked fluctuation in the ratios of recorded cases to deaths (see also Method 1). Where the predicted incidence rates for 2018 were considered unrealistic, the most recent incidence rates from the cancer registries used in the model were used as a proxy for the 2018 national incidence rate.

2B Regional models were fitted when no incidence data were available or when they were deemed to be lacking sufficient quality (in nine European countries). The

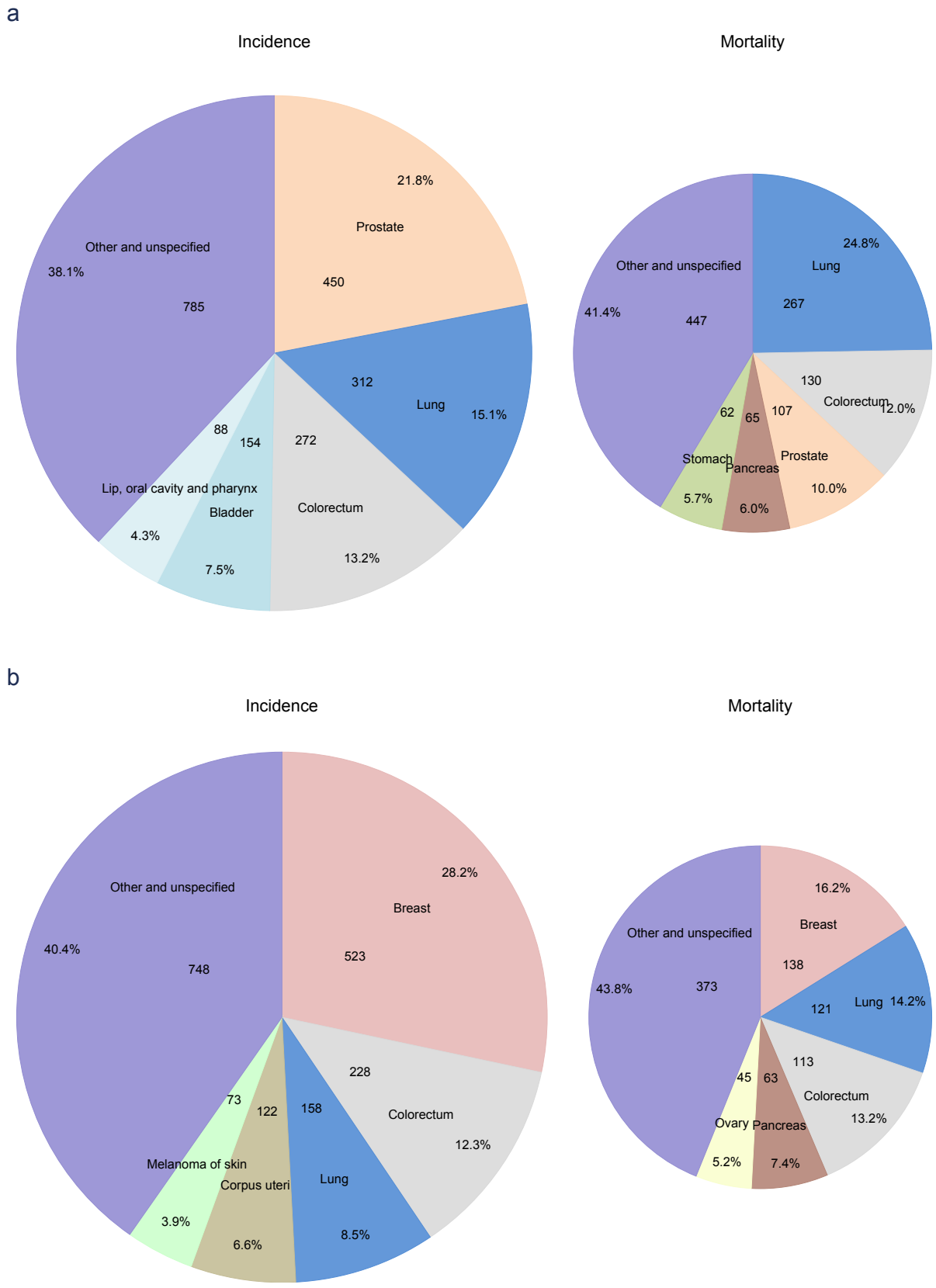

Fig. 1. Distribution of the expected cases and deaths for the 5 most common cancers in Europe 2018 in males (a) and females (b). For each sex, the area of the pie chart reflects the proportion of the total number of cases or deaths.

Table 2
Estimated numbers of new cancer cases and deaths from cancer (thousands), ASRs (per 100,000) by sex and cancer site in Europe in 2018.

Cancer site	Incidence									Mortality								
	Both sexes			Male			Female			Both sexes			Male			Female		
	Cases	%	ASR (E)	Cases	%	ASR (E)	Cases	%	ASR (E)	Deaths	%	ASR (E)	Deaths	%	ASR (E)	Deaths	%	ASR (E)
Lip, oral cavity and pharynx	121.3	3.1	12.4	87.9	4.3	19.9	33.4	1.8	5.9	53.2	2.8	5.3	41.4	3.8	9.2	11.8	1.4	1.9
Oesophagus	53.0	1.4	5.0	40.7	2.0	8.7	12.3	0.7	1.9	45.1	2.3	4.1	34.9	3.2	7.3	10.1	1.2	1.4
Stomach	133.1	3.4	11.9	81.6	4.0	17.0	51.5	2.8	8.0	102.2	5.3	8.8	61.9	5.7	12.6	40.3	4.7	5.8
Colorectum	499.7	12.8	44.4	271.6	13.2	55.9	228.1	12.3	35.6	242.5	12.6	19.6	129.7	12.0	25.4	112.8	13.2	15.3
Liver	82.5	2.1	7.4	55.8	2.7	11.7	26.6	1.4	4.0	77.4	4.0	6.6	50.4	4.7	10.3	27.0	3.2	3.8
Gallbladder	33.7	0.9	2.8	15.2	0.7	3.0	18.5	1.0	2.6	24.9	1.3	2.0	10.4	1.0	2.0	14.4	1.7	2.0
Pancreas	132.6	3.4	11.5	67.2	3.3	13.9	65.4	3.5	9.5	128.0	6.6	10.9	65.0	6.0	13.3	63.0	7.4	8.9
Larynx	39.9	1.0	4.0	35.2	1.7	7.8	4.6	0.2	0.9	19.6	1.0	1.9	17.6	1.6	3.8	1.9	0.2	0.3
Lung	470.0	12.0	43.5	311.8	15.1	65.2	158.2	8.5	26.4	387.9	20.1	34.8	267.3	24.8	55.0	120.6	14.2	19.1
Melanoma of skin	144.2	3.7	15.0	71.2	3.5	15.8	73.0	3.9	14.6	27.1	1.4	2.5	15.2	1.4	3.2	11.9	1.4	1.9
Breast							522.5	28.2	100.9							137.7	16.2	21.8
Cervix uteri							61.1	3.3	13.9							25.8	3.0	5.0
Corpus uteri							121.6	6.6	22.2							29.6	3.5	4.4
Ovary							67.8	3.7	12.9							44.6	5.2	7.4
Prostate				449.8	21.8	92.5							107.3	10.0	19.4			
Testis				24.0	1.2	6.7							1.6	0.1	0.4			
Kidney	136.5	3.5	13.3	84.9	4.1	18.6	51.6	2.8	9.0	54.7	2.8	4.7	35.1	3.3	7.1	19.6	2.3	2.7
Bladder	197.1	5.0	17.0	153.8	7.5	30.9	43.3	2.3	6.5	65.0	3.4	4.8	49.3	4.6	9.2	15.7	1.8	1.9
Brain, central nervous system	64.6	1.7	7.0	35.3	1.7	8.3	29.4	1.6	5.8	53.0	2.7	5.4	29.1	2.7	6.6	23.9	2.8	4.3
Thyroid	78.4	2.0	9.3	18.0	0.9	4.4	60.4	3.3	13.9	7.0	0.4	0.6	2.8	0.3	0.6	4.2	0.5	0.6
Hodgkin lymphoma	19.2	0.5	2.5	10.5	0.5	2.8	8.7	0.5	2.2	4.3	0.2	0.4	2.4	0.2	0.5	1.9	0.2	0.3
Non-Hodgkin lymphoma	115.1	2.9	11.1	62.4	3.0	13.6	52.7	2.8	9.1	48.1	2.5	4.0	26.3	2.4	5.2	21.8	2.6	3.0
Multiple myeloma	48.3	1.2	4.3	26.3	1.3	5.4	22.0	1.2	3.4	30.9	1.6	2.5	16.1	1.5	3.1	14.7	1.7	2.0
Leukaemia	94.8	2.4	9.3	53.3	2.6	11.7	41.5	2.2	7.4	61.5	3.2	5.2	34.0	3.2	6.8	27.4	3.2	4.0
All sites excl. non-melanoma skin	3911.3	100.0	374.3	2059.7	100.0	436.0	1851.6	100.0	332.6	1929.7	100.0	165.8	1078.0	100.0	217.4	851.7	100.0	128.1

Table 3
Most common leading types of cancer in terms of new cases (i) and deaths (m) in each of the European countries in 2018.

Country/region	First				Second				Third			
	Males		Females		Males		Females		Males		Females	
	i	m	i	m	i	m	i	m	i	m	i	m
Europe	Prostate	Lung	Breast	Breast	Lung	Colorectum	Colorectum	Lung	Colorectum	Prostate	Lung	Colorectum
EU-28	Prostate	Lung	Breast	Lung	Lung	Colorectum	Colorectum	Breast	Colorectum	Prostate	Lung	Colorectum
Albania	Lung	Lung	Breast	Breast	Bladder	Stomach	Corpus uteri	Liver	Prostate	Prostate	Lung	Lung
Austria	Prostate	Lung	Breast	Lung	Lung	Colorectum	Lung	Breast	Colorectum	Prostate	Colorectum	Colorectum
Belarus	Lung	Lung	Breast	Colorectum	Prostate	Colorectum	Colorectum	Breast	Colorectum	Stomach	Corpus uteri	Stomach
Belgium	Prostate	Lung	Breast	Breast	Lung	Colorectum	Colorectum	Lung	Colorectum	Prostate	Lung	Colorectum
Bosnia Herzegovina	Lung	Lung	Breast	Breast	Colorectum	Colorectum	Colorectum	Colorectum	Prostate	Prostate	Cervix uteri	Lung
Bulgaria	Prostate	Lung	Breast	Breast	Lung	Colorectum	Colorectum	Colorectum	Colorectum	Prostate	Corpus uteri	Lung
Croatia	Prostate	Lung	Breast	Breast	Lung	Colorectum	Colorectum	Colorectum	Colorectum	Prostate	Corpus uteri	Lung
Cyprus	Prostate	Lung	Breast	Breast	Lung	Prostate	Thyroid	Colorectum	Colorectum	Colorectum	Colorectum	Lung
Czech Republic	Prostate	Lung	Breast	Lung	Colorectum	Colorectum	Colorectum	Breast	Lung	Prostate	Lung	Colorectum
Denmark	Prostate	Lung	Breast	Lung	Colorectum	Prostate	Colorectum	Breast	Lung	Colorectum	Lung	Colorectum
Estonia	Prostate	Lung	Breast	Breast	Lung	Prostate	Colorectum	Colorectum	Colorectum	Colorectum	Lung	Lung
Finland	Prostate	Lung	Breast	Lung	Colorectum	Prostate	Colorectum	Breast	Lung	Colorectum	Lung	Pancreas
France	Prostate	Lung	Breast	Breast	Lung	Colorectum	Colorectum	Lung	Colorectum	Prostate	Lung	Colorectum
Germany	Prostate	Lung	Breast	Breast	Lung	Prostate	Lung	Lung	Colorectum	Colorectum	Colorectum	Colorectum
Greece	Lung	Lung	Breast	Breast	Prostate	Colorectum	Colorectum	Lung	Bladder	Prostate	Corpus uteri	Colorectum
Hungary	Lung	Lung	Breast	Lung	Colorectum	Colorectum	Colorectum	Breast	Prostate	Prostate	Lung	Colorectum
Iceland	Prostate	Lung	Breast	Lung	Colorectum	Prostate	Lung	Breast	Lung	Colorectum	Colorectum	Colorectum
Ireland	Prostate	Lung	Breast	Lung	Colorectum	Colorectum	Lung	Breast	Lung	Prostate	Colorectum	Colorectum
Italy	Prostate	Lung	Breast	Breast	Colorectum	Colorectum	Colorectum	Lung	Lung	Liver	Lung	Colorectum
Latvia	Prostate	Lung	Breast	Breast	Lung	Prostate	Colorectum	Colorectum	Colorectum	Colorectum	Corpus uteri	Lung
Lithuania	Prostate	Lung	Breast	Breast	Lung	Prostate	Colorectum	Colorectum	Colorectum	Colorectum	Corpus uteri	Stomach
Luxembourg	Prostate	Lung	Breast	Breast	Lung	Colorectum	Colorectum	Lung	Colorectum	Prostate	Lung	Colorectum
FYR Macedonia	Lung	Lung	Breast	Breast	Prostate	Prostate	Colorectum	Colorectum	Colorectum	Colorectum	Corpus uteri	Lung
Malta	Prostate	Lung	Breast	Breast	Colorectum	Colorectum	Colorectum	Colorectum	Lung	Pancreas	Corpus uteri	Pancreas
Moldova	Lung	Lung	Breast	Breast	Colorectum	Colorectum	Colorectum	Colorectum	Prostate	Liver	Cervix uteri	Lung
Montenegro	Lung	Lung	Breast	Breast	Prostate	Prostate	Lung	Lung	Colorectum	Colorectum	Colorectum	Colorectum
Netherlands	Prostate	Lung	Breast	Lung	Colorectum	Colorectum	Colorectum	Breast	Lung	Prostate	Lung	Colorectum
Norway	Prostate	Lung	Breast	Lung	Colorectum	Prostate	Colorectum	Colorectum	Lung	Colorectum	Lung	Breast
Poland	Lung	Lung	Breast	Lung	Prostate	Colorectum	Lung	Breast	Colorectum	Prostate	Colorectum	Colorectum
Portugal	Prostate	Lung	Breast	Colorectum	Colorectum	Colorectum	Colorectum	Breast	Lung	Prostate	Thyroid	Lung
Romania	Lung	Lung	Breast	Breast	Colorectum	Colorectum	Colorectum	Colorectum	Prostate	Prostate	Cervix uteri	Lung
Russian Federation	Lung	Lung	Breast	Breast	Prostate	Colorectum	Colorectum	Colorectum	Colorectum	Stomach	Corpus uteri	Stomach
Serbia	Lung	Lung	Breast	Breast	Colorectum	Colorectum	Lung	Lung	Prostate	Prostate	Colorectum	Colorectum
Slovakia	Colorectum	Lung	Breast	Breast	Lung	Colorectum	Colorectum	Colorectum	Prostate	Prostate	Corpus uteri	Lung
Slovenia	Prostate	Lung	Breast	Lung	Colorectum	Colorectum	Colorectum	Breast	Lung	Prostate	Lung	Colorectum
Spain	Prostate	Lung	Breast	Colorectum	Colorectum	Colorectum	Colorectum	Breast	Lung	Prostate	Lung	Lung
Sweden	Prostate	Prostate	Breast	Lung	Colorectum	Lung	Colorectum	Breast	Bladder	Colorectum	Melanoma of skin	Colorectum
Switzerland	Prostate	Lung	Breast	Lung	Colorectum	Prostate	Colorectum	Breast	Lung	Colorectum	Lung	Colorectum
Ukraine	Lung	Lung	Breast	Breast	Colorectum	Colorectum	Colorectum	Colorectum	Prostate	Stomach	Corpus uteri	Stomach
United Kingdom	Prostate	Lung	Breast	Lung	Lung	Prostate	Lung	Breast	Colorectum	Colorectum	Colorectum	Colorectum

Table 4
Estimated numbers of new cancer cases and deaths from cancer (thousands), ASRs (per 100,000) by sex and cancer site in the EU-28 in 2018.

Cancer site	Incidence									Mortality								
	Both sexes			Male			Female			Both sexes			Male			Female		
	Cases	%	ASR (E)	Cases	%	ASR (E)	Cases	%	ASR (E)	Deaths	%	ASR (E)	Deaths	%	ASR (E)	Deaths	%	ASR (E)
Lip, oral cavity and pharynx	90.1	3.0	13.0	63.9	4.0	19.8	26.2	1.9	6.7	34.6	2.4	4.7	26.0	3.3	7.7	8.6	1.4	1.9
Oesophagus	40.2	1.3	5.2	30.3	1.9	8.6	9.9	0.7	2.2	33.6	2.4	4.1	25.5	3.2	7.0	8.1	1.3	1.6
Stomach	80.2	2.7	9.6	50.2	3.1	13.5	30.0	2.2	6.3	58.5	4.1	6.6	36.0	4.5	9.3	22.5	3.6	4.3
Colorectum	378.4	12.6	45.9	212.2	13.1	57.5	166.3	12.0	36.3	173.2	12.2	18.5	96.2	12.1	24.1	77.0	12.4	14.0
Liver	65.6	2.2	8.2	45.9	2.8	12.8	19.7	1.4	4.1	59.5	4.2	6.9	39.9	5.0	10.6	19.6	3.2	3.7
Gallbladder	26.9	0.9	3.0	12.6	0.8	3.3	14.3	1.0	2.8	19.0	1.3	2.0	8.3	1.0	2.1	10.7	1.7	2.0
Pancreas	100.0	3.3	11.7	50.7	3.1	13.7	49.4	3.6	10.0	95.4	6.7	10.8	48.3	6.1	12.8	47.1	7.6	9.1
Larynx	27.3	0.9	3.9	23.6	1.5	7.0	3.7	0.3	1.0	12.4	0.9	1.6	10.9	1.4	3.0	1.5	0.2	0.4
Lung	364.6	12.1	46.4	231.1	14.3	63.5	133.6	9.6	32.2	296.1	20.9	36.1	194.5	24.5	52.1	101.6	16.4	23.1
Melanoma of skin	120.5	4.0	17.8	60.5	3.7	18.4	60.0	4.3	17.7	20.0	1.4	2.5	11.6	1.5	3.2	8.4	1.4	1.9
Breast							404.9	29.2	113.6							98.8	15.9	21.4
Cervix uteri							32.7	2.4	10.7							14.2	2.3	3.7
Corpus uteri							78.9	5.7	20.3							18.8	3.0	3.7
Ovary							44.8	3.2	11.8							31.5	5.1	7.1
Prostate				375.8	23.2	103.2							81.5	10.3	18.2			
Testis				20.3	1.3	8.4							1.0	0.1	0.4			
Kidney	99.2	3.3	13.3	63.5	3.9	18.6	35.8	2.6	8.6	39.1	2.8	4.4	25.0	3.1	6.5	14.1	2.3	2.7
Bladder	164.4	5.5	19.4	128.5	7.9	33.7	36.0	2.6	7.6	52.9	3.7	5.2	39.8	5.0	9.3	13.2	2.1	2.2
Brain, central nervous system	48.9	1.6	7.4	27.3	1.7	8.8	21.6	1.6	6.0	38.4	2.7	5.4	21.7	2.7	6.6	16.7	2.7	4.3
Thyroid	58.3	1.9	10.0	14.5	0.9	4.9	43.8	3.2	15.0	4.9	0.3	0.6	2.1	0.3	0.6	2.8	0.5	0.5
Hodgkin lymphoma	14.0	0.5	2.6	7.9	0.5	3.0	6.1	0.4	2.3	2.7	0.2	0.4	1.6	0.2	0.5	1.2	0.2	0.3
Non-Hodgkin lymphoma	97.4	3.2	13.0	53.6	3.3	15.7	43.8	3.2	10.7	39.5	2.8	4.3	21.8	2.7	5.6	17.6	2.8	3.3
Multiple myeloma	41.1	1.4	4.9	22.9	1.4	6.2	18.2	1.3	3.9	25.5	1.8	2.7	13.7	1.7	3.4	11.9	1.9	2.2
Leukaemia	74.6	2.5	10.0	42.8	2.6	12.5	31.8	2.3	7.9	47.6	3.4	5.2	26.9	3.4	6.8	20.7	3.3	4.0
All sites excl. non-melanoma skin	3002.0	100.0	398.0	1617.1	100.0	455.5	1384.8	100.0	354.7	1414.1	100.0	161.9	794.3	100.0	206.0	619.8	100.0	127.7

Table 5
Estimated ASRs (European standard) of cancer incidence by sex, cancer site and country, 2018.

Country/region	Lip, oral cavity and pharynx		Oesophagus		Stomach		Colorectum		Liver		Gallbladder		Pancreas		Larynx		Lung		Melanoma		Breast	Cervix
	C00–14		C15		C16		C18–21		C22		C23–24		C25		C32		C33–34		C43		C50	C53
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	F	F
Europe	**19.9**	**5.9**	**8.7**	**1.9**	**17.0**	**8.0**	**55.9**	**35.6**	**11.7**	**4.0**	**3.0**	**2.6**	**13.9**	**9.5**	**7.8**	**0.9**	**65.2**	**26.4**	**15.8**	**14.6**	**100.9**	**13.9**
EU-28	**19.8**	**6.7**	**8.6**	**2.2**	**13.5**	**6.3**	**57.5**	**36.3**	**12.8**	**4.1**	**3.3**	**2.8**	**13.7**	**10.0**	**7.0**	**1.0**	**63.5**	**32.2**	**18.4**	**17.7**	**113.6**	**10.7**
Central and Eastern Europe	**22.9**	**4.8**	**8.3**	**1.2**	**25.1**	**10.9**	**55.5**	**33.8**	**9.0**	**3.7**	**2.6**	**2.5**	**14.5**	**8.6**	**10.8**	**0.7**	**71.5**	**17.1**	**7.6**	**7.1**	**73.7**	**20.0**
Belarus	30.3	3.0	11.1	0.6	36.7	15.7	61.6	37.8	6.9	3.1	1.8	2.0	15.2	7.2	13.0	0.2	78.2	8.2	7.6	7.5	68.1	16.7
Bulgaria	14.8	3.8	4.5	0.7	17.6	7.0	56.2	30.0	8.1	2.7	1.7	1.9	16.5	8.4	12.2	0.8	71.1	15.8	6.2	4.8	79.3	25.4
Czech Republic	18.9	7.8	8.9	1.8	11.4	6.8	63.8	36.7	9.2	4.0	4.5	4.4	16.7	10.9	7.3	0.8	57.7	26.5	18.8	16.2	97.0	12.4
Hungary	37.3	11.3	11.2	1.6	20.9	9.4	104.2	54.1	13.3	3.5	4.7	4.9	18.8	13.6	16.7	2.8	111.6	58.7	14.0	13.2	116.0	21.6
Moldova	29.6	3.0	5.7	0.7	26.5	13.0	68.3	36.1	29.3	12.2	1.4	1.4	21.6	9.9	21.5	0.5	71.3	14.9	6.3	5.5	66.3	26.9
Poland	23.3	6.7	6.3	1.3	18.5	7.7	61.3	32.8	6.9	3.1	3.7	4.1	12.9	8.6	12.6	1.6	78.5	35.4	8.2	6.5	79.5	12.6
Romania	33.7	4.6	5.3	0.8	18.8	7.3	53.5	28.1	18.6	7.2	2.7	1.8	13.9	8.5	13.7	0.7	72.8	18.1	4.5	4.6	70.3	25.8
Russian Federation	18.5	4.2	9.0	1.4	30.0	12.9	48.6	33.8	8.7	3.7	2.1	2.0	13.9	8.3	9.1	0.5	69.6	11.7	6.3	6.6	72.3	21.0
Slovakia	32.8	5.0	10.7	1.0	23.3	10.8	90.3	46.0	11.1	4.2	5.7	7.3	17.6	11.6	12.0	0.6	79.7	19.1	13.6	10.5	81.8	21.1
Ukraine	26.9	3.6	9.2	0.7	25.3	9.9	49.1	30.3	4.4	2.2	2.2	1.9	14.5	7.9	10.8	0.3	59.7	9.2	7.7	6.9	60.0	21.1
Northern Europe	**17.7**	**7.1**	**12.7**	**4.2**	**9.5**	**4.6**	**56.5**	**40.4**	**9.9**	**4.4**	**2.7**	**2.9**	**12.5**	**9.8**	**4.6**	**0.9**	**52.1**	**40.5**	**23.4**	**23.2**	**123.0**	**11.2**
Denmark	20.6	8.0	12.0	3.8	8.9	3.7	69.5	54.7	10.5	3.9	2.5	2.2	12.7	10.5	5.1	1.2	56.4	53.8	30.3	41.7	121.1	13.2
Estonia	15.9	3.5	8.3	1.1	27.5	9.2	53.3	39.0	7.8	3.0	3.5	2.8	21.1	8.8	8.8	0.7	76.3	21.9	12.7	15.0	83.1	28.3
Finland	12.2	5.8	5.3	1.7	8.1	4.7	43.4	31.5	8.0	3.5	2.3	2.7	13.6	10.9	2.8	0.3	37.8	21.8	22.9	20.7	122.9	5.7
Iceland	7.6	2.4	10.5	1.9	7.0	5.0	45.8	33.5	6.1	1.4	2.7	1.7	9.0	7.5	1.5	0.0	41.0	48.1	11.0	14.3	116.7	8.8
Ireland	13.3	5.6	11.1	4.8	15.7	7.6	64.2	39.6	10.1	2.9	3.2	3.4	9.5	8.8	6.5	0.9	59.4	43.9	19.2	25.2	123.2	13.4
Latvia	29.3	3.5	11.6	0.9	28.0	13.1	64.6	41.1	5.7	4.1	1.6	1.4	22.4	10.4	10.1	0.5	77.6	14.0	8.9	7.2	85.1	30.6
Lithuania	20.8	3.0	11.5	1.0	29.3	13.2	53.5	32.6	9.7	2.9	2.4	2.0	14.2	9.1	9.4	0.5	77.0	13.5	12.1	12.1	80.6	23.7
Norway	13.6	6.4	8.0	1.8	9.1	3.5	71.2	58.8	7.6	2.2	2.5	2.8	10.8	9.6	3.8	0.6	47.0	43.3	41.1	40.8	118.7	12.9
Sweden	13.0	7.1	5.8	1.5	6.4	3.5	44.9	36.4	9.4	3.8	2.9	3.7	13.2	10.7	1.8	0.4	25.6	26.4	32.9	34.1	122.9	10.5
United Kingdom	18.9	7.7	15.0	5.4	8.3	3.9	56.7	39.6	10.4	4.9	2.7	2.9	12.0	9.7	4.6	1.0	55.0	45.6	21.2	20.1	127.7	9.7
Southern Europe	**14.7**	**4.6**	**4.8**	**0.9**	**15.6**	**7.5**	**60.4**	**35.6**	**16.0**	**4.7**	**3.7**	**3.0**	**12.8**	**9.1**	**7.8**	**0.9**	**63.9**	**22.5**	**12.5**	**11.2**	**108.2**	**9.8**
Albania	6.1	3.6	2.6	0.4	27.6	9.8	13.7	10.2	15.6	9.0	0.5	2.9	10.3	3.4	8.5	1.1	56.2	10.5	2.2	2.1	62.0	8.4
Bosnia Herzegovina	10.8	4.0	5.8	1.0	20.5	10.1	47.9	29.3	13.3	9.0	4.3	4.6	13.5	9.9	12.2	1.3	89.4	19.3	5.0	5.6	60.9	28.7
Croatia	18.4	4.0	6.0	1.2	17.7	8.6	68.8	36.9	14.6	5.2	4.3	3.1	14.8	9.7	10.1	1.0	75.6	25.8	12.6	9.2	93.6	10.1
Cyprus	6.5	2.1	2.3	0.9	10.5	6.8	52.3	22.9	7.8	3.1	2.5	2.5	11.3	6.3	6.9	0.2	61.3	12.4	7.0	5.4	110.5	7.1
Greece	9.7	2.7	2.6	0.5	13.4	6.8	48.6	31.1	13.0	4.9	3.1	1.9	13.8	8.7	9.7	0.6	99.0	23.5	10.0	12.8	94.3	10.1
Italy	12.0	4.7	3.3	0.9	15.0	7.5	54.3	36.7	18.7	5.3	3.8	3.4	13.0	10.1	6.3	0.9	52.7	23.3	18.1	13.7	125.4	8.7
FYR Macedonia	6.8	1.9	3.3	0.4	22.6	9.0	44.8	37.1	10.5	4.7	1.2	2.5	14.8	8.8	14.9	1.4	79.0	20.0	11.5	7.3	82.9	13.0
Malta	9.2	4.4	5.5	1.0	13.1	6.2	54.8	34.3	5.1	1.6	1.4	0.9	14.1	10.6	6.6	1.3	43.7	17.1	10.4	10.9	121.0	4.4
Montenegro	12.1	3.7	4.4	0.5	9.8	5.2	32.8	21.6	9.2	4.0	1.1	0.8	11.4	5.5	18.3	4.8	89.5	26.8	3.3	3.5	116.1	15.8
Portugal	24.9	3.5	9.6	0.6	22.8	11.0	80.2	42.1	13.3	3.5	2.2	1.8	11.5	6.1	8.7	0.4	55.2	13.8	9.7	8.3	94.0	11.0
Serbia	20.9	5.6	6.5	1.2	14.7	6.4	70.0	37.3	8.5	4.7	4.3	4.4	15.1	10.4	12.5	1.3	100.9	42.8	12.8	10.9	101.4	26.0
Slovenia	21.0	4.6	6.6	1.3	18.9	8.8	87.7	37.6	14.5	3.6	5.3	5.2	14.8	10.2	4.9	0.9	68.5	29.7	24.7	25.2	93.4	8.9
Spain	17.1	5.6	6.0	1.0	13.9	6.5	67.7	34.4	15.7	3.6	4.2	2.4	11.9	8.3	7.8	0.9	62.3	19.7	7.4	9.4	101.2	6.6
Western Europe	**21.2**	**8.2**	**9.9**	**2.5**	**12.2**	**5.5**	**51.8**	**35.1**	**12.3**	**3.6**	**3.0**	**2.3**	**14.3**	**11.0**	**5.6**	**1.1**	**63.7**	**36.7**	**24.9**	**25.0**	**125.5**	**8.5**
Austria	15.0	5.1	6.5	1.4	11.4	5.4	39.7	23.9	12.1	4.5	3.0	2.4	14.2	12.1	3.9	0.7	48.4	33.0	20.4	15.9	96.2	7.0
Belgium	21.0	7.8	10.3	3.3	12.6	5.6	65.7	41.6	8.4	4.2	2.6	1.9	14.1	11.7	7.1	1.4	78.1	39.7	21.6	29.7	154.7	9.8
France	31.3	10.2	9.5	2.3	10.8	4.4	55.3	36.7	19.2	4.0	2.9	2.3	16.0	10.8	7.0	0.9	74.2	31.8	19.1	16.7	133.3	8.4
Germany	16.8	7.2	9.5	2.5	13.9	6.5	46.6	32.8	9.5	3.3	3.1	2.4	14.0	11.2	4.7	1.1	60.9	39.2	26.9	29.9	116.2	9.3

(*continued on next page*)

Table 5 (*continued*)

Country/region	Lip, oral cavity and pharynx		Oesophagus		Stomach		Colorectum		Liver		Gallbladder		Pancreas		Larynx		Lung		Melanoma		Breast	Cervix
	C00–14		C15		C16		C18–21		C22		C23–24		C25		C32		C33–34		C43		C50	C53
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	F	F
Luxembourg	20.6	4.6	8.9	2.1	13.0	5.1	48.2	37.8	13.7	6.0	1.5	1.1	13.9	10.5	8.2	1.2	60.9	26.6	24.9	19.2	148.8	7.2
Netherlands	13.1	7.8	15.7	3.9	9.5	4.4	68.1	45.9	5.0	2.6	3.6	2.6	11.3	10.2	4.5	1.4	52.0	47.1	37.0	33.5	143.8	7.0
Switzerland	17.4	7.5	8.3	2.4	10.7	5.5	42.6	29.6	10.9	4.0	2.8	2.9	12.0	9.9	5.8	1.0	40.0	28.3	32.1	25.2	120.7	4.9

Country/region	Corpus	Ovary	Prostate	Testis	Kidney		Bladder		Brain, cns		Thyroid		Hodgkin		NHL		Multiple myeloma		Leukaemia		All sites	
	C54	C56	C61	C62	C64–65		C67		C70–72		C73		C81		C82–86,C96		C88 + C90		C91–95		C00–97/C44	
	F	F	M	M	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Europe	**22.2**	**12.9**	**92.5**	**6.7**	**18.6**	**9.0**	**30.9**	**6.5**	**8.3**	**5.8**	**4.4**	**13.9**	**2.8**	**2.2**	**13.6**	**9.1**	**5.4**	**3.4**	**11.7**	**7.4**	**436.0**	**332.6**
EU-28	**20.3**	**11.8**	**103.2**	**8.4**	**18.6**	**8.6**	**33.7**	**7.6**	**8.8**	**6.0**	**4.9**	**15.0**	**3.0**	**2.3**	**15.7**	**10.7**	**6.2**	**3.9**	**12.5**	**7.9**	**455.5**	**354.7**
Central and Eastern Europe	**26.2**	**15.7**	**63.7**	**3.8**	**18.7**	**9.8**	**23.9**	**4.7**	**7.5**	**5.4**	**3.0**	**12.0**	**2.1**	**1.9**	**7.8**	**5.8**	**2.9**	**2.2**	**9.5**	**6.3**	**390.4**	**287.4**
Belarus	34.0	20.1	75.6	3.2	32.9	15.5	24.1	3.7	8.2	6.0	3.5	18.6	2.3	2.4	8.1	7.8	2.2	2.1	7.1	6.3	450.1	301.3
Bulgaria	24.8	14.5	82.2	5.4	13.0	4.9	30.2	7.1	8.5	6.2	1.6	7.3	1.4	1.7	7.3	5.4	1.5	1.6	7.1	5.4	396.7	278.6
Czech Republic	26.7	13.1	128.8	8.2	30.0	13.7	30.2	8.0	7.8	5.5	4.9	15.4	2.5	2.3	12.1	10.2	4.4	2.9	11.8	6.3	480.4	347.0
Hungary	25.4	17.9	90.4	11.5	23.2	12.4	39.8	13.0	8.2	5.8	3.7	16.7	2.7	1.9	14.0	10.3	3.9	2.6	13.9	9.0	580.5	438.5
Moldova	19.2	14.3	48.6	1.8	12.4	7.7	19.2	3.5	10.7	7.3	5.3	13.6	2.2	2.3	7.7	5.5	2.1	1.6	9.9	6.9	423.1	284.9
Poland	27.2	19.7	65.6	7.3	17.0	8.8	35.7	8.5	11.3	7.2	3.1	13.0	1.5	1.3	9.2	6.8	4.6	3.1	11.0	6.5	413.7	312.4
Romania	18.1	13.9	47.2	3.7	10.9	5.3	25.0	5.0	9.0	6.1	2.4	8.3	1.3	1.2	6.5	5.2	2.8	2.1	7.9	5.7	373.4	261.6
Russian Federation	25.7	14.6	59.6	2.1	18.9	10.1	18.4	3.1	6.2	4.9	2.5	10.6	2.1	2.0	6.2	4.6	2.3	2.0	8.5	6.0	361.5	274.7
Slovakia	27.7	15.9	78.3	9.6	25.7	13.2	28.1	7.8	10.2	6.9	3.2	11.2	3.0	2.3	13.8	11.9	5.8	4.7	14.2	8.0	510.5	343.9
Ukraine	29.3	15.9	48.2	2.7	16.6	9.0	20.1	3.1	5.7	4.5	3.9	14.7	2.4	2.6	8.0	5.8	2.6	1.8	9.8	6.3	352.9	262.0
Northern Europe	**22.4**	**12.9**	**127.2**	**7.9**	**19.0**	**10.0**	**21.8**	**6.4**	**8.3**	**5.8**	**3.6**	**10.9**	**3.2**	**2.5**	**19.0**	**13.7**	**7.4**	**4.8**	**13.9**	**8.5**	**460.2**	**391.4**
Denmark	20.5	10.3	111.7	9.9	18.2	8.2	45.0	11.6	7.3	5.3	2.9	10.6	2.7	1.8	19.2	12.6	5.0	3.5	12.6	7.3	489.9	432.9
Estonia	23.2	14.2	162.4	3.5	30.8	14.1	25.7	5.8	7.4	5.3	1.7	9.3	2.1	2.3	16.3	7.8	4.7	3.5	11.2	7.0	523.2	324.8
Finland	18.9	10.2	108.4	8.6	14.9	8.9	21.7	4.3	6.7	5.9	5.1	15.3	3.3	2.4	18.3	13.1	5.9	4.2	10.8	7.3	391.6	348.0
Iceland	18.7	10.4	86.9	3.7	21.0	12.9	33.5	7.8	4.5	3.0	7.6	12.7	2.3	1.9	16.0	10.5	5.8	4.7	10.4	4.5	354.8	348.4
Ireland	26.1	16.1	189.3	8.3	22.6	9.9	24.6	8.4	8.6	7.0	2.5	15.4	3.1	2.6	20.3	14.8	7.1	4.2	13.0	8.6	535.2	410.0
Latvia	24.2	19.3	121.2	3.6	29.0	15.7	32.0	8.6	13.5	12.3	3.0	23.1	3.4	2.0	9.5	7.7	4.2	2.9	16.9	7.6	538.1	361.8
Lithuania	33.5	16.5	97.9	2.9	28.6	15.3	25.0	5.1	12.2	8.7	3.8	17.1	1.9	2.1	13.6	12.0	5.6	3.3	20.0	10.6	483.3	335.7
Norway	22.7	9.7	157.3	13.0	22.3	6.7	32.5	9.0	8.1	5.4	5.1	11.1	3.1	2.1	17.6	14.4	6.8	6.0	11.5	8.2	511.5	414.0
Sweden	19.6	8.8	149.8	8.0	12.6	6.4	27.6	7.8	7.7	5.1	3.6	9.7	2.5	2.4	16.5	10.8	6.5	4.2	10.4	7.2	424.7	365.4
United Kingdom	22.4	13.6	120.9	7.7	19.1	10.5	17.2	5.6	8.4	5.6	3.5	9.6	3.5	2.7	20.0	14.6	8.2	5.2	14.9	8.9	455.9	398.5
Southern Europe	**20.0**	**11.1**	**89.2**	**7.0**	**17.1**	**7.0**	**40.3**	**8.1**	**9.1**	**6.3**	**6.1**	**17.5**	**3.1**	**2.8**	**13.6**	**9.9**	**5.9**	**3.9**	**11.2**	**7.2**	**435.2**	**326.3**
Albania	13.3	5.1	37.0	5.4	9.8	3.4	40.4	9.9	11.8	7.9	0.6	3.1	1.8	1.4	2.1	0.7	2.6	0.8	9.5	6.2	280.6	196.3
Bosnia Herzegovina	15.6	13.9	41.7	3.8	11.1	4.2	18.6	6.9	10.6	8.0	1.0	5.5	2.5	2.6	5.1	3.9	1.8	1.3	7.1	4.5	348.1	267.8
Croatia	27.6	16.3	80.8	13.6	23.6	9.9	35.1	9.0	10.7	8.4	7.1	22.4	2.2	2.1	10.8	8.1	4.6	2.7	10.6	6.1	469.9	339.0
Cyprus	20.6	9.8	114.6	7.1	9.5	4.7	18.7	5.7	7.4	5.1	10.0	40.1	3.2	3.2	13.3	12.4	5.0	3.5	12.1	8.2	389.6	305.5
Greece	29.7	11.0	76.0	8.2	19.8	6.0	60.6	6.6	11.6	8.1	6.2	18.9	6.3	5.6	10.6	5.7	5.1	3.8	13.8	8.3	463.5	318.2
Italy	18.5	10.8	91.0	8.4	17.2	8.3	41.3	8.7	8.5	5.8	9.2	22.6	3.6	3.6	15.8	11.3	6.8	4.5	11.6	8.0	430.3	356.1
FYR Macedonia	33.1	11.8	61.3	5.7	5.6	2.2	26.8	5.5	15.5	8.5	0.3	5.2	2.4	1.7	4.1	3.3	3.3	1.3	9.4	5.6	361.4	279.7
Malta	25.4	11.0	88.3	6.4	15.8	9.4	33.1	7.1	5.7	5.1	7.1	18.9	3.1	2.9	15.2	14.6	5.2	3.8	7.2	5.3	371.5	334.4
Montenegro	12.8	8.3	52.8	6.7	8.3	5.8	16.8	6.5	11.1	6.4	1.1	9.4	3.6	0.2	4.0	2.3	1.6	1.3	4.7	3.6	330.9	282.9
Portugal	12.1	7.0	87.7	3.2	11.9	5.6	22.2	4.9	11.4	6.2	5.2	22.5	3.4	1.1	15.3	11.1	6.3	5.7	9.8	5.5	431.9	288.6

Serbia	26.6	21.8	54.7	8.0	14.6	7.0	36.7	9.3	10.4	8.1	3.1	6.0	2.7	2.6	9.1	8.0	6.5	4.4	12.2	7.6	460.5	377.2
Slovenia	26.3	10.4	117.2	11.1	22.6	7.6	25.8	7.4	8.1	6.5	3.6	9.0	2.3	2.1	19.1	15.2	5.3	3.6	11.1	6.8	513.7	343.4
Spain	19.4	10.1	104.2	5.2	18.5	6.2	42.2	8.3	8.1	5.9	3.8	13.7	2.1	2.0	13.2	10.3	5.3	3.3	10.8	6.8	444.7	298.5
Western Europe	**17.6**	**9.8**	**111.9**	**10.5**	**19.1**	**8.6**	**34.7**	**7.7**	**8.6**	**5.8**	**5.2**	**15.7**	**3.4**	**2.0**	**17.4**	**11.0**	**6.5**	**4.0**	**13.4**	**8.7**	**472.6**	**374.6**
Austria	14.6	11.4	90.9	7.9	13.2	7.3	15.2	4.6	6.9	5.7	5.4	13.6	1.6	1.7	12.1	8.9	4.8	3.3	10.8	6.3	367.4	301.6
Belgium	15.7	8.4	96.7	7.2	17.2	9.4	42.5	9.5	8.5	4.7	4.4	14.8	3.6	2.5	20.6	13.0	8.4	4.0	16.7	11.9	491.8	424.1
France	21.2	10.0	144.9	10.8	24.6	10.9	26.9	4.3	9.8	6.5	7.3	25.6	3.9	1.6	19.9	11.6	7.5	4.3	15.6	9.9	535.1	380.6
Germany	15.5	9.9	94.4	10.8	17.4	7.8	40.4	9.5	8.2	5.8	4.5	10.1	3.1	2.2	15.5	10.4	5.9	3.9	12.9	8.4	445.8	368.9
Luxembourg	15.9	11.9	116.7	9.3	12.4	6.9	24.6	4.4	7.1	4.4	6.8	19.6	2.3	2.7	15.0	13.3	5.4	4.3	15.4	7.1	451.6	376.5
Netherlands	16.0	9.1	101.2	11.0	15.1	6.9	39.7	11.7	7.4	4.6	2.6	6.4	3.4	2.3	20.3	11.8	5.7	3.4	8.2	5.5	457.5	405.8
Switzerland	20.2	8.4	114.2	10.1	13.2	4.4	32.4	8.1	8.7	4.8	3.9	20.3	3.3	2.2	15.1	9.6	6.0	4.2	11.3	7.3	415.0	343.7

I_R/M_R ratios were obtained by the aggregation of cancer registry data in neighbouring countries. Specifically for Luxembourg, we applied the I_R/M_R ratios obtained by the aggregation of recorded data in 16 cancer registries in Belgium and France to the 5-year national mortality data (2010–2014). When the estimated numbers by sex and site for all ages were lower than the corresponding numbers recorded by the Luxembourg pathology register in 2013 [19], the recorded age-specific numbers in 2013 were used. The estimated incidence rates (around 2013) were then applied to the 2018 national population. Finally, we applied to the local mortality used in the models in methods 2A and 2B the same redistribution procedures of the number of cancer deaths coded as *other and ill-defined digestive organs* (C26); *other and ill-defined sites in the respiratory system* (C39) and *uterus, unspecified* (C55).

3. Results

Fig. 1 and Table 2 summarise the estimated numbers of new cancer cases and cancer deaths in Europe in 2018 (in thousands), by type of cancer and sex. There were just over 3.9 million new cases of cancer (excluding non-melanoma skin cancers) in Europe in 2018, 53% (2.05 million) occurring in men and 47% (1.85 million) in women. The most common cancer sites were female breast cancer (523,000 cases, 13.4% of all cancer cases), followed by colorectal cancer (500,000, 12.8%), lung cancer (470,000, 12.0%) and prostate cancer (450,000, 11.5%). These four cancers represented almost half (49.7%) of the estimated overall burden of cancer in Europe in 2018. The most common primary sites in men were prostate (21.8% of the total), lung (312,000, 15.1%), colorectum (272,000, 13.2%) and bladder (154,000, 7.5%). In women, breast cancer was by far the most frequently diagnosed neoplasm (28.2% of the total), followed by colorectal (228,000, 12.3%), lung (158,000, 8.5%) and corpus uteri (122,000, 6.6%) cancers. The estimated total number of cancer deaths in Europe in 2018 was 1.93 million, of which 56% (1.08 million) were in men and 44% (850,000) in women. Lung cancer, with an estimated 388,000 deaths (one-fifth of the total) was the most frequent cause of death from cancer in Europe in 2018, followed by colorectal cancer (242,000 deaths, 12.6%), female breast cancer (138,000, 7.1%) and pancreatic cancer (128,000, 6.6%). Lung cancer continued to be the most common cause of death from cancer in men (267,000, 24.8%) followed by colorectal (almost 130,000 deaths, 12.0%) and prostate (107,000, 10.0%) cancer. Breast cancer was the leading cause of death in women (138,000, 16.2%), followed by lung (121,000 deaths, 14.2%) and colorectal (113,000, 13.2%) cancers. Table 3 reiterates the importance of these cancers as the leading causes of cancer occurrence, in terms of new cases and deaths, in each of the 40 European countries in 2018.

Table 6
Estimated ASRs (European standard) of cancer mortality by sex, cancer site and country, 2018.

Country/region	Lip, oral cavity and pharynx		Oesophagus		Stomach		Colorectum		Liver		Gallbladder		Pancreas		Larynx		Lung		Melanoma		Breast	Cervix
	C00–14		C15		C16		C18–21		C22		C23–24		C25		C32		C33–34		C43		C50	C53
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	F	F
Europe	**9.2**	**1.9**	**7.3**	**1.4**	**12.6**	**5.8**	**25.4**	**15.3**	**10.3**	**3.8**	**2.0**	**2.0**	**13.3**	**8.9**	**3.8**	**0.3**	**55.0**	**19.1**	**3.2**	**1.9**	**21.8**	**5.0**
EU-28	**7.7**	**1.9**	**7.0**	**1.6**	**9.3**	**4.3**	**24.1**	**14.0**	**10.6**	**3.7**	**2.1**	**2.0**	**12.8**	**9.1**	**3.0**	**0.4**	**52.1**	**23.1**	**3.2**	**1.9**	**21.4**	**3.7**
Central and Eastern Europe	**14.0**	**2.0**	**7.6**	**1.0**	**20.8**	**8.7**	**31.5**	**18.1**	**8.9**	**3.6**	**2.3**	**2.2**	**14.2**	**8.3**	**6.2**	**0.3**	**64.5**	**13.6**	**3.0**	**2.0**	**22.1**	**8.1**
Belarus	17.2	1.2	9.3	0.7	23.1	8.4	29.4	19.4	5.4	1.6	1.3	1.4	13.5	6.8	6.2	0.1	55.4	4.9	3.0	1.8	18.0	5.0
Bulgaria	7.5	1.4	3.5	0.6	13.7	5.7	32.7	15.3	7.9	3.0	1.4	1.3	14.7	8.1	7.4	0.4	62.9	15.1	2.6	1.5	23.5	9.8
Czech Republic	8.8	2.3	7.6	1.2	7.8	4.4	27.3	14.3	7.5	3.1	4.1	3.9	15.0	10.7	3.5	0.3	46.7	19.8	3.4	1.8	17.1	5.5
Hungary	20.7	4.1	8.8	1.3	15.2	6.6	48.2	22.9	10.8	3.2	3.6	4.0	16.6	12.0	8.1	1.0	91.7	44.3	2.9	2.1	26.1	7.0
Moldova	19.4	1.5	4.7	0.6	21.0	9.5	39.9	19.3	24.7	9.8	1.2	1.1	17.5	8.1	11.7	0.2	57.2	10.4	2.8	1.7	28.3	10.6
Poland	12.1	2.7	6.0	1.2	16.2	6.2	35.3	17.8	5.8	2.7	3.1	3.7	12.7	8.4	6.9	0.8	74.3	30.7	4.0	2.4	22.9	6.9
Romania	16.6	1.8	4.8	0.7	16.0	5.9	29.5	14.6	16.6	6.6	2.1	1.5	13.0	7.9	7.7	0.4	66.0	15.6	1.9	1.4	21.2	12.3
Russian Federation	12.7	2.0	8.6	1.2	25.3	10.4	29.1	18.7	9.4	3.9	2.0	1.9	14.6	8.4	5.4	0.3	64.4	8.7	2.7	2.0	21.5	8.1
Slovakia	19.1	2.4	8.5	0.9	12.8	6.7	47.2	22.6	10.0	3.9	5.7	4.9	15.0	9.3	5.2	0.3	58.3	16.7	4.8	3.2	24.6	7.8
Ukraine	18.2	1.6	8.2	0.5	22.3	8.6	30.3	17.7	5.6	2.6	1.5	1.5	13.9	7.1	6.7	0.2	55.3	7.4	3.4	1.9	23.6	8.6
Northern Europe	**5.4**	**1.8**	**10.2**	**3.3**	**6.5**	**3.2**	**21.8**	**14.9**	**8.1**	**4.0**	**1.1**	**1.5**	**11.4**	**9.0**	**1.6**	**0.3**	**39.2**	**27.8**	**3.8**	**2.2**	**20.9**	**2.8**
Denmark	7.1	2.4	7.6	2.2	5.9	3.1	22.3	16.8	8.8	4.1	1.5	1.4	12.9	10.8	1.9	0.4	47.7	39.0	4.1	3.1	22.2	2.9
Estonia	10.7	1.2	7.2	1.1	19.2	9.0	28.9	15.3	7.4	2.5	2.4	2.4	16.3	9.1	4.2	0.2	68.3	14.5	3.7	2.1	20.5	5.9
Finland	3.6	1.5	4.9	1.4	5.8	3.3	17.1	10.7	8.5	3.3	2.3	2.2	13.9	11.3	0.8	0.1	32.1	17.0	4.4	1.7	16.5	1.3
Iceland	0.9	1.5	5.2	2.0	4.0	4.4	21.2	13.8	8.1	3.0	1.3	0.2	14.7	11.7	0.0	0.0	32.4	32.7	2.2	2.0	25.7	1.7
Ireland	4.9	1.7	10.8	3.6	7.0	4.1	24.7	15.5	8.9	4.0	0.8	1.1	9.7	7.7	2.5	0.4	39.6	29.9	3.4	2.4	26.0	3.9
Latvia	17.6	1.8	10.5	1.0	24.1	8.2	27.5	16.3	7.8	2.4	1.7	1.4	16.3	8.6	6.1	0.2	61.2	12.6	3.0	2.2	25.5	8.8
Lithuania	15.2	1.8	11.4	1.0	26.2	9.3	30.9	13.9	8.2	2.7	2.0	1.9	15.0	7.8	6.5	0.3	66.4	9.1	2.9	1.8	22.7	9.6
Norway	2.9	1.1	5.0	1.4	5.7	2.4	24.6	18.2	6.3	2.6	0.8	1.2	12.1	10.9	0.9	0.2	34.5	28.1	6.3	4.1	16.3	2.4
Sweden	3.2	1.2	5.1	1.3	4.2	2.4	20.0	14.4	6.9	2.8	2.4	3.3	13.3	10.8	0.7	0.1	23.3	22.7	4.8	2.6	17.2	2.9
United Kingdom	5.2	2.0	12.1	4.3	5.6	2.6	21.5	14.9	8.3	4.5	0.8	1.2	10.4	8.3	1.5	0.3	39.7	30.4	3.5	1.9	21.5	2.3
Southern Europe	**5.7**	**1.5**	**4.1**	**0.7**	**11.1**	**5.2**	**24.4**	**13.3**	**12.6**	**4.2**	**2.4**	**2.0**	**11.8**	**8.2**	**3.5**	**0.3**	**54.6**	**16.8**	**2.7**	**1.6**	**19.5**	**3.0**
Albania	3.4	1.6	2.5	0.4	21.3	7.7	6.8	4.5	15.1	8.9	0.4	1.9	9.5	3.2	4.8	0.6	49.9	8.6	0.8	0.6	15.1	3.2
Bosnia Herzegovina	5.7	1.1	4.3	0.8	16.1	7.5	28.1	14.7	12.3	8.1	2.9	3.2	11.7	7.7	6.4	0.6	79.0	16.2	2.2	1.5	21.1	6.3
Croatia	10.4	1.5	4.8	0.9	15.3	7.2	43.6	19.9	12.7	4.1	3.3	2.9	12.7	9.3	6.0	0.3	74.0	21.7	4.6	2.5	27.3	5.2
Cyprus	2.0	0.6	2.7	0.6	9.3	6.8	23.5	10.6	9.8	4.6	2.2	1.9	13.5	5.9	1.5	0.1	63.7	10.9	3.0	1.4	24.7	2.2
Greece	3.6	1.0	2.3	0.4	9.3	4.6	20.4	11.5	10.5	4.1	2.0	1.4	12.4	7.9	3.8	0.2	81.1	17.5	2.3	1.6	20.2	2.9
Italy	4.6	1.5	2.8	0.7	10.3	5.1	20.6	12.7	14.0	4.4	2.7	2.5	11.9	8.9	2.3	0.3	44.8	17.2	3.1	1.6	20.3	2.1
FYR Macedonia	3.9	0.7	2.8	0.4	18.0	7.2	21.8	16.6	10.6	4.8	1.0	1.9	13.5	7.7	8.1	0.7	65.7	14.5	4.0	2.2	24.8	4.9
Malta	3.0	0.6	5.6	0.6	10.1	4.1	21.3	13.5	5.2	1.8	0.8	0.2	14.5	11.4	2.1	0.0	46.3	10.6	2.2	1.4	18.7	2.3
Montenegro	2.3	0.4	4.1	0.5	8.3	4.8	16.9	11.4	9.2	4.0	1.1	0.8	10.5	5.5	10.8	2.4	75.1	18.8	1.2	1.3	32.0	5.6
Portugal	10.4	1.2	7.9	0.5	17.4	7.7	29.5	14.9	13.1	3.3	1.6	1.2	11.2	6.0	4.8	0.2	49.1	10.4	2.5	1.6	16.6	3.9
Serbia	10.1	2.0	5.2	1.0	11.8	5.2	35.4	17.6	9.4	5.3	3.0	3.0	14.5	9.5	7.1	0.7	88.1	31.1	4.7	2.6	31.9	9.5
Slovenia	10.1	1.2	6.0	0.8	12.4	5.7	27.2	14.1	11.5	4.1	3.6	2.5	14.9	8.8	3.5	0.6	56.5	26.0	4.8	3.2	20.2	4.0
Spain	5.9	1.5	5.2	0.7	9.5	4.4	26.8	12.7	11.5	3.3	1.9	1.3	10.8	7.5	3.4	0.3	51.9	14.4	1.9	1.3	15.4	2.3
Western Europe	**7.6**	**2.0**	**7.8**	**1.7**	**7.4**	**3.4**	**20.8**	**12.7**	**10.6**	**3.4**	**1.9**	**1.7**	**13.8**	**9.9**	**2.1**	**0.3**	**50.4**	**24.7**	**3.3**	**1.9**	**23.0**	**2.9**
Austria	8.7	1.9	5.2	1.2	6.7	4.0	19.3	10.0	10.9	2.9	2.0	1.9	14.4	10.7	2.3	0.3	42.0	24.2	3.4	1.8	21.3	2.4
Belgium	7.6	2.2	8.7	2.2	5.9	2.4	19.1	12.5	7.8	3.3	0.8	0.9	11.4	9.0	2.0	0.4	57.2	26.8	2.9	2.6	24.3	2.7
France	8.1	1.9	7.1	1.5	7.2	2.6	20.8	12.5	15.7	4.0	1.0	0.9	14.4	9.5	2.1	0.3	57.6	22.1	3.0	1.7	22.7	3.2
Germany	8.2	2.2	7.7	1.6	8.2	4.1	20.6	12.4	8.7	3.1	2.7	2.4	14.1	10.3	2.2	0.3	48.0	24.8	3.2	1.8	23.4	3.0

Luxembourg	4.0		0.6		6.2	1.0	6.5	3.7	19.8	12.8	10.2	3.9	0.9	0.8	11.9	9.4	1.8	0.0	43.5	19.3	3.1	1.7	23.6	2.8
Netherlands	3.7		1.7		12.1	3.4	6.4	3.3	26.3	18.4	5.1	2.6	1.9	2.1	12.0	9.6	1.4	0.3	46.8	36.1	4.6	3.1	24.2	2.0
Switzerland	5.7		2.1		6.9	1.7	6.5	2.9	16.1	10.2	9.0	4.0	1.4	1.6	11.3	9.1	2.0	0.3	33.1	20.5	4.2	1.8	18.2	1.5

Country/region	Corpus	Ovary	Prostate	Testis	Kidney		Bladder		Brain, cns		Thyroid		Hodgkin		NHL		Multiple myeloma		Leukaemia		All sites	
	C54	C56	C61	C62	C64–65		C67		C70–72		C73		C81		C82–86,C96		C88 + C90		C91–95		C00–97/C44	
	F	F	M	M	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Europe	**4.4**	**7.4**	**19.4**	**0.4**	**7.1**	**2.7**	**9.2**	**1.9**	**6.6**	**4.3**	**0.6**	**0.6**	**0.5**	**0.3**	**5.2**	**3.0**	**3.1**	**2.0**	**6.8**	**4.0**	**217.4**	**128.1**
EU-28	**3.7**	**7.1**	**18.2**	**0.4**	**6.5**	**2.7**	**9.3**	**2.2**	**6.6**	**4.3**	**0.6**	**0.5**	**0.5**	**0.3**	**5.6**	**3.3**	**3.4**	**2.2**	**6.8**	**4.0**	**206.0**	**127.7**
Central and Eastern Europe	**5.8**	**8.4**	**22.2**	**0.6**	**8.7**	**3.0**	**9.5**	**1.5**	**6.6**	**4.5**	**0.5**	**0.7**	**0.7**	**0.4**	**4.1**	**2.6**	**2.2**	**1.6**	**6.6**	**4.0**	**250.2**	**132.0**
Belarus	5.2	6.3	21.8	0.8	15.6	4.7	5.5	0.6	5.2	4.3	0.4	1.1	0.8	0.6	4.5	2.6	1.8	1.7	6.0	3.9	238.0	108.4
Bulgaria	5.3	8.4	20.9	1.0	6.3	1.6	10.3	2.5	8.7	5.9	0.4	0.4	0.8	0.4	4.3	2.6	1.2	0.9	6.3	3.1	230.1	128.4
Czech Republic	4.3	9.7	20.6	0.5	10.6	4.3	8.6	2.5	5.6	3.6	0.5	0.5	0.5	0.3	4.3	2.7	2.5	2.1	7.2	4.0	205.9	127.9
Hungary	4.4	9.5	20.0	0.8	7.8	4.0	10.8	3.1	6.4	4.5	0.5	0.7	0.4	0.2	5.2	3.1	2.3	1.5	7.5	4.8	299.9	178.1
Moldova	4.4	7.0	21.6	0.4	6.7	2.3	8.4	1.3	8.2	5.2	0.6	0.9	1.0	0.7	4.3	2.6	1.4	1.1	5.7	3.6	272.6	138.1
Poland	5.7	11.1	24.7	0.8	8.6	3.4	14.9	2.7	8.8	5.1	0.6	0.7	0.4	0.3	4.9	3.3	3.6	2.2	7.8	4.0	266.4	153.3
Romania	3.2	7.3	18.4	0.5	4.8	1.9	9.7	1.7	7.3	4.8	0.5	0.6	0.5	0.3	3.2	2.3	1.9	1.3	6.0	3.7	245.0	128.2
Russian Federation	6.0	7.8	22.1	0.5	9.0	2.9	7.6	1.0	6.1	4.3	0.6	0.7	0.7	0.5	3.7	2.2	2.0	1.6	6.3	3.8	248.1	127.5
Slovakia	6.1	9.2	34.0	0.8	10.9	4.9	13.4	2.4	7.0	5.5	0.5	0.5	0.8	0.4	10.4	8.7	4.1	3.4	8.0	5.9	294.1	160.1
Ukraine	6.9	8.3	21.6	0.6	8.4	2.6	9.0	1.0	5.3	3.9	0.4	0.7	0.8	0.5	3.4	2.5	1.7	1.2	5.7	4.2	239.4	122.1
Northern Europe	**4.1**	**7.6**	**23.8**	**0.2**	**6.1**	**2.7**	**7.2**	**2.4**	**6.3**	**4.0**	**0.4**	**0.5**	**0.5**	**0.3**	**5.9**	**3.6**	**3.6**	**2.4**	**6.0**	**3.5**	**186.1**	**135.4**
Denmark	3.8	8.0	28.4	0.2	6.1	2.4	8.3	3.2	7.4	5.2	0.3	0.5	0.5	0.2	4.8	2.6	3.9	2.2	7.1	4.4	205.9	156.4
Estonia	4.2	9.6	37.3	0.2	12.1	4.2	8.7	1.8	6.6	4.9	0.5	0.7	0.3	0.3	6.9	3.7	3.0	3.0	6.8	4.8	264.0	130.1
Finland	3.9	6.4	19.0	0.5	6.0	2.6	4.1	0.9	5.6	3.6	0.6	0.5	0.5	0.2	7.0	4.1	3.2	2.3	4.5	3.1	155.6	107.1
Iceland	2.0	6.2	26.7	0.0	7.3	3.4	5.0	0.8	7.3	6.1	1.2	1.0	0.0	0.0	4.3	2.2	3.5	1.0	4.9	2.7	159.0	133.0
Ireland	4.9	9.7	20.6	0.2	5.7	2.7	6.3	3.1	6.7	4.4	0.4	0.6	0.5	0.3	5.8	4.3	4.2	2.5	6.6	3.1	178.2	143.3
Latvia	7.6	11.1	35.7	0.4	11.9	4.0	16.9	2.0	6.5	4.8	0.7	0.9	0.7	0.2	5.3	3.4	3.2	2.2	7.9	5.0	282.7	140.6
Lithuania	5.6	11.1	30.4	0.3	13.0	4.1	9.5	1.5	8.4	5.5	0.4	0.5	0.4	0.1	5.7	2.6	2.6	1.8	8.7	4.5	284.8	131.4
Norway	3.9	7.9	28.9	0.2	5.2	2.2	6.6	1.7	7.1	3.9	0.4	0.6	0.4	0.2	5.2	3.3	4.2	3.4	5.8	3.4	172.1	127.1
Sweden	3.2	5.9	27.1	0.2	4.7	2.6	5.9	2.0	4.5	2.6	0.4	0.4	0.3	0.1	5.0	3.2	3.5	2.7	5.5	4.2	154.2	121.4
United Kingdom	4.1	7.4	22.4	0.2	5.8	2.6	7.3	2.7	6.4	4.1	0.3	0.4	0.5	0.3	6.1	3.8	3.5	2.3	5.8	3.2	185.7	138.7
Southern Europe	**3.5**	**5.9**	**13.9**	**0.3**	**5.4**	**2.0**	**10.0**	**1.9**	**6.8**	**4.5**	**0.4**	**0.5**	**0.6**	**0.4**	**5.0**	**3.0**	**3.2**	**2.2**	**6.8**	**3.9**	**201.1**	**113.7**
Albania	2.5	2.3	17.0	0.6	5.1	1.2	14.8	3.3	9.8	5.7	0.3	0.5	0.7	0.4	1.1	0.3	1.2	0.4	4.9	3.3	180.2	87.3
Bosnia Herzegovina	3.7	7.4	19.9	0.5	5.7	1.8	8.1	2.1	9.6	6.9	0.3	0.6	0.5	0.4	2.7	1.6	1.6	1.0	5.2	3.1	239.0	128.9
Croatia	5.2	9.0	27.3	0.7	9.9	3.1	12.8	3.3	8.8	5.9	0.5	0.7	0.4	0.3	6.7	3.9	3.6	2.2	8.4	4.2	281.7	150.6
Cyprus	4.9	9.6	27.6	0.3	4.8	1.5	11.5	2.3	6.0	4.3	0.3	0.4	0.4	0.1	6.7	4.6	5.0	3.2	11.8	6.5	222.4	115.9
Greece	4.1	6.0	15.7	0.3	5.9	1.8	12.9	1.5	8.8	5.9	0.4	0.5	1.4	0.8	3.1	1.6	2.7	2.1	8.5	4.7	226.8	115.2
Italy	3.1	5.7	10.7	0.3	4.8	2.0	8.3	1.7	6.0	4.0	0.4	0.4	0.6	0.4	5.3	3.2	3.6	2.3	6.8	4.2	181.1	114.7
FYR Macedonia	6.2	5.2	24.5	0.5	2.8	0.9	9.0	1.9	13.0	6.3	0.3	0.5	0.6	0.4	2.0	1.5	1.4	0.6	5.1	3.3	220.4	120.4
Malta	4.8	7.9	13.5	0.0	6.3	2.3	7.7	2.2	5.6	3.9	0.4	0.8	0.0	0.0	6.4	3.0	2.3	1.6	5.0	3.6	171.3	104.2
Montenegro	3.0	4.4	20.7	0.6	3.7	1.9	6.4	2.4	10.4	5.4	0.0	0.9	1.4	0.2	2.4	1.4	0.8	0.5	3.8	2.5	209.3	124.0
Portugal	2.8	4.3	18.9	0.3	3.8	1.6	9.1	1.9	8.9	4.9	0.6	0.4	0.4	0.2	6.6	3.9	4.0	3.4	7.0	3.5	221.3	102.4
Serbia	5.3	9.5	22.1	0.9	6.4	2.6	12.5	2.7	9.0	6.1	0.7	0.7	1.0	0.6	4.3	3.1	2.7	1.8	7.5	4.2	279.4	170.6
Slovenia	5.0	7.8	25.6	0.4	8.9	2.7	8.2	2.2	6.2	4.8	0.4	0.4	0.4	0.3	8.2	6.2	3.7	2.6	8.0	3.3	236.0	136.4
Spain	3.5	5.4	13.2	0.2	5.7	1.8	11.2	1.8	5.7	4.0	0.4	0.5	0.3	0.2	4.6	2.8	2.9	1.9	6.1	3.5	191.4	98.1
Western Europe	**3.2**	**6.6**	**17.7**	**0.4**	**6.9**	**2.9**	**8.8**	**2.2**	**6.5**	**4.0**	**0.8**	**0.6**	**0.4**	**0.2**	**6.0**	**3.2**	**3.5**	**2.2**	**7.0**	**4.2**	**199.4**	**126.8**
Austria	2.7	6.6	16.8	0.4	5.6	2.7	8.1	2.0	5.9	4.0	0.7	0.5	0.2	0.1	5.8	3.1	3.4	2.2	6.2	4.0	180.8	120.1
Belgium	3.3	5.9	15.4	0.2	5.4	2.5	9.1	2.2	7.0	3.8	0.6	0.7	0.3	0.1	6.2	3.0	3.5	2.1	6.7	4.5	193.9	126.6

(*continued on next page*)

Table 6 (*continued*)

Country/region	Corpus	Ovary	Prostate	Testis	Kidney		Bladder		Brain, cns		Thyroid		Hodgkin		NHL		Multiple myeloma		Leukaemia		All sites	
	C54	C56	C61	C62	C64–65		C67		C70–72		C73		C81		C82–86,C96		C88 + C90		C91–95		C00–97/C44	
	F	F	M	M	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
France	4.0	6.5	14.5	0.4	7.0	2.7	10.1	1.9	6.6	4.1	0.4	0.4	0.5	0.2	6.3	3.3	3.4	2.0	7.7	4.5	216.0	123.0
Germany	2.7	6.8	19.7	0.4	7.5	3.1	8.1	2.3	6.6	4.1	1.1	0.7	0.3	0.2	5.9	3.2	3.4	2.2	6.9	4.0	195.6	128.4
Luxembourg	3.1	7.8	14.7	0.0	2.7	2.0	8.1	1.6	6.2	3.4	0.3	0.1	0.0	0.0	3.5	3.0	3.1	2.4	8.0	3.2	169.6	115.1
Netherlands	3.4	7.5	20.4	0.2	6.8	3.0	8.2	2.4	5.2	3.4	0.6	0.7	0.4	0.3	5.6	3.7	4.4	2.6	6.5	3.9	195.9	148.6
Switzerland	2.9	5.4	19.9	0.2	4.3	1.5	7.0	1.9	6.8	3.8	0.8	0.6	0.4	0.1	4.9	2.6	3.4	2.2	5.7	3.5	158.6	105.3

Table 4 shows the estimated numbers of cases and deaths by site of cancer and sex (in thousands) for the 28 countries of the European Union (EU-28). The EU-28 accounted for an estimated 3 million new cases (77% of the European total) and 1.4 million deaths (73%) in 2018. The most common forms of cancers were female breast cancer (405,000 cases, 13.5% of all cancer cases), followed by colorectal cancer (378,000, 12.6%), prostate cancer (376,000, 12.5%) and lung cancer (365,000, 12.1%). Similar to Europe overall, these four cancers represented half of the overall burden of cancer in the EU-28 in 2018. Lung cancer, with an estimated 296,000 deaths (20.9% of total) was by far the most common cause of death from cancer in the EU-28. It has also become the most important cause of death from cancer both in men (195,000 deaths) and in women (102,000). Colorectal cancer is the second most common cause of cancer death (173,000 deaths, 12.2%), followed by female breast (99,000, 7.0%) and pancreatic cancer (95,000, 6.7%).

Appendix Tables 5 and 6 presents the estimated incidence and mortality rates by sex and site, for the 40 European countries, while appendix Tables 7 and 8 present the equivalent numbers of cases and deaths. A brief description of the overall cancer patterns and for the four leading cancers in Europe is provided below.

3.1. Overall cancer patterns

After adjusting for differing population age structures, overall cancer incidence rates in both sexes were highest in Hungary, both in men (580.5 per 100,000) and in women (438.5), with rates above 500 (in men) in geographically diverse countries including Estonia, France, Ireland, Latvia, Norway, Slovakia and Slovenia (Figs. 2a, b and 3a). The lowest all-cancer incidence rates were observed in both sexes in Albania (280.6 in men, 196.3 in women), in Bosnia Herzegovina (348.1, 267.8) and also in Ukraine (352.9, 262.0). Mortality rates reflect the frequency and the fatality of cancer, both high in men and women in Hungary (299.9 and 178.1 respectively), with rates elevated in certain Eastern European, Baltic and Balkan countries (e.g. Slovakia, Latvia, Lithuania Serbia and Croatia). The lowest mortality rates were estimated in the Northern European countries, Sweden (154.2) and Finland (155.6) for men, and in Southern European countries of Albania (87.3) and Spain (98.1) in women (Fig. 2c, d and 3b).

3.2. Female breast cancer

Breast cancer is the leading cancer site in women in all countries of Europe (Table 3) in 2018. There are large variations in the estimated incidence rates (60–155 per 100,000) with a clear geographic gradient (Fig. 4), with elevated incidence rates in Western European countries, notably in Belgium (154.7), Luxembourg (148.8) and

Table 7
Estimated number of new cancer cases (hundreds) by sex, cancer site and country, 2018.

Country/region	Lip, oral cavity and pharynx		Oesophagus		Stomach		Colorectum		Liver		Gallbladder		Pancreas		Larynx		Lung		Melanoma		Breast	Cervix
	C00–14		C15		C16		C18–21		C22		C23–24		C25		C32		C33–34		C43		C50	C53
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	F	F
Europe	**879.0**	**334.5**	**406.7**	**123.0**	**816.1**	**515.2**	**2716.0**	**2280.7**	**558.3**	**266.4**	**152.3**	**184.9**	**672.1**	**653.5**	**352.4**	**46.3**	**3118.4**	**1582.0**	**711.7**	**730.4**	**5225.1**	**610.7**
EU-28	**638.9**	**262.2**	**303.1**	**99.2**	**502.1**	**300.0**	**2121.7**	**1662.8**	**458.8**	**196.9**	**125.9**	**142.8**	**506.5**	**493.5**	**235.9**	**37.3**	**2310.5**	**1335.5**	**605.2**	**599.8**	**4049.2**	**326.8**
Central and Eastern Europe	**347.6**	**104.5**	**127.2**	**28.9**	**384.3**	**260.6**	**849.5**	**800.5**	**137.4**	**90.5**	**40.2**	**63.9**	**220.5**	**212.5**	**165.5**	**14.8**	**1099.3**	**391.6**	**115.5**	**146.7**	**1490.2**	**359.4**
Belarus	14.3	2.2	5.2	0.5	16.8	12.0	28.0	28.8	3.2	2.4	0.8	1.6	7.0	5.7	6.2	0.2	36.3	6.1	3.5	5.0	45.0	9.8
Bulgaria	6.5	2.2	2.0	0.4	8.6	4.6	27.2	18.8	3.8	1.8	0.8	1.3	7.8	5.5	5.6	0.4	33.6	8.9	2.8	2.5	40.2	10.8
Czech Republic	12.4	5.9	5.9	1.5	8.1	5.9	45.4	33.0	6.8	3.8	3.2	4.4	11.7	10.4	4.9	0.6	42.0	23.4	12.7	11.8	74.4	8.1
Hungary	20.3	8.1	6.3	1.2	12.3	8.6	61.2	46.9	7.7	3.2	2.8	4.8	10.9	12.3	9.2	1.8	64.7	45.4	7.8	9.4	82.2	13.1
Moldova	5.7	0.8	1.1	0.2	4.8	3.3	12.4	9.3	5.4	3.1	0.3	0.4	4.0	2.6	4.1	0.1	13.2	3.8	1.2	1.4	16.5	6.4
Poland	50.6	19.8	14.0	4.1	41.8	24.8	140.3	104.8	15.4	10.3	8.3	13.8	29.2	28.6	27.6	4.4	179.9	105.9	18.0	19.3	202.0	32.2
Romania	37.6	6.9	6.0	1.3	22.9	12.3	65.0	45.8	22.3	12.2	3.3	3.0	16.6	14.5	15.7	1.0	85.8	27.6	5.0	6.1	96.3	33.1
Russian Federation	130.1	43.9	62.9	16.9	204.5	147.6	330.9	383.1	59.5	44.0	14.0	24.3	95.3	98.2	64.3	5.0	483.8	129.8	43.2	66.1	714.3	181.6
Slovakia	9.8	1.9	3.2	0.4	6.9	4.7	27.2	19.0	3.4	1.8	1.7	3.3	5.3	5.1	3.6	0.2	24.2	7.6	4.1	3.9	30.0	6.9
Ukraine	60.3	12.6	20.6	2.5	57.6	36.6	111.8	111.0	10.0	7.8	5.0	7.1	32.7	29.7	24.3	1.1	135.8	33.1	17.3	21.3	189.6	57.3
Northern Europe	**111.1**	**51.8**	**90.6**	**38.6**	**71.1**	**41.3**	**412.6**	**346.4**	**70.9**	**39.1**	**20.0**	**26.5**	**92.2**	**90.8**	**30.8**	**6.4**	**392.6**	**351.1**	**156.7**	**156.6**	**842.7**	**63.2**
Denmark	7.4	3.1	4.9	1.8	3.7	1.8	29.7	26.2	4.3	1.9	1.1	1.1	5.4	5.2	2.0	0.5	24.3	25.2	11.1	14.5	46.3	4.2
Estonia	1.1	0.4	0.6	0.1	2.1	1.2	4.2	5.3	0.6	0.4	0.3	0.4	1.6	1.3	0.6	0.1	5.8	2.7	0.9	1.4	8.0	2.3
Finland	4.5	2.7	2.1	0.9	3.4	2.5	18.3	16.1	3.5	2.0	1.1	1.7	5.8	6.1	1.1	0.1	16.3	11.3	8.8	7.9	47.7	1.8
Iceland	0.1	0.1	0.2	0.1	0.1	0.1	0.9	0.8	0.1	0.0	0.1	0.0	0.2	0.2	0.0	0.0	0.8	1.0	0.2	0.3	2.3	0.1
Ireland	3.4	1.6	3.0	1.6	4.3	2.4	17.5	12.2	2.8	0.9	0.9	1.1	2.6	2.8	1.7	0.3	16.3	13.4	5.1	7.0	33.3	3.4
Latvia	3.1	0.6	1.3	0.2	3.1	2.5	7.3	8.2	0.6	0.9	0.2	0.3	2.5	2.2	1.1	0.1	8.7	2.6	1.0	1.2	12.7	3.4
Lithuania	3.3	0.8	1.8	0.3	4.8	3.8	9.0	9.3	1.6	0.9	0.4	0.6	2.3	2.8	1.5	0.1	12.7	3.8	1.9	2.7	17.4	4.3
Norway	4.5	2.3	2.8	0.7	3.3	1.5	25.3	23.6	2.5	0.9	0.9	1.1	3.9	4.0	1.3	0.2	16.8	16.6	13.6	13.3	38.0	3.6
Sweden	8.4	5.1	4.3	1.3	4.9	2.9	33.7	30.5	6.4	3.3	2.2	3.4	10.2	9.7	1.3	0.3	19.7	20.4	21.7	21.4	80.2	5.6
United Kingdom	74.9	35.0	69.3	31.6	41.2	22.5	265.5	213.4	48.3	27.9	12.9	16.7	57.5	56.3	20.1	4.7	270.1	253.1	92.0	86.5	554.4	34.3
Southern Europe	**150.8**	**61.9**	**51.5**	**13.0**	**182.8**	**115.3**	**694.5**	**505.0**	**177.0**	**73.2**	**46.3**	**48.2**	**149.2**	**143.6**	**81.6**	**10.5**	**724.1**	**285.2**	**122.3**	**116.0**	**1195.8**	**91.5**
Albania	1.0	0.7	0.5	0.1	4.6	1.8	2.3	1.8	2.6	1.7	0.1	0.5	1.7	0.7	1.4	0.2	9.6	1.9	0.3	0.3	9.7	1.3
Bosnia Herzegovina	2.3	1.0	1.2	0.3	4.5	2.7	10.5	7.7	3.0	2.6	0.9	1.3	2.9	2.7	2.6	0.3	19.3	5.0	1.0	1.3	13.9	5.6
Croatia	4.7	1.3	1.6	0.5	5.0	3.6	19.5	14.4	4.1	2.3	1.3	1.4	4.2	4.1	2.6	0.3	21.2	9.0	3.3	2.7	28.6	2.7
Cyprus	0.4	0.2	0.1	0.1	0.7	0.5	3.4	1.7	0.5	0.2	0.2	0.2	0.7	0.5	0.4	0.0	4.0	0.9	0.4	0.4	7.3	0.5
Greece	7.3	2.9	2.1	0.6	11.6	7.5	41.6	31.6	11.2	5.2	2.7	2.3	11.6	10.2	7.3	0.6	78.6	21.0	7.6	9.0	77.3	7.0
Italy	52.0	24.9	15.6	5.7	77.3	50.7	269.3	224.0	87.4	35.8	20.5	23.6	66.4	69.6	27.9	4.6	269.1	130.8	69.3	53.7	570.4	31.1
FYR Macedonia	0.8	0.3	0.4	0.1	2.6	1.2	5.2	4.8	1.2	0.6	0.1	0.3	1.7	1.2	1.7	0.2	9.1	2.5	1.3	0.9	10.0	1.5
Malta	0.3	0.1	0.2	0.1	0.4	0.2	1.8	1.2	0.1	0.1	0.1	0.0	0.4	0.4	0.2	0.0	1.4	0.6	0.3	0.3	3.5	0.1
Montenegro	0.4	0.2	0.2	0.0	0.3	0.2	1.1	0.9	0.3	0.2	0.0	0.0	0.4	0.3	0.6	0.2	3.1	1.0	0.1	0.1	4.2	0.5
Portugal	15.5	3.5	6.4	0.7	17.2	11.7	61.0	41.7	9.8	4.0	2.0	2.1	8.9	7.3	5.4	0.4	40.0	12.9	6.4	6.8	69.7	7.5
Serbia	10.4	3.4	3.3	0.8	8.0	4.2	37.8	23.7	4.6	3.1	2.4	3.0	8.1	7.0	6.4	0.8	53.7	25.4	6.4	6.0	58.1	13.3
Slovenia	2.8	0.7	0.9	0.2	2.8	1.7	13.0	6.9	2.2	0.8	0.8	1.1	2.2	2.0	0.7	0.1	10.0	4.9	3.4	3.5	13.8	1.1
Spain	53.0	22.6	19.1	4.0	47.6	29.2	227.4	144.3	49.8	16.5	15.1	12.3	39.9	37.8	24.2	2.7	204.4	69.1	22.3	30.9	328.3	19.4
Western Europe	**269.4**	**116.3**	**137.3**	**42.5**	**177.9**	**98.0**	**759.5**	**628.7**	**173.0**	**63.6**	**45.8**	**46.2**	**210.2**	**206.6**	**74.6**	**14.6**	**902.4**	**554.2**	**317.2**	**311.0**	**1696.4**	**96.6**
Austria	8.5	3.2	3.8	1.0	7.4	4.5	25.3	18.9	7.5	3.7	2.0	2.1	8.9	10.0	2.3	0.4	29.4	22.0	11.6	9.4	59.2	3.9
Belgium	14.9	5.9	7.9	3.1	10.1	5.6	52.7	40.8	6.4	3.7	2.1	1.9	11.1	11.0	5.2	1.0	62.1	32.1	14.9	20.4	118.5	6.4

(*continued on next page*)

Table 7 (*continued*)

Country/region	Lip, oral cavity and pharynx		Oesophagus		Stomach		Colorectum		Liver		Gallbladder		Pancreas		Larynx		Lung		Melanoma		Breast	Cervix
	C00–14		C15		C16		C18–21		C22		C23–24		C25		C32		C33–34		C43		C50	C53
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	F	F
France	121.8	45.5	41.8	12.3	50.2	27.0	258.1	212.1	83.8	22.4	13.9	14.3	73.1	66.6	28.5	3.8	322.0	149.3	74.3	71.8	561.6	30.7
Germany	99.0	47.1	59.4	18.9	91.3	50.5	310.3	270.2	61.9	26.9	21.4	21.9	95.1	95.6	29.5	7.0	396.9	270.6	155.9	158.5	718.9	46.1
Luxembourg	0.7	0.2	0.3	0.1	0.5	0.2	1.7	1.5	0.5	0.2	0.1	0.1	0.5	0.5	0.3	0.0	2.1	1.0	0.9	0.6	5.2	0.3
Netherlands	14.8	9.7	19.1	5.4	12.1	6.3	85.1	64.1	6.2	3.8	4.6	3.8	14.2	15.3	5.4	1.7	65.1	60.1	41.9	36.3	162.1	6.7
Switzerland	9.7	4.7	4.9	1.7	6.4	3.8	26.0	20.8	6.6	2.8	1.8	2.2	7.3	7.5	3.4	0.6	24.3	18.8	17.6	13.9	70.3	2.6

Country/region	Corpus	Ovary	Prostate	Testis	Kidney		Bladder		Brain, cns		Thyroid		Hodgkin		NHL		Multiple myeloma		Leukaemia		All sites	
	C54	C56	C61	C62	C64–65		C67		C70–72		C73		C81		C82–85,C96		C88 + C90		C91–95		C00–97/C44	
	F	F	M	M	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Europe	**1215.8**	**677.7**	**4497.6**	**239.9**	**849.3**	**515.9**	**1538.5**	**432.6**	**352.8**	**293.6**	**180.1**	**604.1**	**104.6**	**87.3**	**623.9**	**527.3**	**263.4**	**219.6**	**532.6**	**415.2**	**20,596.7**	**18,516.4**
EU-28	**789.2**	**447.8**	**3758.4**	**203.4**	**634.6**	**357.6**	**1284.6**	**359.9**	**273.1**	**216.4**	**145.3**	**438.1**	**78.6**	**61.0**	**535.9**	**438.0**	**229.2**	**181.8**	**428.4**	**317.8**	**16,171.4**	**13,848.1**
Central and Eastern Europe	**546.6**	**307.9**	**981.4**	**55.0**	**283.6**	**208.5**	**365.6**	**113.5**	**110.7**	**105.2**	**44.9**	**211.9**	**29.5**	**30.3**	**116.3**	**121.8**	**44.6**	**49.5**	**138.9**	**126.9**	**5951.9**	**6077.8**
Belarus	22.4	12.6	33.7	1.5	15.4	10.3	10.8	3.0	3.7	3.4	1.6	10.4	1.1	1.2	3.7	5.4	1.0	1.5	3.2	4.1	206.6	203.8
Bulgaria	13.2	7.2	42.6	1.9	5.7	2.6	14.5	4.4	3.6	3.1	0.7	3.0	0.5	0.6	3.1	2.9	0.7	0.9	3.0	2.6	188.5	149.3
Czech Republic	21.4	10.1	92.2	4.4	20.6	11.8	21.7	7.7	4.9	4.0	3.1	9.4	1.4	1.3	8.2	8.6	3.1	2.5	8.0	5.3	336.0	280.8
Hungary	19.2	13.1	55.1	5.5	13.1	9.9	23.3	10.6	4.3	4.1	1.9	10.0	1.3	0.9	7.7	8.1	2.3	2.2	7.7	6.9	334.5	331.6
Moldova	4.8	3.4	8.3	0.4	2.4	1.8	3.4	0.9	2.0	1.7	1.1	3.0	0.4	0.5	1.5	1.4	0.4	0.4	1.8	1.5	77.9	70.6
Poland	78.5	50.8	153.9	14.2	37.6	25.6	82.0	26.9	23.8	19.0	6.7	29.7	2.9	2.9	20.0	19.8	10.4	10.1	23.3	18.5	932.7	882.6
Romania	24.7	18.4	60.3	3.7	12.5	7.9	30.5	8.7	9.9	8.7	2.5	9.7	1.3	1.3	7.2	7.1	3.4	3.2	9.3	7.9	443.2	377.4
Russian Federation	258.6	139.4	400.6	14.8	131.3	104.1	125.1	36.6	43.0	45.7	17.6	94.2	14.6	15.1	43.2	46.4	15.7	20.8	57.4	58.3	2481.7	2808.9
Slovakia	10.5	5.8	23.6	2.7	7.7	5.2	8.4	3.2	2.9	2.5	0.9	3.6	0.8	0.7	4.1	4.5	1.8	2.0	4.1	3.0	152.9	131.6
Ukraine	93.3	47.2	111.1	6.0	37.3	29.2	45.9	11.5	12.3	13.0	8.7	38.8	5.2	5.8	17.6	17.7	5.9	6.0	21.1	18.6	797.9	841.2
Northern Europe	**169.2**	**95.0**	**913.9**	**39.6**	**129.4**	**79.2**	**168.7**	**59.5**	**51.3**	**39.3**	**21.2**	**63.6**	**17.5**	**13.9**	**129.9**	**107.1**	**54.7**	**41.6**	**95.5**	**65.5**	**3265.9**	**2968.2**
Denmark	8.9	4.3	46.7	2.7	7.0	3.5	19.5	5.7	2.7	2.0	0.9	3.4	0.8	0.5	7.5	5.5	2.1	1.6	5.0	3.1	199.4	180.6
Estonia	2.4	1.5	12.5	0.2	2.3	1.7	2.0	0.8	0.5	0.5	0.1	0.8	0.1	0.2	1.2	0.9	0.4	0.4	0.8	0.8	39.7	35.5
Finland	8.7	4.4	46.6	2.2	5.8	4.3	9.5	2.5	2.3	2.2	1.7	4.9	0.9	0.7	7.1	6.1	2.5	2.2	4.1	3.1	160.4	152.9
Iceland	0.4	0.2	1.8	0.1	0.4	0.3	0.7	0.2	0.1	0.1	0.1	0.2	0.0	0.0	0.3	0.2	0.1	0.1	0.2	0.1	7.1	7.1
Ireland	7.2	4.6	49.8	1.9	6.0	2.9	6.8	2.6	2.2	1.9	0.6	3.9	0.8	0.6	5.4	4.3	1.9	1.3	3.5	2.5	142.8	117.0
Latvia	3.8	2.9	13.8	0.3	3.1	2.8	3.6	1.7	1.4	1.8	0.3	3.1	0.3	0.2	1.0	1.3	0.5	0.5	1.8	1.3	59.6	59.3
Lithuania	7.7	3.7	15.5	0.4	4.6	3.8	4.3	1.6	1.9	2.0	0.6	3.1	0.3	0.3	2.2	3.1	0.9	0.9	3.2	2.7	78.3	80.3
Norway	8.0	3.3	54.8	3.5	7.4	2.4	11.8	3.7	2.5	1.7	1.6	3.2	0.9	0.6	5.9	5.2	2.4	2.3	3.8	2.9	175.9	145.5
Sweden	14.9	5.8	105.8	3.8	8.4	4.6	21.8	6.8	4.3	2.9	2.1	5.3	1.3	1.2	11.5	8.3	4.8	3.4	6.8	4.9	300.3	259.5
United Kingdom	106.8	64.1	564.0	24.4	84.1	52.7	88.3	33.9	33.4	24.2	13.1	35.4	12.1	9.5	87.5	71.9	39.0	28.6	66.2	44.0	2092.8	1922.2
Southern Europe	**232.6**	**124.3**	**995.5**	**49.0**	**179.5**	**89.4**	**474.7**	**116.0**	**87.6**	**71.6**	**54.1**	**156.3**	**24.1**	**22.8**	**141.4**	**121.9**	**68.5**	**55.8**	**117.0**	**87.4**	**4792.3**	**3929.9**
Albania	2.2	0.8	6.6	0.8	1.7	0.6	6.9	1.9	1.9	1.3	0.1	0.5	0.3	0.2	0.3	0.1	0.4	0.1	1.4	1.0	47.2	33.0
Bosnia Herzegovina	3.7	3.2	9.4	0.7	2.3	1.1	4.1	1.9	2.2	2.0	0.2	1.2	0.5	0.5	1.1	0.9	0.4	0.3	1.5	1.1	75.0	64.8
Croatia	9.0	4.9	23.5	2.7	6.2	3.3	9.9	3.5	2.6	2.6	1.7	5.4	0.5	0.5	2.7	2.6	1.3	1.0	2.8	2.1	128.8	112.7
Cyprus	1.4	0.7	7.5	0.5	0.6	0.3	1.2	0.4	0.5	0.4	0.6	2.5	0.2	0.2	0.8	0.9	0.3	0.3	0.7	0.6	25.0	20.9
Greece	22.6	9.0	64.6	4.4	15.1	5.8	51.1	6.9	8.5	7.3	4.0	12.1	3.9	3.4	7.4	4.9	4.2	3.9	10.8	7.6	373.6	275.1
Italy	89.5	49.8	438.4	21.9	75.9	43.6	206.9	52.1	33.2	26.6	32.0	77.3	10.4	10.9	68.9	56.9	33.4	27.0	50.0	39.3	2019.7	1775.9
FYR Macedonia	4.0	1.4	7.1	0.6	0.6	0.3	3.1	0.8	1.7	1.0	0.0	0.6	0.3	0.2	0.5	0.4	0.4	0.2	1.0	0.7	41.4	34.6
Malta	0.8	0.3	2.9	0.1	0.5	0.3	1.1	0.3	0.2	0.1	0.2	0.5	0.1	0.1	0.4	0.5	0.2	0.1	0.2	0.2	11.7	10.5

Montenegro	0.5	0.3	2.0	0.2	0.3	0.2	0.6	0.3	0.4	0.3	0.0	0.3	0.1	0.0	0.1	0.1	0.1	0.2	0.1	11.8	11.0
Portugal	10.7	5.7	66.1	1.5	7.9	5.1	17.6	5.8	7.3	5.0	3.0	14.0	1.6	0.7	11.2	4.5	9.7	5.0	5.4	7.1	4.8	312.4	244.7
Serbia	15.9	12.0	31.8	3.4	7.3	4.4	19.9	6.0	5.0	4.3	1.4	3.1	1.2	1.2	4.5	2.7	4.7	3.5	2.7	6.0	4.1	243.9	221.8
Slovenia	4.2	1.6	17.6	1.1	3.2	1.3	3.9	1.4	1.1	1.0	0.5	1.1	0.3	0.2	2.7	2.6	2.6	0.8	0.7	1.5	1.1	74.3	55.4
Spain	67.8	34.3	317.3	11.1	57.7	23.0	147.9	34.8	23.1	19.7	10.4	37.6	4.9	4.7	40.6	37.5	18.6	14.1	33.6	24.8	1423.5	1066.5
Western Europe	**267.4**	**150.5**	**1606.8**	**96.2**	**256.8**	**138.8**	**529.4**	**143.6**	**103.2**	**77.5**	**59.8**	**172.3**	**33.4**	**20.4**	**236.3**	**176.5**	**95.6**	**72.7**	**181.1**	**135.4**	**6586.7**	**5540.6**
Austria	9.9	7.6	56.0	3.4	7.8	5.2	9.8	3.7	3.7	3.2	2.8	6.9	0.7	0.8	7.1	6.2	3.0	2.6	6.3	4.3	221.8	201.3
Belgium	13.8	6.9	75.4	3.9	12.8	8.1	35.0	9.6	5.6	3.3	2.9	9.3	2.1	1.4	15.4	11.3	6.6	3.7	12.2	9.5	377.6	343.3
France	105.8	49.9	649.5	32.1	103.5	55.6	134.1	28.7	37.8	29.0	26.4	90.6	12.7	5.2	86.3	61.2	35.4	26.7	68.7	52.0	2335.9	1793.7
Germany	104.3	67.8	626.4	43.5	106.8	57.4	278.1	79.3	43.5	34.2	23.0	48.7	13.4	9.9	94.8	75.9	39.6	31.7	77.9	58.1	2837.1	2477.6
Luxembourg	0.6	0.5	4.0	0.3	0.4	0.2	0.9	0.2	0.2	0.1	0.2	0.6	0.1	0.1	0.5	0.5	0.2	0.2	0.6	0.3	15.6	13.8
Netherlands	20.9	12.2	127.0	8.6	17.7	8.9	50.9	16.3	7.7	4.9	2.6	6.2	3.0	2.0	23.4	15.0	7.1	4.8	9.3	6.5	553.4	496.3
Switzerland	12.0	5.6	67.8	4.3	7.7	3.3	20.4	5.8	4.5	2.7	2.0	10.0	1.5	1.0	8.7	6.4	3.7	3.1	6.2	4.5	242.7	212.6

The Netherlands (143.8), and in Northern Europe, particularly in the United Kingdom (127.7) and in the Nordic countries, Sweden and Finland (122.9). In comparison, incidence rates in Eastern European countries such as the Ukraine (60.0), Moldova (66.3) and Belarus (68.1) were considerably lower. The range of mortality rates varies two-fold (15–32 per 100,000), with highest rates seen in the Balkan Peninsula countries of Montenegro and Serbia (32.0) and Croatia (27.3) and in part of Eastern Europe including Moldova (28.3) and Hungary (26.1). The lowest mortality rates (15–16 per 100,000) were estimated in South Europe (e.g. Spain and Portugal) and in the Nordic countries of Norway and Finland (Fig. 4).

3.3. Colorectal cancer

The incidence rates of colorectal cancer are slightly higher in men than in women (Fig. 5a). Elevated rates of incidence were estimated in Central Europe–in Hungary (104.2 per 100,000), Slovakia (90.3) and Slovenia (87.7) in men and in Norway (58.8), Denmark (54.7) and Hungary (54.1) in women. A five-fold variation in the incidence rates were observed across Europe, with the lowest rates in Montenegro (32.8 in men, 21.6 in women) and Albania (13.7, 10.2). Geographical patterns of mortality partially follow incidence, although colorectal cancer mortality is also high in some countries with relatively low incidence rates (e.g. Moldova, Russian Federation, Montenegro, Poland and Lithuania) (Fig. 5a, b).

3.4. Prostate cancer

Incidence rates of prostate cancer also vary five-fold (37–189 per 100,000), with the highest rates were estimated in Northern and Western Europe, including Ireland (189.3), Estonia (162.4), Norway (157.3) and France (144.9) and the lowest in Central and Eastern Europe, e.g. Albania (37.0), Romania (47.2) and Ukraine (48.2). In comparison with incidence, mortality rates vary less, ranging from the elevated rates in Estonia (37.3) and Latvia (35.7) to relative low figures seen in Spain (13.2) and Italy (10.7) (Fig. 6).

3.5. Lung cancer

In men, incidence was highest in Central and Eastern Europe–Hungary (111.6 per 100,000), Serbia (100.9) and in Southern Europe e.g. Greece (99.0) and Montenegro (89.5), with the lowest rates observed in Finland (37.8) and Sweden (25.6). In women, the highest incidence rate was also estimated in Hungary (58.7), with rates high in Northern Europe [e.g. Denmark (53.8), Iceland (48.1) and The Netherlands (47.1)] while low rates were seen in Eastern Europe [e.g. Russian Federation (11.7), Ukraine (9.2) and Belarus (8.2)]

Table 8
Estimated number of cancer deaths (hundreds) by sex, cancer site and country, 2018.

Country/region	Lip, oral cavity and pharynx		Oesophagus		Stomach		Colorectum		Liver		Gallbladder		Pancreas		Larynx		Lung		Melanoma		Breast	Cervix
	C00–14		C15		C16		C18–21		C22		C23–24		C25		C32		C33–34		C43		C50	C53
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	F	F
Europe	**413.9**	**117.7**	**349.3**	**101.3**	**618.8**	**402.9**	**1297.1**	**1127.8**	**503.6**	**270.1**	**104.3**	**144.3**	**650.2**	**630.3**	**176.3**	**19.5**	**2673.2**	**1206.0**	**152.4**	**119.0**	**1377.1**	**258.3**
EU-28	**259.9**	**85.8**	**255.1**	**80.8**	**359.6**	**225.3**	**962.2**	**770.1**	**399.2**	**195.7**	**82.7**	**107.4**	**483.1**	**470.6**	**109.0**	**14.8**	**1945.4**	**1016.0**	**115.8**	**84.1**	**987.5**	**141.7**
Central and Eastern Europe	**213.3**	**45.8**	**116.3**	**25.1**	**318.4**	**214.3**	**480.3**	**465.2**	**135.8**	**91.6**	**35.0**	**57.5**	**217.2**	**209.3**	**94.8**	**7.5**	**992.7**	**320.9**	**46.2**	**45.6**	**499.5**	**160.1**
Belarus	8.2	0.9	4.4	0.5	10.5	6.7	13.2	16.0	2.5	1.3	0.6	1.1	6.2	5.5	2.9	0.1	25.6	3.8	1.4	1.3	12.6	3.2
Bulgaria	3.3	0.9	1.6	0.4	6.7	3.9	16.4	10.7	3.8	2.1	0.7	0.9	7.0	5.5	3.5	0.3	29.9	8.8	1.3	1.0	13.9	4.8
Czech Republic	5.8	1.9	5.1	1.1	5.6	4.3	19.7	14.5	5.7	3.1	3.0	3.9	10.7	10.5	2.4	0.3	34.3	17.9	2.4	1.6	15.8	4.3
Hungary	11.3	3.0	4.9	1.0	8.9	6.3	28.7	22.1	6.3	2.9	2.2	3.9	9.7	11.1	4.6	0.7	53.6	35.4	1.7	1.8	22.1	5.0
Moldova	3.7	0.4	0.9	0.2	3.8	2.4	7.0	5.0	4.5	2.5	0.2	0.3	3.2	2.1	2.2	0.1	10.6	2.7	0.5	0.4	7.2	2.6
Poland	26.4	8.3	13.4	3.7	36.8	20.9	81.0	62.6	13.1	9.3	7.2	12.8	28.7	28.4	15.5	2.2	171.3	93.7	9.0	8.3	69.2	19.5
Romania	18.6	2.9	5.5	1.2	19.8	10.4	37.0	26.2	20.0	11.4	2.6	2.6	15.7	13.8	9.0	0.5	78.4	24.4	2.3	2.1	33.8	17.4
Russian Federation	89.4	21.0	59.6	14.8	171.6	124.0	194.3	229.2	64.3	47.6	13.6	23.8	100.0	100.6	37.9	2.7	445.4	100.5	18.5	21.6	231.8	75.8
Slovakia	5.8	0.9	2.6	0.4	3.8	2.9	13.8	10.2	3.0	1.7	1.6	2.2	4.5	4.1	1.6	0.1	17.6	6.8	1.4	1.3	10.2	2.8
Ukraine	40.8	5.5	18.3	1.9	50.7	32.3	69.2	68.7	12.7	9.8	3.4	5.8	31.5	27.7	15.3	0.5	126.0	27.0	7.8	6.1	82.8	24.8
Northern Europe	**37.1**	**15.6**	**75.8**	**32.8**	**49.9**	**30.2**	**173.7**	**152.9**	**60.9**	**39.1**	**8.8**	**14.7**	**85.3**	**86.1**	**11.9**	**2.5**	**301.1**	**255.7**	**28.1**	**19.1**	**180.6**	**20.6**
Denmark	2.8	1.1	3.2	1.1	2.5	1.5	10.0	9.3	3.7	2.1	0.7	0.7	5.6	5.7	0.8	0.2	21.2	19.4	1.7	1.4	10.9	1.3
Estonia	0.8	0.1	0.5	0.1	1.5	1.3	2.3	2.5	0.6	0.4	0.2	0.4	1.3	1.4	0.3	0.0	5.3	1.9	0.3	0.3	2.5	0.6
Finland	1.5	0.9	2.1	0.8	2.5	1.8	7.6	6.4	3.8	2.0	1.0	1.4	6.0	6.5	0.4	0.1	14.1	9.1	1.8	0.9	7.9	0.6
Iceland	0.0	0.0	0.1	0.1	0.1	0.1	0.5	0.4	0.2	0.1	0.0	0.0	0.3	0.3	0.0	0.0	0.7	0.7	0.0	0.1	0.6	0.0
Ireland	1.3	0.5	3.0	1.2	2.0	1.4	6.9	5.2	2.5	1.4	0.2	0.4	2.7	2.6	0.7	0.1	11.0	9.6	0.9	0.8	7.9	1.1
Latvia	1.9	0.3	1.1	0.2	2.7	1.8	3.2	3.9	0.9	0.5	0.2	0.3	1.8	2.0	0.7	0.0	6.8	2.5	0.3	0.5	4.7	1.3
Lithuania	2.4	0.5	1.8	0.3	4.4	2.8	5.3	4.6	1.4	0.9	0.3	0.6	2.5	2.5	1.1	0.1	11.0	2.6	0.5	0.5	5.8	2.1
Norway	1.0	0.5	1.8	0.6	2.1	1.1	9.2	8.3	2.2	1.1	0.3	0.6	4.3	4.7	0.3	0.1	12.5	11.3	2.2	1.6	6.3	0.9
Sweden	2.3	1.1	3.8	1.2	3.4	2.2	16.4	14.3	5.2	2.7	1.9	3.1	10.4	10.1	0.5	0.1	18.4	20.1	3.5	2.1	15.1	2.2
United Kingdom	23.1	10.6	58.1	27.1	28.7	16.1	111.9	97.7	40.4	27.9	3.9	7.2	50.2	50.2	7.2	1.8	199.2	177.7	16.7	10.9	118.5	10.3
Southern Europe	**61.7**	**22.4**	**45.5**	**11.0**	**136.3**	**88.3**	**309.9**	**229.8**	**148.0**	**72.0**	**30.4**	**35.0**	**139.9**	**135.0**	**39.9**	**4.5**	**639.3**	**227.0**	**30.6**	**21.4**	**280.6**	**35.1**
Albania	0.6	0.3	0.4	0.1	3.6	1.4	1.1	0.8	2.6	1.7	0.1	0.3	1.6	0.6	0.8	0.1	8.6	1.6	0.1	0.1	2.5	0.5
Bosnia Herzegovina	1.2	0.3	0.9	0.2	3.6	2.2	6.3	4.5	2.8	2.5	0.7	1.0	2.6	2.4	1.4	0.2	17.3	4.4	0.5	0.4	5.7	1.4
Croatia	2.7	0.6	1.3	0.3	4.4	3.2	12.9	9.0	3.6	1.8	1.0	1.3	3.6	4.0	1.7	0.1	21.0	7.8	1.3	0.9	11.1	1.8
Cyprus	0.1	0.1	0.2	0.1	0.6	0.5	1.5	0.9	0.6	0.4	0.1	0.2	0.9	0.5	0.1	0.0	4.1	0.8	0.2	0.1	1.8	0.2
Greece	2.9	1.3	2.0	0.6	8.5	5.7	19.9	14.4	9.8	4.9	1.8	1.7	10.7	9.6	3.3	0.3	66.9	16.6	2.1	1.4	22.1	2.7
Italy	21.5	9.9	14.0	4.9	56.5	38.1	114.9	96.8	71.3	34.1	15.4	18.5	62.0	64.6	11.9	1.9	240.3	104.8	14.5	8.7	125.0	9.9
FYR Macedonia	0.4	0.1	0.3	0.1	2.1	1.0	2.5	2.2	1.2	0.7	0.1	0.3	1.5	1.0	0.9	0.1	7.6	1.9	0.5	0.3	3.2	0.6
Malta	0.1	0.0	0.2	0.0	0.3	0.2	0.7	0.5	0.2	0.1	0.0	0.0	0.5	0.4	0.1	0.0	1.5	0.4	0.1	0.1	0.6	0.1
Montenegro	0.1	0.0	0.1	0.0	0.3	0.2	0.6	0.5	0.3	0.2	0.0	0.0	0.4	0.3	0.4	0.1	2.7	0.8	0.0	0.1	1.3	0.2
Portugal	6.7	1.3	5.4	0.6	13.8	8.9	25.0	17.6	9.8	3.9	1.5	1.6	8.8	7.2	3.2	0.2	36.5	10.2	1.9	1.7	17.5	3.4
Serbia	5.2	1.3	2.7	0.7	6.5	3.6	19.7	12.7	5.2	3.8	1.7	2.2	7.9	6.8	3.8	0.5	48.2	19.9	2.5	1.6	21.5	5.5
Slovenia	1.4	0.2	0.9	0.1	1.9	1.2	4.2	3.2	1.8	0.9	0.6	0.6	2.2	1.9	0.5	0.1	8.4	4.4	0.7	0.6	4.0	0.7
Spain	18.9	6.9	17.0	3.3	34.1	22.0	100.4	66.5	38.7	17.0	7.4	7.4	37.1	35.7	11.8	1.0	175.6	53.4	6.4	5.3	64.2	8.3
Western Europe	**101.7**	**34.0**	**111.8**	**32.5**	**114.2**	**70.0**	**333.2**	**279.8**	**159.0**	**67.4**	**30.0**	**37.2**	**207.8**	**199.9**	**29.6**	**5.0**	**740.0**	**402.3**	**47.5**	**33.0**	**416.3**	**42.5**
Austria	5.1	1.5	3.1	0.9	4.5	3.6	13.2	9.6	7.0	2.5	1.4	1.8	9.3	9.3	1.4	0.2	26.5	17.4	2.2	1.4	17.2	1.6
Belgium	5.7	2.0	6.8	2.3	5.0	2.9	16.7	15.6	6.3	3.7	0.7	1.1	9.4	10.1	1.5	0.4	46.8	23.6	2.2	2.4	24.6	2.4
France	33.8	9.9	32.8	9.3	35.1	18.1	108.2	91.4	73.8	26.9	5.3	6.9	68.9	64.0	9.4	1.3	261.6	113.0	13.2	9.3	133.5	14.7

Germany	49.1		16.6		49.3	13.5	56.9	37.9	149.3	124.0	59.4	27.1	19.3	22.7	97.4	94.0	14.2	2.4	321.7	183.9	21.8	14.6	193.8	20.1
Luxembourg	0.1		0.0		0.2	0.0	0.2	0.2	0.7	0.6	0.4	0.2	0.0	0.0	0.4	0.4	0.1	0.0	1.5	0.8	0.1	0.1	1.0	0.1
Netherlands	4.5		2.5		15.3	5.2	8.3	5.1	34.4	30.0	6.5	4.0	2.4	3.3	15.3	14.6	1.8	0.5	61.0	49.1	5.3	4.0	33.0	2.5
Switzerland	3.3		1.5		4.3	1.3	4.1	2.3	10.5	8.6	5.7	3.1	0.9	1.3	7.0	7.3	1.3	0.2	20.7	14.3	2.6	1.3	13.0	1.0

Country/region	Corpus	Ovary	Prostate	Testis	Kidney		Bladder		Brain, cns		Thyroid		Hodgkin		NHL		Multiple myeloma		Leukaemia		All sites	
	C54	C56	C61	C62	C64–65		C67		C70–72		C73		C81		C82–86,C96		C88 + C90		C91–95		C00–97/C44	
	F	F	M	M	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Europe	**296.4**	**445.8**	**1073.2**	**16.5**	**350.9**	**196.2**	**493.1**	**156.6**	**291.5**	**238.8**	**27.8**	**42.0**	**24.2**	**18.9**	**263.0**	**217.9**	**161.1**	**147.5**	**340.3**	**274.4**	**10,779.9**	**8517.2**
EU-28	**187.7**	**315.0**	**815.4**	**10.4**	**250.3**	**140.9**	**397.6**	**131.7**	**217.1**	**167.4**	**21.3**	**28.0**	**15.6**	**11.7**	**218.5**	**176.1**	**136.7**	**118.8**	**268.8**	**207.5**	**7942.5**	**6198.3**
Central and Eastern Europe	**137.9**	**181.2**	**336.8**	**8.7**	**133.2**	**75.8**	**143.7**	**40.6**	**98.5**	**93.5**	**8.3**	**17.4**	**10.1**	**8.4**	**61.5**	**60.0**	**33.8**	**38.5**	**98.5**	**89.3**	**3817.3**	**3107.6**
Belarus	4.0	4.4	9.5	0.4	7.3	3.5	2.4	0.6	2.4	2.7	0.2	0.9	0.4	0.3	2.1	1.9	0.8	1.3	2.7	2.9	108.9	82.0
Bulgaria	3.3	4.7	11.2	0.4	2.9	1.0	5.3	1.9	3.8	3.2	0.2	0.3	0.3	0.2	2.0	1.6	0.6	0.6	2.9	1.9	111.2	78.8
Czech Republic	4.2	8.3	15.2	0.3	7.6	4.4	6.3	2.7	3.7	2.8	0.3	0.5	0.4	0.3	3.1	2.6	1.9	2.1	5.2	4.0	147.7	120.5
Hungary	4.1	7.8	12.3	0.4	4.6	3.7	6.5	3.0	3.5	3.4	0.3	0.7	0.2	0.2	3.0	2.9	1.4	1.4	4.4	4.3	174.9	153.3
Moldova	1.1	1.7	3.6	0.1	1.2	0.6	1.4	0.4	1.6	1.2	0.1	0.2	0.2	0.1	0.8	0.7	0.3	0.3	1.1	0.9	49.5	35.2
Poland	20.1	32.0	57.6	1.6	19.6	11.4	34.5	10.0	19.1	14.7	1.3	2.4	1.0	0.9	11.0	10.7	8.1	7.5	17.6	13.3	607.7	490.8
Romania	5.1	10.9	24.8	0.5	5.8	3.3	12.4	3.5	8.3	7.3	0.6	1.0	0.5	0.4	3.7	3.4	2.4	2.0	7.3	5.6	296.7	207.4
Russian Federation	68.4	80.9	143.2	3.3	62.0	36.2	50.3	13.0	42.3	44.2	4.0	8.7	5.0	4.5	25.3	24.1	13.4	17.6	42.4	40.7	1690.6	1439.4
Slovakia	2.7	3.8	9.7	0.2	3.2	2.1	3.9	1.1	2.1	2.1	0.1	0.3	0.3	0.1	3.0	3.9	1.2	1.5	2.4	2.5	87.0	68.0
Ukraine	24.9	26.8	49.7	1.4	19.1	9.4	20.7	4.5	11.8	11.8	1.0	2.5	1.9	1.4	7.7	8.3	3.8	4.2	12.6	13.2	543.3	432.2
Northern Europe	**38.8**	**66.1**	**210.9**	**1.2**	**45.7**	**27.0**	**61.9**	**27.4**	**40.9**	**29.8**	**2.8**	**4.8**	**3.1**	**2.3**	**45.6**	**37.4**	**28.9**	**24.4**	**47.4**	**34.1**	**1453.9**	**1268.1**
Denmark	2.0	3.8	13.5	0.1	2.6	1.3	3.8	1.8	2.8	2.2	0.1	0.3	0.2	0.1	2.1	1.5	1.8	1.2	3.2	2.4	90.6	79.9
Estonia	0.6	1.2	3.1	0.0	0.9	0.7	0.7	0.3	0.5	0.5	0.0	0.1	0.0	0.0	0.5	0.6	0.2	0.4	0.6	0.8	20.8	18.1
Finland	2.3	3.3	9.1	0.1	2.6	1.6	1.9	0.7	2.0	1.5	0.3	0.3	0.2	0.1	3.1	2.5	1.4	1.4	2.0	1.8	68.2	58.8
Iceland	0.1	0.1	0.6	0.0	0.2	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.1	3.5	3.1
Ireland	1.6	3.0	5.8	0.1	1.6	0.9	1.8	1.2	1.8	1.2	0.1	0.2	0.1	0.1	1.6	1.4	1.2	0.9	1.9	1.0	49.4	46.0
Latvia	1.6	2.0	4.3	0.0	1.4	1.0	2.0	0.6	0.7	0.7	0.1	0.2	0.1	0.0	0.6	0.7	0.3	0.4	0.9	1.1	32.0	28.3
Lithuania	1.6	2.8	5.5	0.1	2.2	1.3	1.7	0.6	1.3	1.3	0.1	0.2	0.1	0.0	0.9	0.9	0.5	0.6	1.4	1.3	47.8	37.6
Norway	1.7	3.0	11.6	0.1	1.9	1.0	2.6	0.8	2.3	1.3	0.1	0.3	0.1	0.1	1.9	1.6	1.5	1.6	2.1	1.5	63.8	53.6
Sweden	3.2	5.3	25.2	0.1	3.7	2.6	5.1	2.2	2.9	1.8	0.3	0.4	0.2	0.1	4.0	3.3	2.9	2.6	4.5	4.0	125.4	112.5
United Kingdom	24.0	41.5	131.4	0.7	28.7	16.5	41.9	19.1	26.4	19.0	1.6	2.7	2.1	1.6	30.6	24.9	18.8	15.2	30.6	20.1	948.5	826.8
Southern Europe	**54.6**	**78.7**	**205.2**	**2.8**	**64.2**	**32.4**	**136.9**	**37.2**	**69.8**	**56.3**	**5.0**	**7.7**	**6.0**	**5.0**	**60.6**	**49.2**	**41.5**	**36.7**	**82.8**	**62.9**	**2449.4**	**1743.3**
Albania	0.4	0.4	3.0	0.1	0.9	0.2	2.6	0.7	1.6	1.0	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.8	0.6	30.8	15.8
Bosnia Herzegovina	1.0	1.9	4.7	0.1	1.3	0.6	1.9	0.7	2.0	1.8	0.1	0.2	0.1	0.1	0.6	0.5	0.3	0.3	1.1	0.9	53.0	36.5
Croatia	2.2	3.2	8.6	0.1	2.8	1.4	3.9	1.7	2.3	2.1	0.1	0.3	0.1	0.1	1.9	1.7	1.1	1.0	2.4	1.9	81.1	61.9
Cyprus	0.4	0.7	1.9	0.0	0.3	0.1	0.8	0.2	0.4	0.3	0.0	0.0	0.0	0.0	0.5	0.4	0.3	0.2	0.8	0.6	14.6	9.1
Greece	3.9	5.9	18.5	0.2	5.3	2.3	13.2	2.2	6.8	5.7	0.3	0.6	1.2	0.9	2.6	1.9	2.5	2.5	7.9	5.6	203.6	127.6
Italy	20.9	32.6	70.9	0.9	25.2	14.3	50.8	14.6	25.5	20.7	2.0	3.0	2.4	2.2	28.7	22.3	20.0	17.1	35.9	28.6	978.1	767.9
FYR Macedonia	0.8	0.7	2.7	0.1	0.3	0.1	1.0	0.3	1.5	0.8	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.6	0.4	25.1	15.7
Malta	0.2	0.3	0.4	0.0	0.2	0.1	0.3	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.2	0.1	5.5	3.9
Montenegro	0.1	0.2	0.8	0.0	0.1	0.1	0.2	0.1	0.3	0.2	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	7.5	5.3
Portugal	3.2	4.1	18.8	0.2	3.0	2.0	8.2	2.9	6.0	4.4	0.4	0.5	0.3	0.2	5.6	4.3	3.4	3.7	5.7	3.9	174.8	112.5
Serbia	3.7	6.0	12.7	0.4	3.4	1.9	7.0	2.1	4.6	3.7	0.3	0.5	0.5	0.4	2.3	2.1	1.5	1.2	4.0	2.7	152.3	114.4
Slovenia	1.1	1.4	4.2	0.1	1.3	0.6	1.3	0.6	0.9	0.8	0.1	0.1	0.1	0.1	1.3	1.7	0.6	0.6	1.3	0.7	36.0	27.7
Spain	16.6	21.2	57.9	0.5	20.0	8.6	45.8	11.0	17.6	14.5	1.6	2.1	1.1	0.9	16.5	13.9	11.3	9.9	22.0	16.9	685.1	443.9
Western Europe	**65.1**	**119.7**	**320.1**	**3.8**	**107.8**	**61.0**	**150.6**	**51.4**	**82.3**	**59.2**	**11.9**	**12.2**	**5.0**	**3.1**	**95.3**	**71.4**	**56.9**	**47.9**	**111.7**	**88.1**	**3059.2**	**2398.3**
Austria	2.4	5.2	12.6	0.2	3.7	2.5	5.8	2.0	3.3	2.6	0.4	0.4	0.2	0.1	3.9	3.0	2.3	2.1	4.2	3.7	118.7	99.3

(*continued on next page*)

Table 8 (*continued*)

Country/region	Corpus	Ovary	Prostate	Testis	Kidney		Bladder		Brain, cns		Thyroid		Hodgkin		NHL		Multiple myeloma		Leukaemia		All sites	
	C54	C56	C61	C62	C64–65		C67		C70–72		C73		C81		C82–86,C96		C88 + C90		C91–95		C00–97/C44	
	F	F	M	M	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Belgium	3.8	6.0	15.3	0.1	4.5	3.0	8.4	2.9	5.0	3.0	0.5	0.7	0.3	0.1	5.2	3.6	3.1	2.6	5.8	5.2	162.6	132.3
France	26.9	39.3	90.0	1.4	34.2	18.8	56.0	15.9	26.6	19.4	2.1	2.8	1.9	0.8	32.6	24.0	18.1	15.9	40.2	31.9	1050.0	763.4
Germany	24.3	54.0	158.4	1.8	53.8	30.7	64.0	24.7	37.9	27.7	7.6	6.6	2.0	1.5	42.8	32.5	25.2	21.0	48.8	38.1	1364.6	1099.6
Luxembourg	0.1	0.3	0.6	0.0	0.1	0.1	0.3	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.3	0.2	6.1	5.1
Netherlands	5.2	10.6	28.5	0.2	8.6	4.6	11.1	4.0	5.7	4.0	0.7	1.2	0.4	0.4	7.4	5.9	5.8	4.3	8.7	6.1	254.2	217.5
Switzerland	2.3	4.3	14.7	0.1	2.8	1.4	4.9	1.7	3.7	2.3	0.5	0.5	0.2	0.1	3.2	2.3	2.2	1.9	3.7	2.9	102.0	80.5

(Fig. 7). Geographical patterns of mortality are quite similar to those of incidence for both sexes (Table 8) because of the relatively poor prognosis of the disease after diagnosis. Lung cancer is the leading cause of cancer death amongst men in all countries except Sweden, and women die from lung cancer more commonly than from breast cancer in a growing number of countries. As a consequence, lung cancer is now the leading cause of death from cancer in women in the EU-28 (Table 4).

4. Discussion

We estimated 3.91 million new cases (excluding non-melanoma skin cancers) and 1.93 million deaths from cancer in Europe in 2018. In combination, cancers of the female breast, colorectal, prostate and lung represent almost half of the overall burden of cancer in Europe. The same diseases are also major causes of cancer death in Europe in 2018, with pancreatic cancer ranking 4th ahead of prostate cancer. This timely comparative analysis of the cancer burden in Europe also reveals the extent to which there remains considerable variability in the incidence and mortality rates at the national level. The differences reflect the underlying prevalence of key risk factors for specific cancers between countries and regions, disparities in the effective delivery of national cancer control plans, and levels of incidental diagnosis of cancers as a result of screening examinations (breast, cervical and colorectal cancer) or changing diagnostic practice (prostate and thyroid cancers) [22,23]. Strategies to reduce the extent of the disease burden on the continent evidently need to be tailored to reflect the cancer profiles in a given country.

Since it takes several years for a registry to collect process and report sufficiently reliable and complete cancer data for a given year, short-term predictions represent a rapid means to provide up-to-date figures to inform cancer control. The methodology used in this is consistent with previous studies estimating cancer incidence and mortality in Europe [7–9]. Short-term prediction methods have been used to prepare estimates for 2018 from the most recently available data—specifically, national mortality rates for the years 2001–2016 and national incidence rates for 2003–2016, depending on the availability of such data in a given country. Although predictions are based on trends in historical data which may or may not continue into the long-term future, they are likely to be reasonably accurate in the short term or when the disease rates exhibit rather stable trends [21].

Cancer mortality data are susceptible to a lower accuracy (validity) than cancer registry statistics, mainly resulting from difficulties in ascertaining and certifying the cause of death. This may have led to an underestimate of the true mortality of cancer at specific sites (and

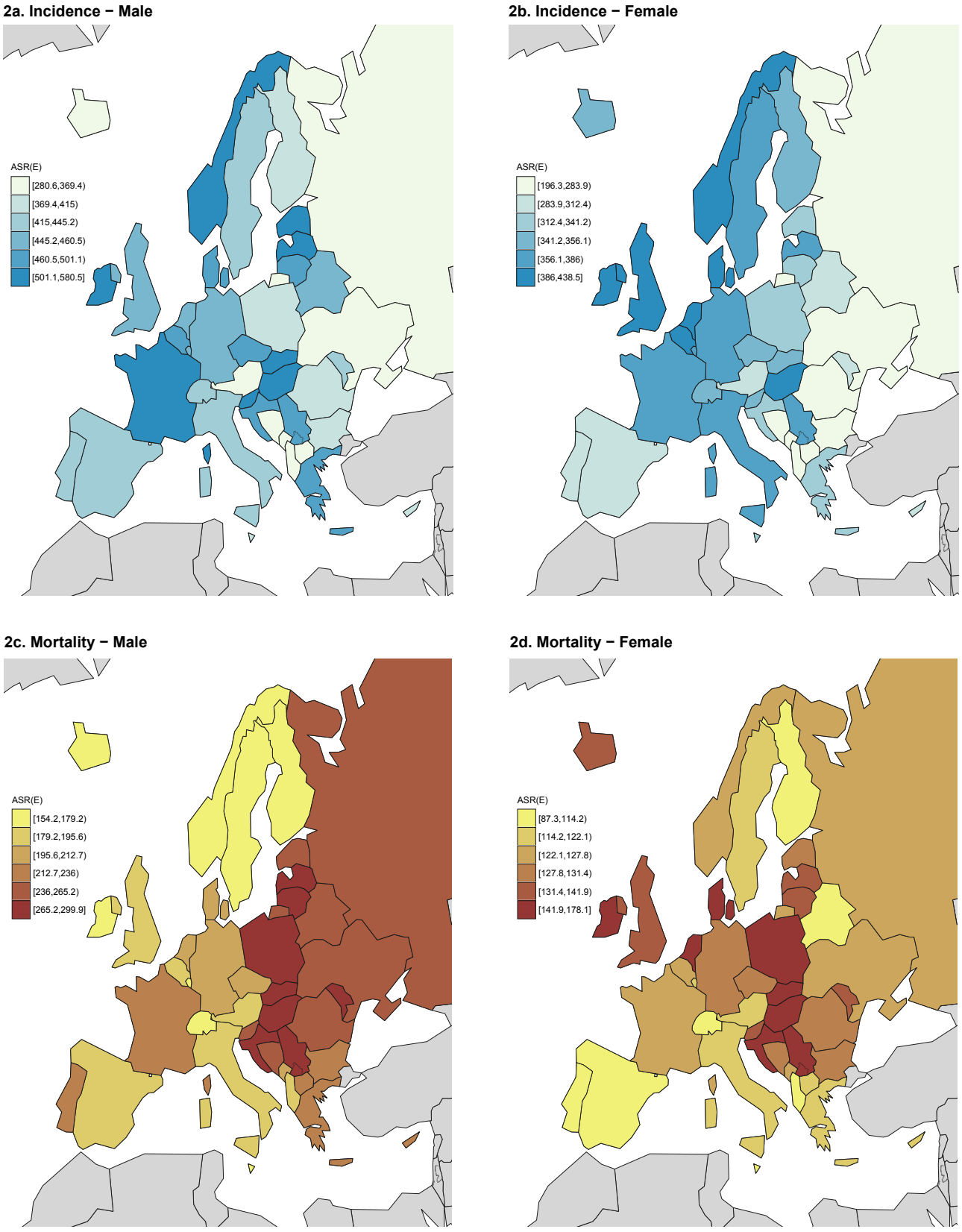

Fig. 2. Age-standardised rates for all cancers excluding non-melanoma skin cancers in Europe 2018.

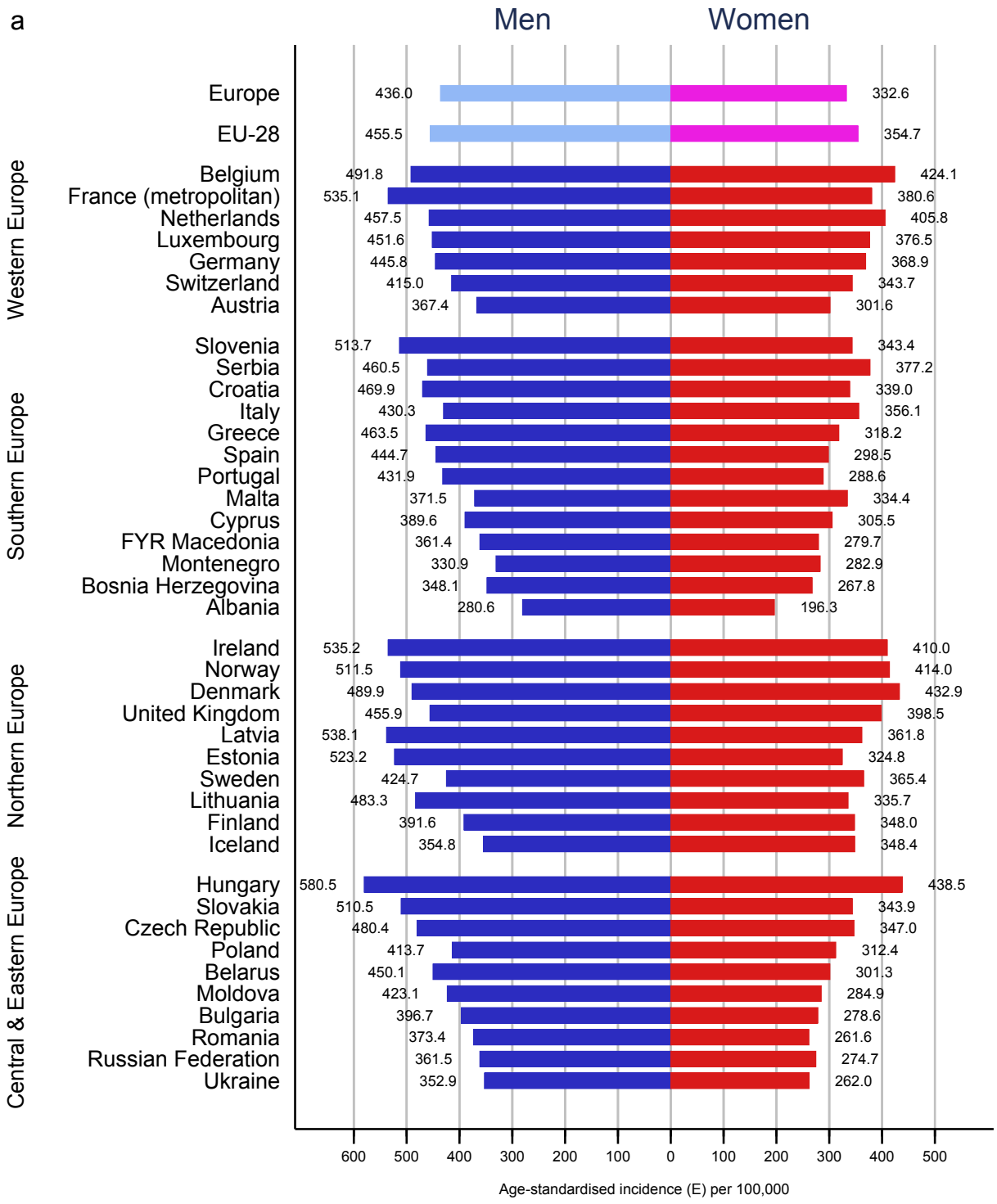

Fig. 3. (a) Age-standardised incidence rates by sex, area and country in Europe 2018: all cancers excluding non-melanoma skin cancers. (b) Age-standardised mortality rates by sex, area and country in Europe 2018: all cancers excluding non-melanoma skin cancers.

possibly incidence, where national mortality statistics were applied to I_R/M_R ratios outside the country of estimation, as in method 2B). We implemented for the first time the redistribution of ill-defined causes of deaths and of ill-defined cancers (other than the *usual* category 'uterus unspecified') across specific cancer sites. This may have led to an overestimate of the mortality, making direct comparison with previous estimates almost impossible. Another attempt to estimate the cancer mortality in the EU-28 for 2018 was published recently [24]. The slightly higher numbers of cancer deaths estimated in the present study (1.41 million compared to 1.38 million cancer deaths) can be explained by the differences in the population estimates

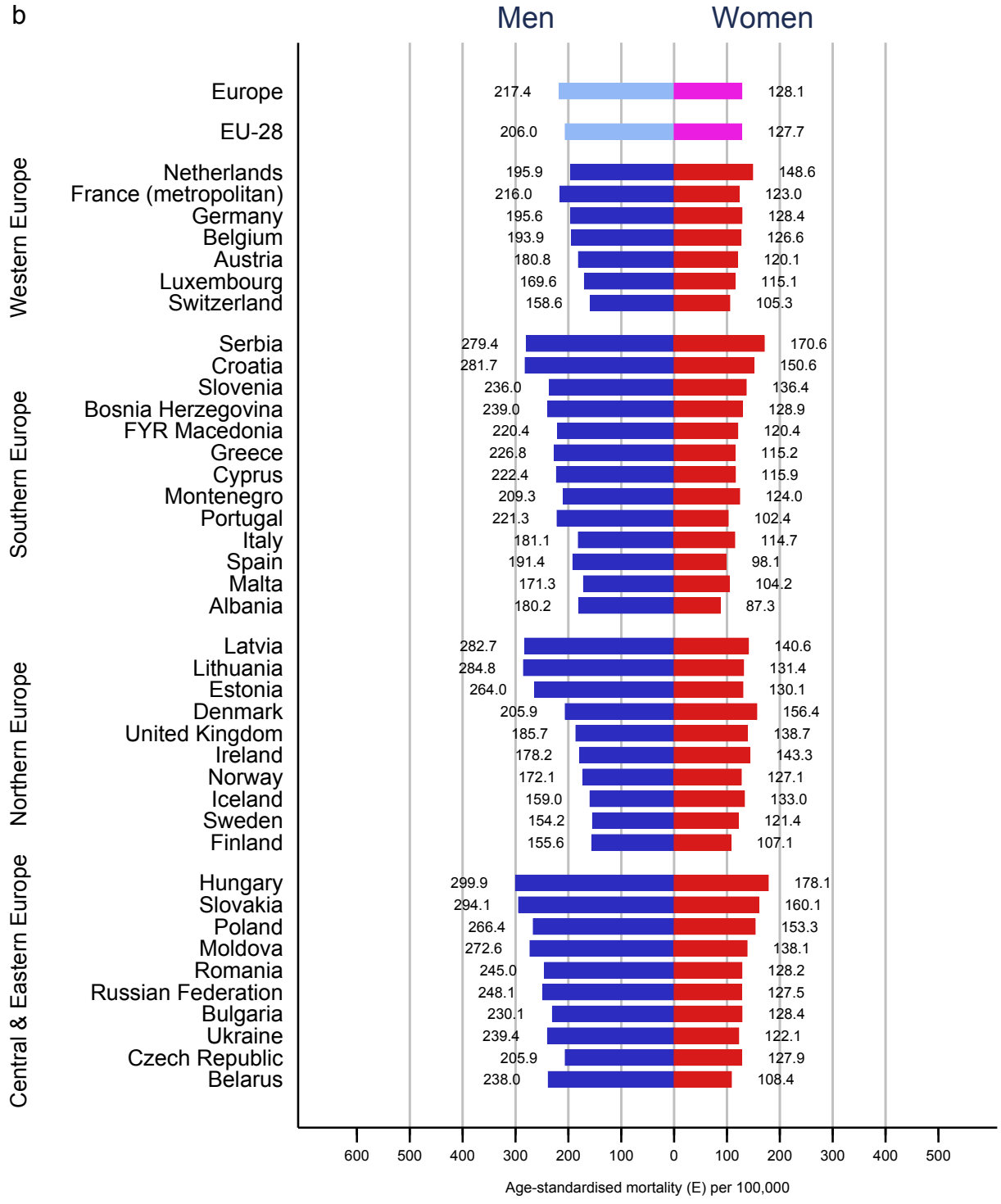

Fig. 3. (*continued*).

and by the redistribution of the ill-defined causes of death and of ill-defined cancers across specific categories performed in this analysis. Finally, we note that the inclusion of metastatic cancers along with primary neoplasms may have inflated mortality rates for some sites, including liver, lung and brain.

With respect to incidence, particular caution must be employed in interpretation of the estimated rates of female breast, prostate and thyroid cancers that are part-dependant on the screening and diagnostic tests in place in different European countries, and of bladder cancer, the magnitude of which partially reflects registry practice as to whether non-malignant tumours are reported along with primary neoplasms [10]. In addition, several sources of data have been used in generating the incidence statistics. National incidence rates were

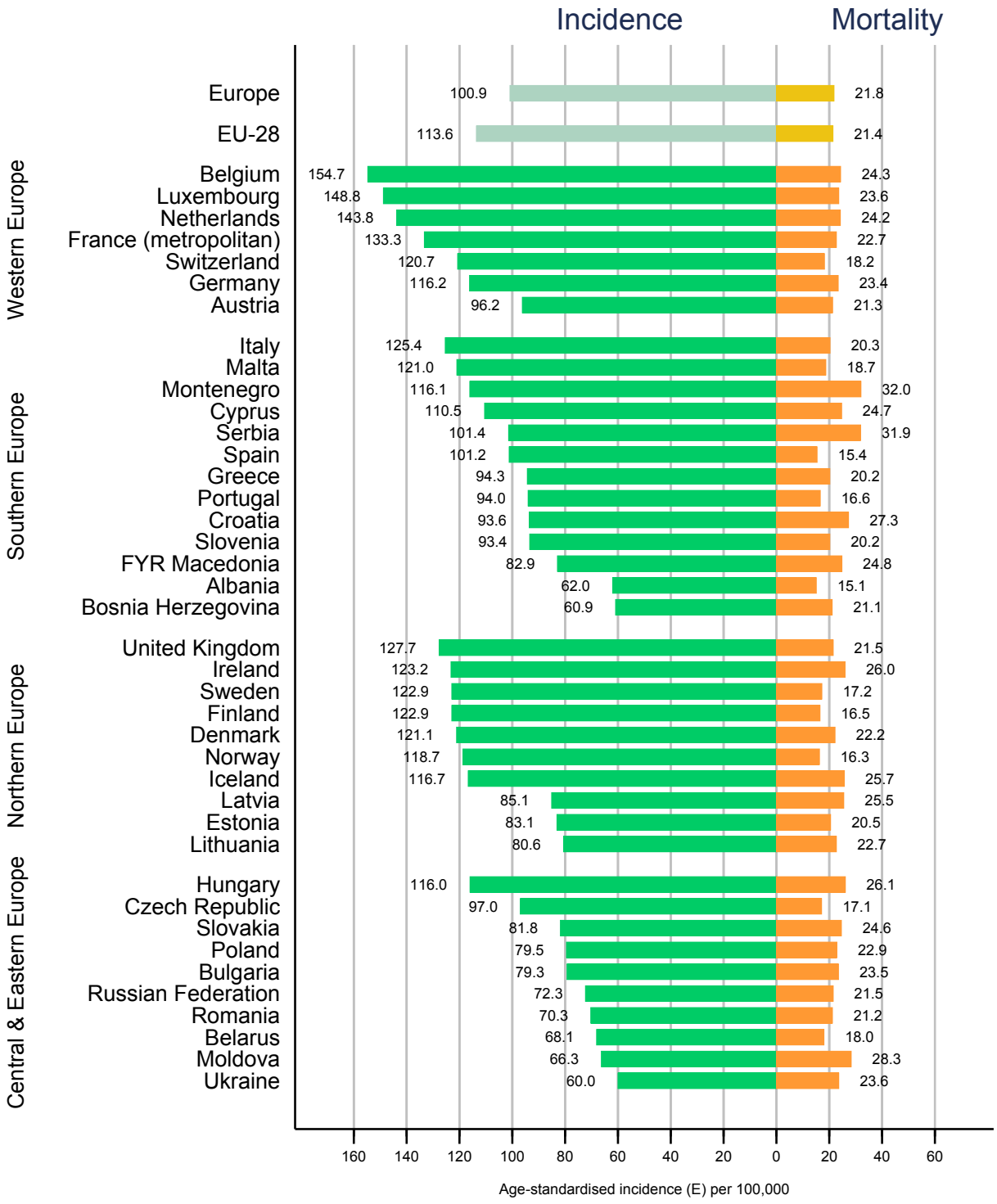

Fig. 4. Age-standardised incidence and mortality rates by area and country in Europe 2018: breast cancer.

provided by 23 European countries (Table 1) representing 50% of the total European population. For Germany, the projection of incidence rates from the aggregated subnational registries was preferred to the standard M:I ratio method given data covered a substantial part of the population (60%). For the remaining 16 countries, it was necessary to estimate incidence using the predicted national mortality in 2018 and mortality to incidence ratios of aggregated data from either local cancer registries or neighbouring countries around 2010 (methods 2A and 2B). Where it was considered likely that the M:I ratios were changing rapidly (cancers of the female breast, prostate and thyroid), national incidence rates were estimated using the recent incidence rates from local cancer registries (method 2A). In the absence of local cancer registry data, M:I ratios from cancer

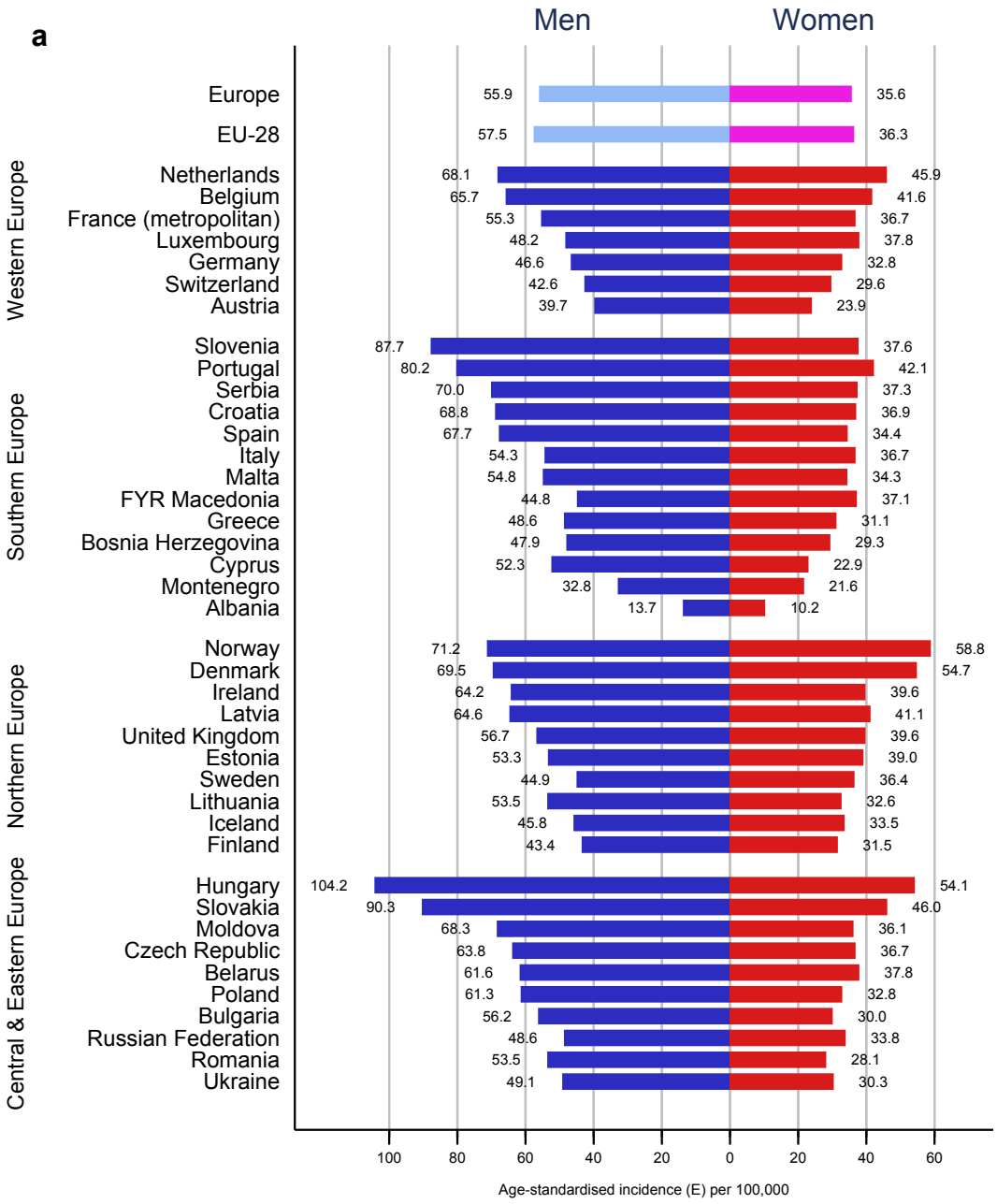

Fig. 5. (a) Age-standardised incidence rates by sex, area and country in Europe 2018: colorectal cancer. (b) Age-standardised mortality rates by sex, area and country in Europe 2018: colorectal cancer.

registries in neighbouring countries were used (method 2B). Evidently, national estimates of incidence (I_N) are likely to be less robust given the national (M_N) and regional mortality (M_R) in Eq. (1) are not from the same vital statistics systems, and the result could be distorted. Finally, the estimates for certain sites are less accurate when one considers the mortality to incidence ratios (M:I) with values greater than 1. This suggests under-reporting of cancer cases by the registry (e.g. pancreatic cancer in elderly patients), and thus a possible under-estimate of the disease burden. Alternatively, M:I greater than 1 implies that the mortality data are suspected if more deaths are attributed to a cancer site because of limited information available at the time of death certification.

Despite the above stipulations about data quality, we believe these estimates provide a reasonable description of the scale and profile of cancer in Europe, and thus a means to identify priorities for cancer control action in Europe. None can be greater than tobacco control, given lung cancer is the leading cause of cancer death in Europe in 2018 (Table 2), and geographic variations in rates are largely determined by past exposure to tobacco smoking and the relative maturity of the tobacco epidemic in a given country. While incidence and mortality rates in men are decreasing in many European

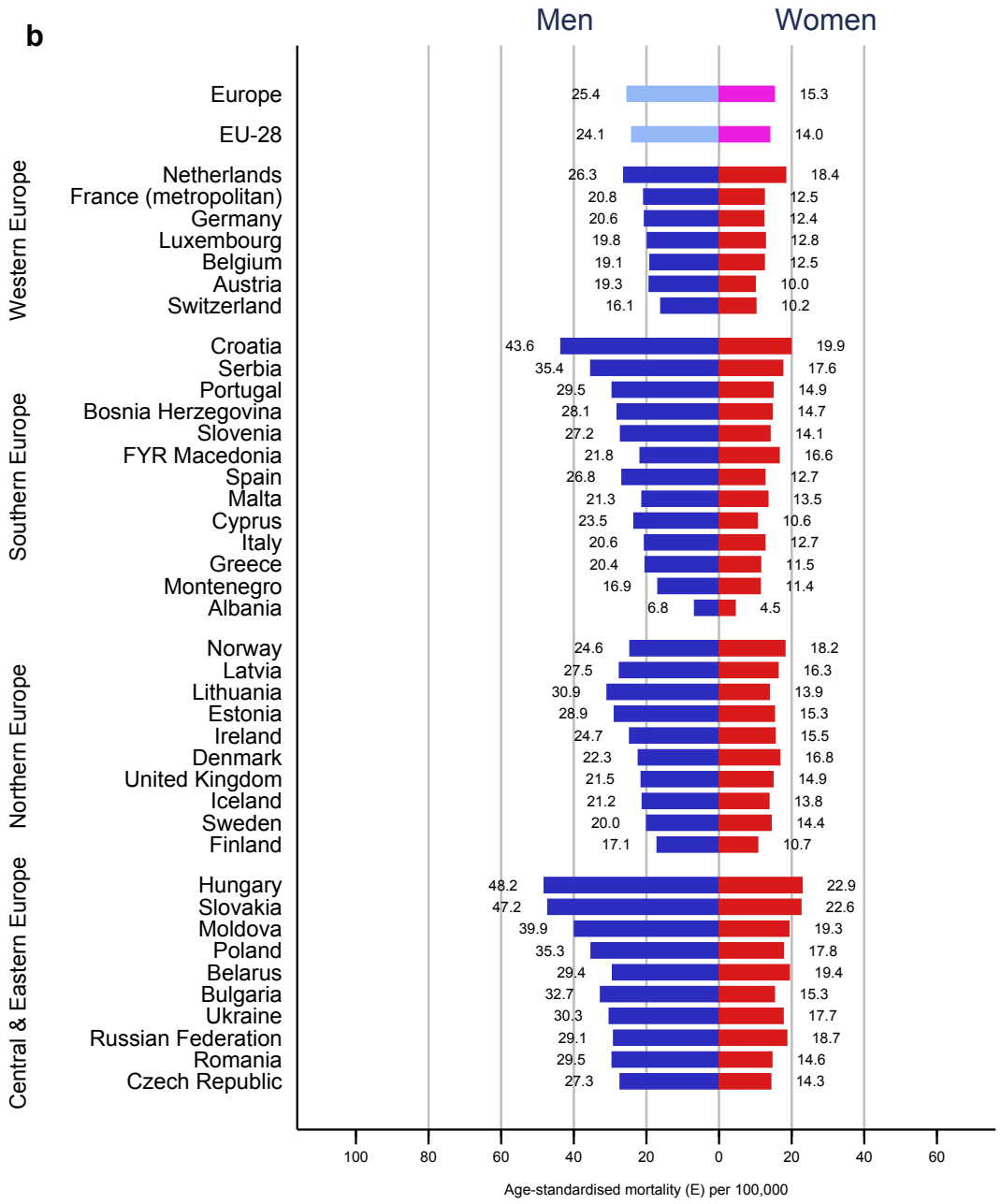

Fig. 5. (*continued*).

countries, particularly in Northern and Western Europe, rates in Central and Eastern Europe remain high but are showing signs of stabilisation or decline [25]. Rates in women however, who acquired the smoking habit later than men, are still rising in Europe (e.g. France, Spain), although rates are beginning to stabilise, notably in the high-risk countries of Northern Europe [25]. Primary prevention, through efforts to deter the initiation of smoking and raise cessation rates through higher taxes, regulations on smoking and information to the public should have a major impact on incidence and mortality from lung and other tobacco-related cancers, including oral cavity and pharynx, oesophagus, pancreas, larynx and urinary tract [26,27]. Yet of the 50 countries that have ratified the WHO Framework Convention on Tobacco Control in the WHO European Region, 25 have raised excise taxes on tobacco products, while few countries have fully implemented other effective measures of tobacco control on the continent [28].

Colorectal cancer is the second leading cause of cancer death in men and the third in women (Table 3). Diets high in red meat and smoked and cured meats have been shown to confer an increased risk of colorectal cancer, while a diet that includes high consumption of cereals (grains), vegetables and maintenance of a healthy bodyweight and regular physical activity may be protective [29]. Organised colorectal screening programmes have been implemented in certain

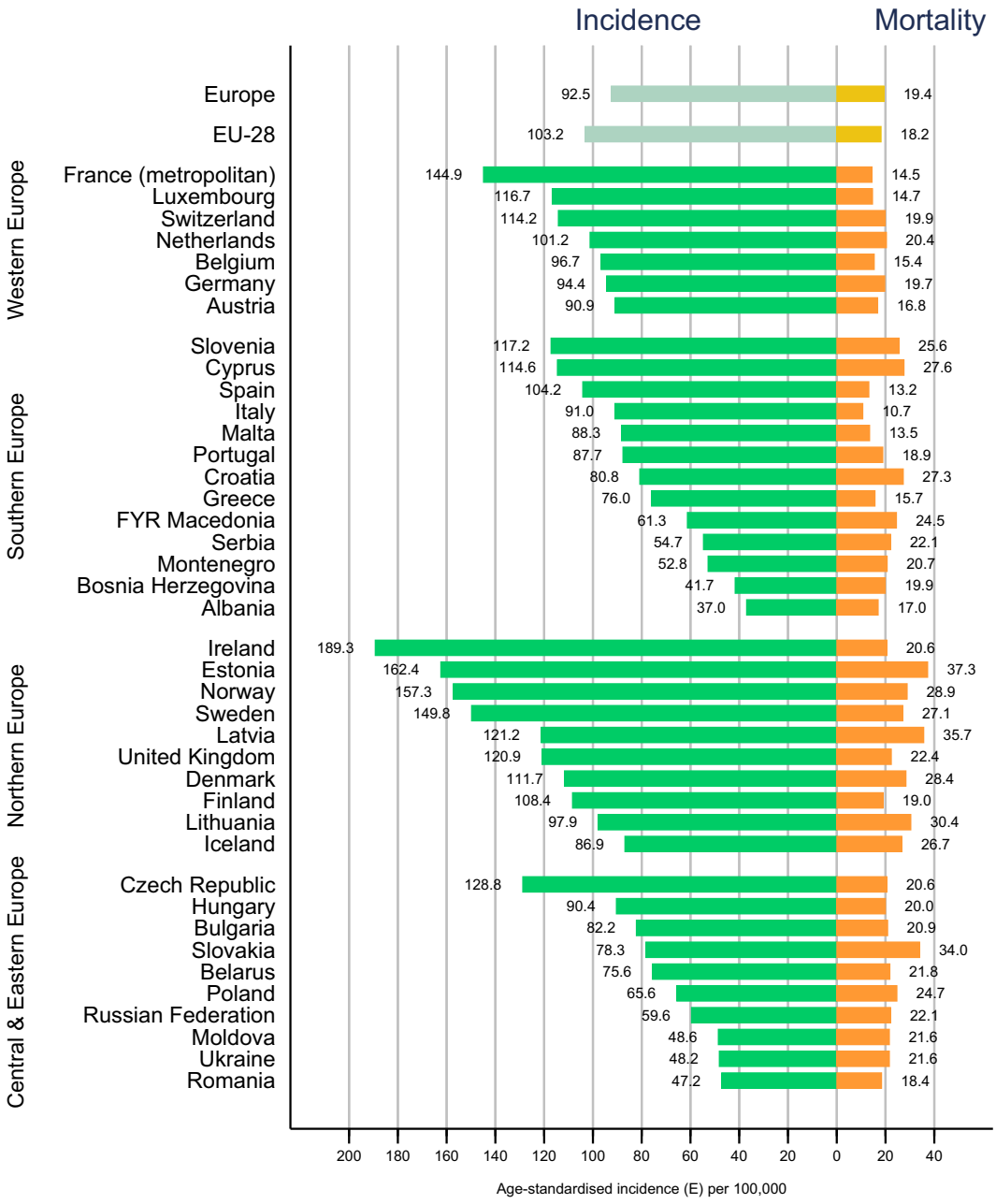

Fig. 6. Age-standardised incidence and mortality rates by area and country in Europe 2018: prostate cancer.

high-resource countries in Europe. An IARC Handbook Working Group recently reported there was sufficient evidence that screening for colorectal cancer with currently established stool-based tests (guaiac testing and FIT) and lower endoscopy (sigmoidoscopy and colonoscopy) reduces the risk of death from colorectal cancer and that the benefits outweigh the harms associated with each type of screening [30].

Breast cancer is the leading cancer among women in every European country and is the leading overall cause of death from cancer in women in Europe (Table 3). It is likely that the variations observed in breast cancer incidence across European countries can at least in part be attributable to the degree of organised and opportunistic screening activities in operation, differences in the prevalence and distribution of the major risk factors (e.g. parity, age at first birth [31], as well as possible artefacts in the methods of estimation). Declines in breast cancer mortality rates in most European countries have been report reported, with greater decreases in Northern and Western European countries relative to Central and Eastern Europe [32]. The favourable trends result from the combined effects of earlier detection (part due to screening, part due to increasing breast cancer awareness), and a range of improvements in treatment [33–36].

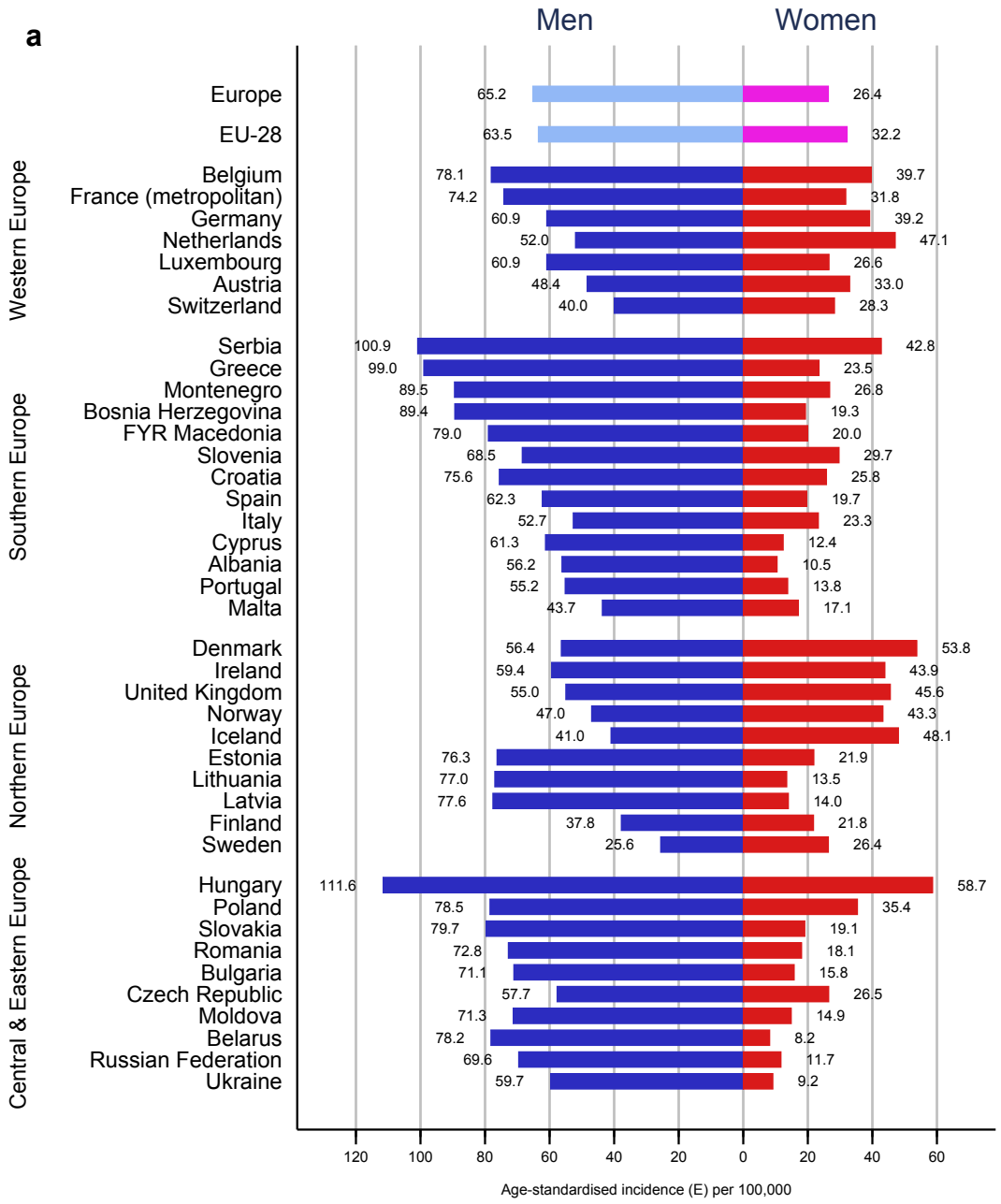

Fig. 7. (a) Age-standardised incidence rates by sex, area and country in Europe 2018: lung cancer. (b) Age-standardised mortality rates by sex, area and country in Europe 2018: lung cancer.

Prostate cancer is the third most common cancer diagnosed in Europe in 2018 (Table 2), and the disease has emerged as the most frequent cancer amongst men in Europe following rapid increases in the detection of a substantial number of early-stage prostate cancers during the early to mid-1990s across the higher income countries of Northern, Western and Southern Europe (Fig. 6). An East-West division can be seen in Europe that related to differences in diagnostic intensity with PSA testing. General increases in prostate cancer incidence have been reported [36,37] and are to a great extent dependent on GP and urologist practices with respect to PSA testing. Conversely, prostate cancer mortality rates appear to be markers of extended disease and case fatality rather than of early diagnosis of asymptomatic cancers. The moderate declines in mortality rates in certain European countries in the last quarter century have provided critical evidence of the favourable effect of increased curative treatment of early-stage prostate cancers.

Pancreatic cancer is the fourth cause of death from cancer in Europe and in the EU-28 (Tables 2 and 4). Pancreatic cancer survival is consistently low [16], with a median survival less than 18 months even in the highest

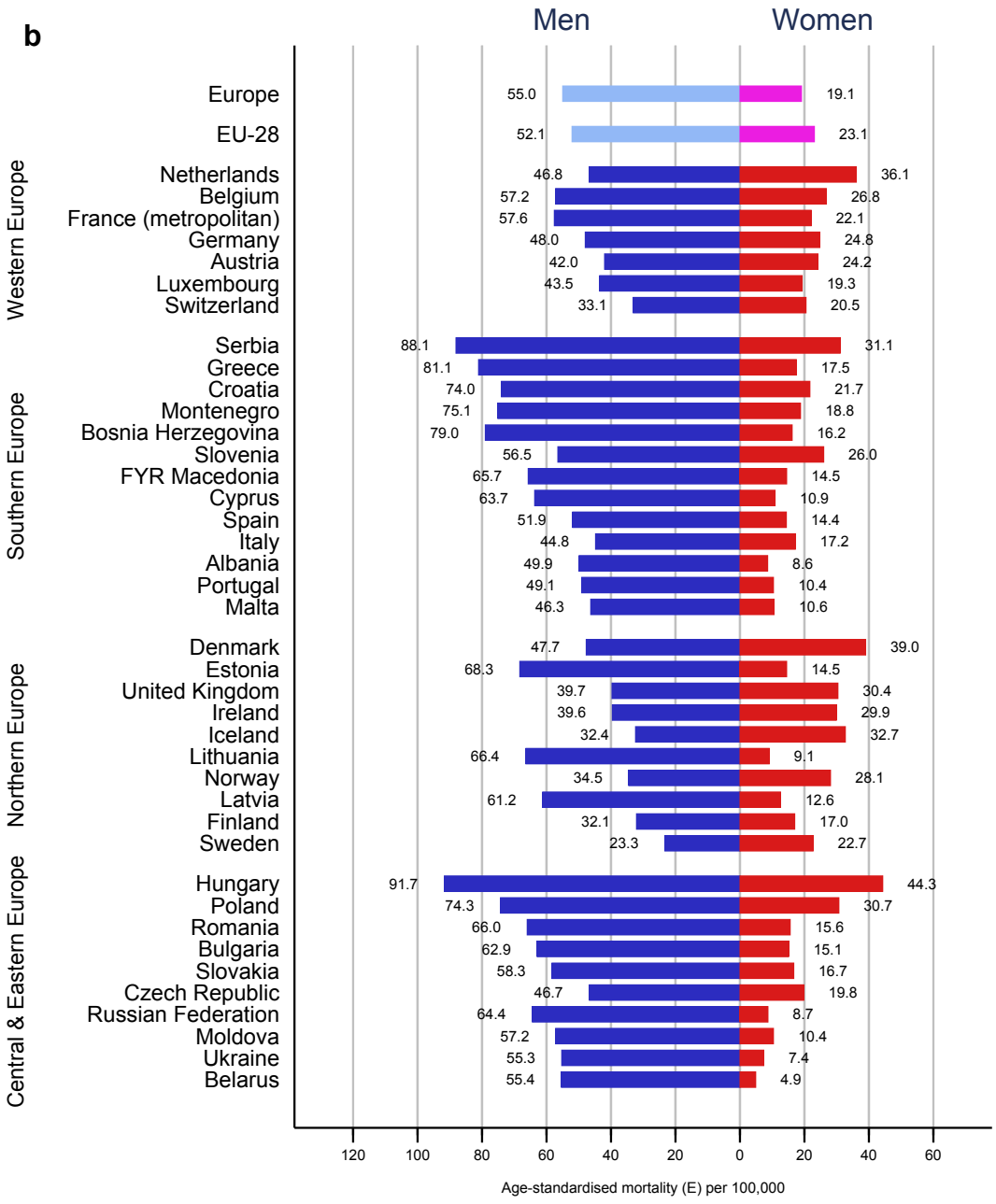

Fig. 7. (*continued*).

income countries in Europe [34]. Observed trends in pancreatic cancer mortality rates in the Europe are stable or slightly increasing [34]. Therefore, the number of deaths from pancreatic cancer is expected to grow with the continuous ageing of the European population. Better diagnosis and improved treatment is required, together with concerted efforts to better understand the aetiology of the disease.

This estimation of cancer incidence in Europe would not be possible without the longstanding existence of more than 150 regional and national population-based cancer registries in 30 European countries, with the role of the European Network of Cancer Registries (ENCR, http://www.encr.eu) essential in promoting collaboration between cancer registries, developing standards for data collection, providing training for cancer registry staff and dissemination of information on incidence and mortality from cancer in the European Union and Europe. The European Cancer Information System web application, housed and developed by JRC, provides recorded data and estimates of the cancer burden across Europe that enables the exploration of geographical patterns and temporal trends of incidence, mortality and survival data across Europe for the major cancer sites (https://ecis.jrc.ec.europa.eu).

Registries represent a critical evidence base for cancer control: identifying priority areas, evaluating whether specific targets are met, and understanding accomplishments

given resources expended [38]. A growing recognition and demand for up-to-date population-based cancer data across Europe is at odds with the fact that European registries increasingly encounter serious day-to-day operational challenges, including insufficient funding, a shortage of qualified staff, and most recently, a requirement to ensure compliance with the EU General Data Protection Regulation (GDPR). Policy-makers must be made aware that cancer registries are unique surveillance systems that inform cancer policy and need to be resourced accordingly.

Conflict of interest statement

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