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Cancer incidence and mortality patterns in Europe: Estimates for 40 countries in 2012

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Abstract Introduction: Cancer incidence and mortality estimates for 25 cancers are presented for the 40 countries in the four United Nations-defined areas of Europe and for the European Union (EU-27) for 2012.

Methods: We used statistical models to estimate national incidence and mortality rates in 2012 from recently-published data, predicting incidence and mortality rates for the year 2012 from recent trends, wherever possible. The estimated rates in 2012 were applied to the corresponding population estimates to obtain the estimated numbers of new cancer cases and deaths in Europe in 2012.

Results: There were an estimated 3.45 million new cases of cancer (excluding non-melanoma skin cancer) and 1.75 million deaths from cancer in Europe in 2012. The most common cancer sites were cancers of the female breast (464,000 cases), followed by colorectal (447,000), prostate (417,000) and lung (410,000). 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 (353,000 deaths), colorectal (215,000), breast (131,000) and stomach (107,000). In the European Union, the estimated numbers of new cases of cancer were approximately 1.4 million

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in males and 1.2 million in females, and around 707,000 men and 555,000 women died from cancer in the same year.

Conclusion: These up-to-date estimates of the cancer burden in Europe alongside the description of the varying distribution of common cancers at both the regional and country level provide a basis for establishing priorities to cancer control actions in Europe. The important role of cancer registries in disease surveillance and in planning and evaluating national cancer plans is becoming increasingly recognised, but needs to be further advocated. The estimates and software tools for further analysis (EUCAN 2012) are available online as part of the European Cancer Observatory (ECO) (<http://eco.iarc.fr>).

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1. Introduction

Up-to-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 global burden of cancer observed in Europe in 2008 despite a total population that comprises one-ninth of the world's population.^{1,2} The International Agency for Research on Cancer (IARC), through its programmes of collaboration with population-based cancer registries in Europe, members of the European Network of Cancer Registries (ENCR, <http://www.enrcr.com.fr/>) has provided estimates of cancer burden at the European and European Union (EU) member state level over the last 25 years.^{3–8}

In this paper, we provide estimates of the incidence of, and the mortality from cancer for 25 sites in 40 European countries in 2012, using the most recently available data. The reported estimates are based on the latest incidence data provided by the ENCR member registries, the World Health Organisation (WHO) mortality database⁹ and UN population estimates.² The results are also presented for four areas as defined by the UN (Eastern, Northern, Southern and Western Europe),² and the European Union 27 Member States (EU-27). The complete set of estimates is available through the European Cancer Observatory (ECO) website (<http://eco.iarc.fr>).¹⁰

2. Data sources and methods

Cancer incidence and mortality for 2012 by sex and 16 age groups (0–4, 5–9, . . . , 70–74, 75 and over) are estimated for each of the 39 European countries defined by the United Nations² and Cyprus. Results are presented for the following cancer sites as defined by the 10th edition of the International Classification of Diseases (ICD-10)¹¹: lip, oral cavity and pharynx (ICD-10 C00–14), oesophagus (C15), stomach (C16), colorectal (including anus C18–21), liver (C22), gallbladder (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 and ureter, C64–66), bladder (C67), brain and central

nervous system (C70–72), thyroid (C73), Hodgkin lymphoma (C81), non-Hodgkin lymphoma (C82–85, C96), multiple myeloma (C88 + C90), leukaemia (C91–95) and all cancers combined, excluding non-melanoma skin cancer (C00–96, except C44). This last category was calculated by summing the estimated counts for each individual cancer site, and the corresponding estimate of the residual category “other and unspecified cancers”. No attempt was made to estimate incidence and mortality from non-melanoma skin cancer given the non-systematic registration of these cases in most cancer registries.

2.1. Development of the estimates

The methods used to estimate country-specific incidence and mortality rates for 2012 are based on previous work,⁸ and involve projections of the most recent national rates available prior to 2012. For countries with fifteen or more years of recent incidence or mortality data available, corresponding rates for 2012 were predicted using the NORDPRED program based on age-period-cohort modelling¹² separately for each cancer site and sex. When the available information was for less than 15 years, or when data up to 2010 were available, a programme developed at IARC (DEPPRED) based on the simple time-linear prediction models of Dyba and Hakulinen¹³ was used to make the short-term predictions. To reduce the prospect of erroneous predictions as a result of inherently large random variation due to small numbers (rare cancers, small populations), cancer-, sex-specific prediction models were fitted only when at least 50 cancer cases or cancer deaths (all ages) were recorded per year for DEPPRED, and when at least 100 cancer cases or deaths (all ages) were recorded per 5-year period for NORDPRED. For the sex and cancer combinations where these criteria were not satisfied, the rates for 2012 were derived from the annual average rates recorded in the most recent 5-year period available. For countries where no historical national incidence or mortality data existed, the most recent disease rates available were used as proxy for 2012. For France, we used the published estimates of national incidence rates for 2011.¹⁴ Since no data were available for Montenegro, incidence and mortality rates were estimated as the simple average of the rates (age-, sex- and site-specific) of those of Bosnia Herzegovina and Serbia.

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