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European cancer mortality predictions for the year 2012

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Background: Estimating current cancer mortality figures is important for defining priorities for prevention and treatment.

Materials and methods: Using logarithmic Poisson count data joinpoint models on mortality and population data from the World Health Organization database, we estimated numbers of deaths and age-standardized rates in 2012 from all cancers and selected cancer sites for the whole European Union (EU) and its six more populated countries.

Results: Cancer deaths in the EU in 2012 are estimated to be 1 283 101 (717 398 men and 565 703 women) corresponding to standardized overall cancer death rates of 139/100 000 men and 85/100 000 women. The fall from 2007 was 10% in men and 7% in women. In men, declines are predicted for stomach (−20%), leukemias (−11%), lung and prostate (−10%) and colorectal (−7%) cancers, and for stomach (−23%), leukemias (−12%), uterus and colorectum (−11%) and breast (−9%) in women. Almost stable rates are expected for pancreatic cancer (+2–3%) and increases for female lung cancer (+7%). Younger women show the greatest falls in breast cancer mortality rates in the EU (−17%), and declines are expected in all individual countries, except Poland.

Conclusion: Apart for lung cancer in women and pancreatic cancer, continuing falls are expected in mortality from major cancers in the EU.

Key words: breast cancer, cancer, Europe, mortality, projections, time trends

introduction

Estimating current cancer mortality figures is important for defining priorities for prevention, management and treatment.

Using the World Health Organization (WHO) mortality database, we estimated the number of deaths and the corresponding death rates from all cancers and for major cancer sites for the year 2011 in the European Union (EU) and in its six more populated countries [1].

The scope of this article is to estimate corresponding statistics for the year 2012, incorporating the new mortality data that have been added to the WHO mortality database in the last year. We also aim to check whether the new data confirm the trends in mortality rates estimated up to 2011. This report also focuses on breast cancer mortality data, also presenting estimated numbers and death rates separately for the age groups 20–49, 50–69 and 70–79 years.

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materials and methods

This work is an update to the previous work for the year 2011 [1], hence, methods are similar.

Official death certification data from stomach, intestines (colon and rectum), pancreas, lung, breast, uterus (cervix and corpus), prostate, leukemias and total cancer mortality were obtained from the WHO database (WHOSIS) [2]. Figures were derived for the EU in the period 1970–2007 and up to the most recent available year for six European countries: France (2007), Germany (2006), Italy (2007), Poland (2008), Spain (2008) and the UK (2009). The EU was defined as the 27 member states as of January 2007, i.e. Austria, Belgium, Bulgaria, the Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, UK. Data for Cyprus were not available. For the calculation of the EU rates only, when data were not available for a country, the nearest available data (i.e. generally that of the previous or subsequent year) were replicated (see supplemental Appendix, available at *Annals of Oncology* online).

In a few countries, mortality data were missing for one or more calendar years. No interpolation was made for missing data except for the construction of the EU rates, as described in supplemental Appendix (available at *Annals of Oncology* online).

During the calendar period considered, three different Revisions of the International Classification of Diseases (ICD) were used. Since differences in classifications between various Revisions were minor, cancer deaths were recoded for all countries according to the 10th Revision of the ICD [3]. ICD-10 encoding of the studied cancers was stomach cancer (C16), intestinal (mainly colon and rectum) cancer (C17–C21, C26), pancreas (C25), lung (C34), breast (C50), uterus (cervix and corpus) (C53–C55, C58), prostate (C61), leukemias (C91–C95) and total cancers (C00–D48).

Estimates of the resident population, based on official censuses, were obtained from the same WHO database. Population projection estimates for the year 2012 were obtained from Eurostat [4].

From the matrices of certified deaths and resident populations, we computed age-specific rates and numbers of death for each 5-year age group (from 0–4 to 80+ years) and calendar year. Age-standardized rates, per 100 000 men and women, at all ages, were computed using the direct method, on the basis of the world standard population [5]. For breast cancer quinquennial and annual, standardized mortality rates were also computed for the 20–49, 50–69 and 70–79 age groups.

A logarithmic Poisson count data joinpoint model was fit to each 5-year age-specific number of certified deaths in order to identify the most recent trend segment. The joinpoint model was set to a maximum of five identifiable segments (four joinpoints) and to have at least five data points from the last available period [6].

A linear regression was carried out on mortality data from each age group over the most recent time period identified by the joinpoint model in order to compute the predicted age-specific certified number of deaths, the corresponding 95% confidence intervals (CI) and prediction intervals (PI). Predicted age-specific rates were computed using the predicted population data from Eurostat and used to compute the predicted standardized death rates with 95% CI and PI.

results

Table 1 and supplemental Tables S1–S6 (available at *Annals of Oncology* online) show total numbers of predicted deaths and predicted standardized death rates for the analyzed neoplasms with 95% PI and CI, in the EU as a whole and the six largest EU member countries in 2012 as well as comparison data from the last available year.

Figure 1 shows bar-plots of standardized death rates per 100 000 population and certified deaths for the year 2007 and the predicted rates and number of deaths for 2012 with 95% PIs for total cancer mortality in the EU in men and women.

Figure 2 shows bar-plots of standardized death rates per 100 000 population for the year 2007 and the predicted rates for 2012 with 95% PIs for the EU in men and women for the following cancer sites: stomach, intestine (mainly colon and rectum), pancreas, lung, female breast, uterus (cervix and corpus), prostate and leukemias.

Total number of cancer deaths in the EU in 2012 is predicted to be 1 283 101, of which 717 398 men and 565 703 women, as compared with 1 261 134, of which 706 619 men and 554 515 women, in 2007. The estimated standardized total cancer death rates in 2012 are 138.7/100 000 men and 84.7/100 000 women compared with the 2007 values of 153.5/100 000 men and 90.6/100 000 women. This would correspond to a 10% fall in men and a 7% fall in women as compared with the most recent recorded rate. In men, lung cancer accounted for the largest number of deaths (183 592 deaths, 26% of total male cancer deaths), with a standardized rate of 37.2/100 000, having fallen 10% from the 41.3/100 000 rate recorded in 2007, based on 183 019 deaths. In women, the favorable total cancer trends are mainly driven by falls in breast cancer mortality, the first cause of EU female cancer deaths, making up for 16% of total deaths with 88 101 deaths and a standardized rate of 14.9/100 000 women (a 10% fall since 2007), colorectal (73 989 deaths, 9.4/100 000 women) and stomach (21 138 deaths, 2.8/100 000 women) cancers. These downward trends in rates are reflected in all the examined cancer sites with the exception of pancreatic cancer that had a slight rise in both sexes (39 088 deaths, 8/100 000 men and 38 443 deaths, 5.4/100 000 women) and female lung cancer that rose from 12.6/100 000 women in 2007 to a predicted rate of 13.4/100 000 (78 658 deaths) for 2012.

Figure 3 shows total cancer death standardized rate trends, for European men and women, for the central years of quinquennia (1972–2007) and the predicted rates for 2012. Figure 4A and B, A (men) and B (women) have the same structure but show standardized death rates for the examined specific cancer sites.

Total cancer mortality in the EU is predicted to decline steadily, as well as rates for male lung cancer, female breast and colorectal and gastric cancers in both sexes and most other neoplasms considered. Pancreatic cancer projected a moderate rise in both sexes, and principally, female lung cancer whose projected rate (13.4/100 000 women) tended to approach that of breast cancer (14.9/100 000), were the only exceptions to the generally favorable trends seen in the EU as a whole.

Supplemental Figure S1 (available at *Annals of Oncology* online) illustrates trends in all-ages standardized (world population) cancer mortality rates for men and women in quinquennia from 1972 to 2007 and the predicted rates for 2012 for stomach, intestines, pancreas, lung, breast, uterus, prostate and leukemias in the six studied countries and the EU as a whole.

Stomach cancer mortality rates were highest in Poland (11.2/100 000 men and 3.7/100 000 women) and Italy (7/100 000 men and 3.5/100 000 women) with rates being

Table 1. Number of predicted deaths and standardized mortality rates in the European Union for the year 2012, with 95% prediction and confidence intervals, with comparison data from 2007

Sex	Cancer	Recorded deaths 2007	Predicted number of deaths	Lower prediction interval (95%)	Upper prediction interval (95%)	Lower confidence interval (95%)	Upper confidence interval (95%)	World standard death rate 2007	Predicted world standard death rate	Lower prediction interval (95%)	Upper prediction interval (95%)	Lower confidence interval (95%)	Upper confidence interval (95%)
Men	Stomach	37424	33926	33267	34585	33467	34384	8.02	6.45	6.31	6.59	6.36	6.54
	Intestine (colon and rectum)	85244	89117	88100	90134	88347	89887	17.68	16.51	16.31	16.72	16.36	16.66
	Pancreas	35022	39088	38580	39595	38702	39474	7.86	8.01	7.89	8.14	7.92	8.11
	Lung	183019	183592	180850	186334	181383	185801	41.29	37.16	36.51	37.82	36.63	37.69
	Prostate	68282	69960	68633	71288	68947	70974	11.97	10.74	10.55	10.92	10.60	10.87
	Leukemias	21553	22320	21732	22908	21830	22811	4.81	4.25	4.08	4.42	4.15	4.35
	All cancers (malignant and benign)	706619	717398	710026	724769	711307	723489	153.50	138.70	137.24	140.16	137.60	139.79
Women	Stomach	25060	21138	20357	21919	20568	21708	3.65	2.80	2.68	2.91	2.73	2.87
	Intestine (colon and rectum)	75294	73989	73139	74840	73394	74585	10.52	9.37	9.24	9.51	9.29	9.46
	Pancreas	34965	38443	37685	39200	37858	39028	5.24	5.38	5.28	5.48	5.30	5.46
	Lung	69115	78658	77376	79939	77668	79647	12.61	13.44	13.18	13.70	13.24	13.65
	Breast	89012	88101	86693	89508	86978	89223	16.40	14.85	14.58	15.11	14.65	15.04
	Uterus (cervix and corpus)	27393	26720	26191	27249	26291	27148	5.16	4.57	4.45	4.69	4.48	4.67
	Leukemias	17884	18605	18224	18987	18337	18873	2.93	2.56	2.47	2.66	2.51	2.62
	All cancers (malignant and benign)	554515	565703	560601	570806	561427	569980	90.64	84.67	83.90	85.44	84.08	85.26

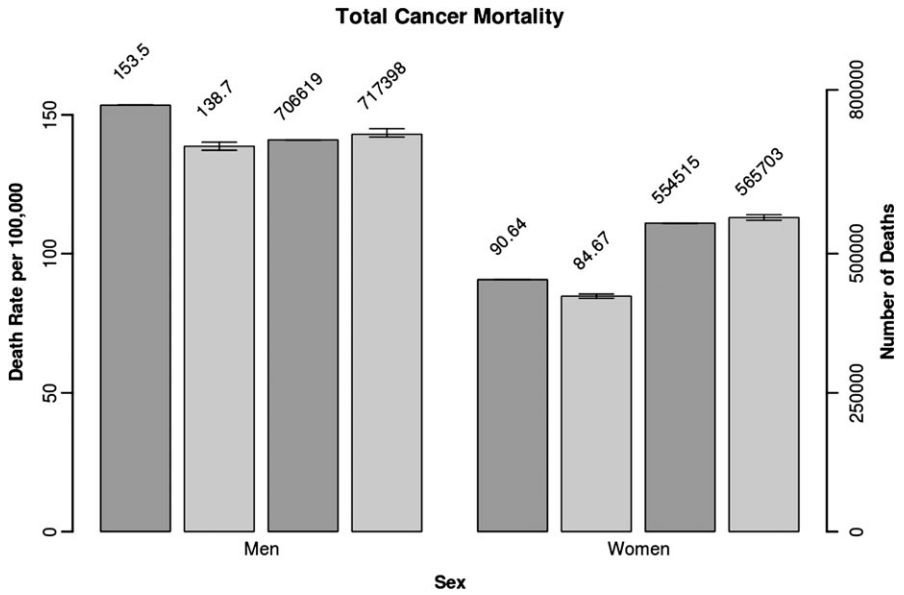

Figure 1. Bar-plots of standardized death rates per 100 000 population and certified deaths for the year 2007 (dark gray) and the predicted rates and number of deaths for 2012 with 95% prediction intervals (light gray) for total cancer mortality in the European Union in men and women.

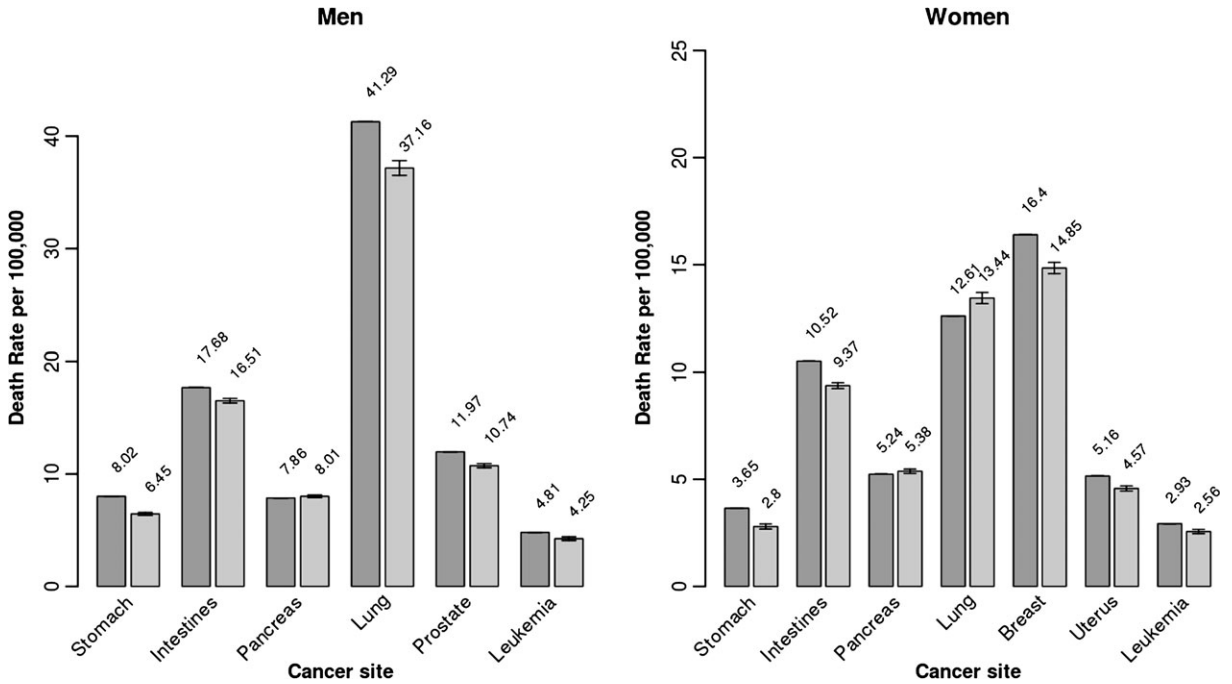

Figure 2. Bar-plots of standardized death rates per 100 000 population for the year 2007 (dark gray) and the predicted rates for 2012 with 95% prediction intervals (light gray) for the European Union in men and women in the studied cancer sites.

2.5- and 4-fold higher than the lowest ones seen in UK males (3/100 000 men) and 3-fold those in females (1.4/100 000 women). France and Germany also showed rates lower than those seen in the EU.

Intestinal cancer mortality rates are projected to decline in all countries considered for women and all countries except Poland, whose rates however stopped increasing in men. Colorectal mortality rates in France, Germany and Italy, as well as British men and Spanish women, are predicted to be lower than in the EU. Poland had the highest rates again (20.6/100 000 men and 10.4/100 000 women). The lowest rates are in Germany (13.9/100 000 men and 7.6/100 000 women).

Pancreatic cancer mortality rates in males varied between 6.6 and 8.2/100 000 men and between 4 and 5.7/100 000 women. Age-standardized rates for this neoplasm were approximately stable compared with the last recorded data. The highest rates are in French men (8.2/100 000) and German women (5.7/100 000), while the lowest ones are in the UK and Spain in men (6.6 and 6.7/100 000, respectively) and in Spanish women (4/100 000 women), whose rates are 20% lower than

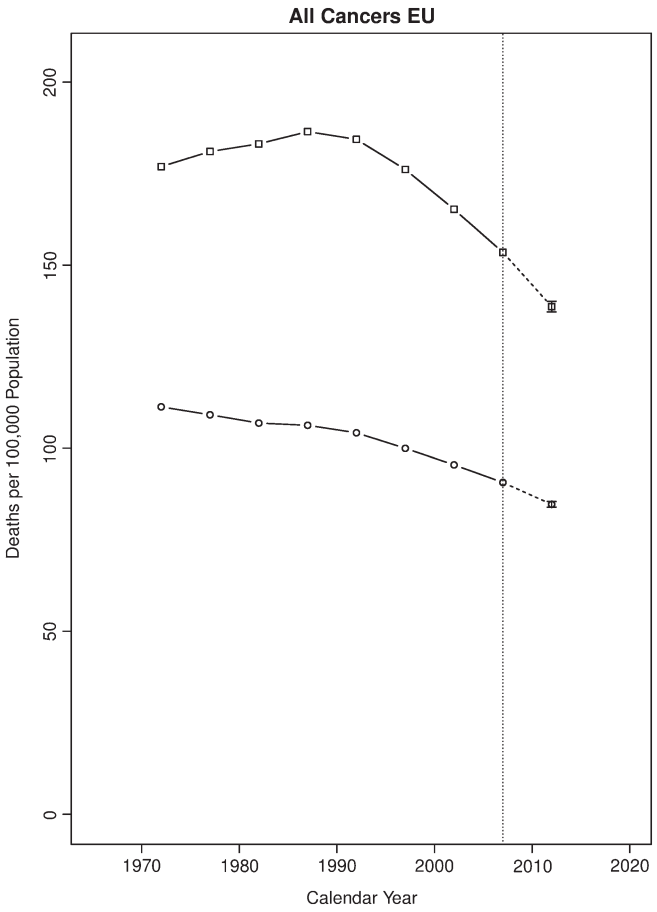

Figure 3. Age-standardized (world population) total cancer mortality trends in 5-year steps from 1972 to 2007 and the predicted rates for 2012, for men (squares) and women (circles) in the European Union (EU).

the second lowest rates seen in British women (5.1/100 000 women).

Male lung cancer rates had favorable trends in all the studied countries with estimated rates in 2012 varying between 56.8/100,000 in Poland and 30.1/100,000 in the UK. Conversely, in women rising trends were observed in all countries, including the UK, whose female lung cancer rates had long been high (∼20/100 000 women), but not been rising consistently over the past two decades. Consequently, the UK had the highest rates in women (21.4/100 000 women), over 3-fold higher than the lowest estimated rate for Spain (6.8/100 000 women).

Estimated female breast cancer mortality rates all resulted in falling trends. The highest rates were in Germany (16.5/100 000 women) and the lowest ones in Spain (11.7/100 000 women).

Estimated mortality rates for cancer of the uterus in Poland were three times higher than the lowest ones predicted for Germany, 7.7 and 2.4/100 000 women, respectively. Remaining countries and the EU showed values between 3.4 and 4.6/100 000 women. Compared with the last available years, estimated rates showed favorable changes in all countries.

Prostate cancer estimated mortality rates for 2012 varied between 8 and 12.8/100 000 men with the highest being in the UK and Poland, while the lowest ones were in Italy. The trend for prostate cancer was also favorable in all the studied countries.

Predicted mortality rates for leukemias for Poland were higher than for the other countries in both men (5.2/100 000) and women (2.9/100 000), while for Spain they were lower (3.3/100 000 men and 1.8/100 000 women). In the remaining countries and the EU, rates varied between 3.8 and 4.5/100 000 men and 2.2 and 2.7/100 000 women. All the estimated rates were lower than those recorded in the last available year.

The predicted total cancer standardized mortality trends to 2012 are favorable for all countries considered in both sexes. The highest estimated rates were in Poland for both sexes, falling 4% to 185.4/100 000 in men since 2008, and 2% to 102.8/100 000 in women. Total male cancer rates were also higher than the EU ones in France (145.6/100 000 men, 9% fall since 2007). Germany, Italy and the UK have predicted male total cancer mortality rates that are lower than the EU ones, with Germany and the UK having the lowest ones at 126.9 and 128/100 000 men displaying 9% and 4% falls since 2006 and 2009, respectively. Conversely, total female cancer mortality rates in the UK are high compared with the EU and the other studied countries (with the exception of Poland), but they fell 2% since 2009 with a predicted rate of 97.6/100 000 women in 2012. France, Germany and Italy have female rates comparable to those in the EU (between 78 and 84/100 000 women), while Spain has sensibly lower female rates, falling 5% and reaching 67.2/100 000 women since 2008.

Table 2 gives standardized breast cancer mortality death rates in the EU and the six most populous member countries, for all ages, 20–49, 50–69 and 70–79 years age groups in the quinquennia 2000–2004 and 2005–2009, with percentage differences as well as the predicted rates for all the age groups.

Figure 5 shows annual female breast age-standardized death rates in the EU per 100 000 population for all ages, 20–49, 50–69 and 70–79 years age groups from 1970 to 2007 and the resulting joinpoint regression model. In addition to the predicted rates for the year 2012 with 95% PIs.

The projected truncated rates (20–49, 50–69 and 70–79 years) all displayed falling rates in the EU as a whole in 2012 compared with the last available period as well as in most single countries and age groups, with also a few exceptions: French 70–79 years, German 50–69 years, Spanish 20–49 and 70–79 years and Polish 50–69 and 70–79 years.

discussion

This short-term prediction models estimate that in the year 2012 in the EU ∼717 000 men and 566 000 women will die of cancer. These numbers are slightly higher than those recorded for 2007 (+1.5% in men and +2% in women). The increase in cancer deaths is due to the aging of the EU population only, and the age-adjusted cancer mortality rates are expected to decrease during those 5 years from 153.5/100 000 men in 2007 to 138.7 in 2012 (−9.6%) and from 90.6/100 000 women to 84.7 (−6.5%). In men, declines are also expected for five of the six individual cancer sites considered, i.e. stomach (−20%), leukemias (−11%), lung and prostate (−10%) and colorectal (−7%) cancers. Conversely, a slight increase (+2%) in pancreatic cancer mortality rates is expected. In women in the

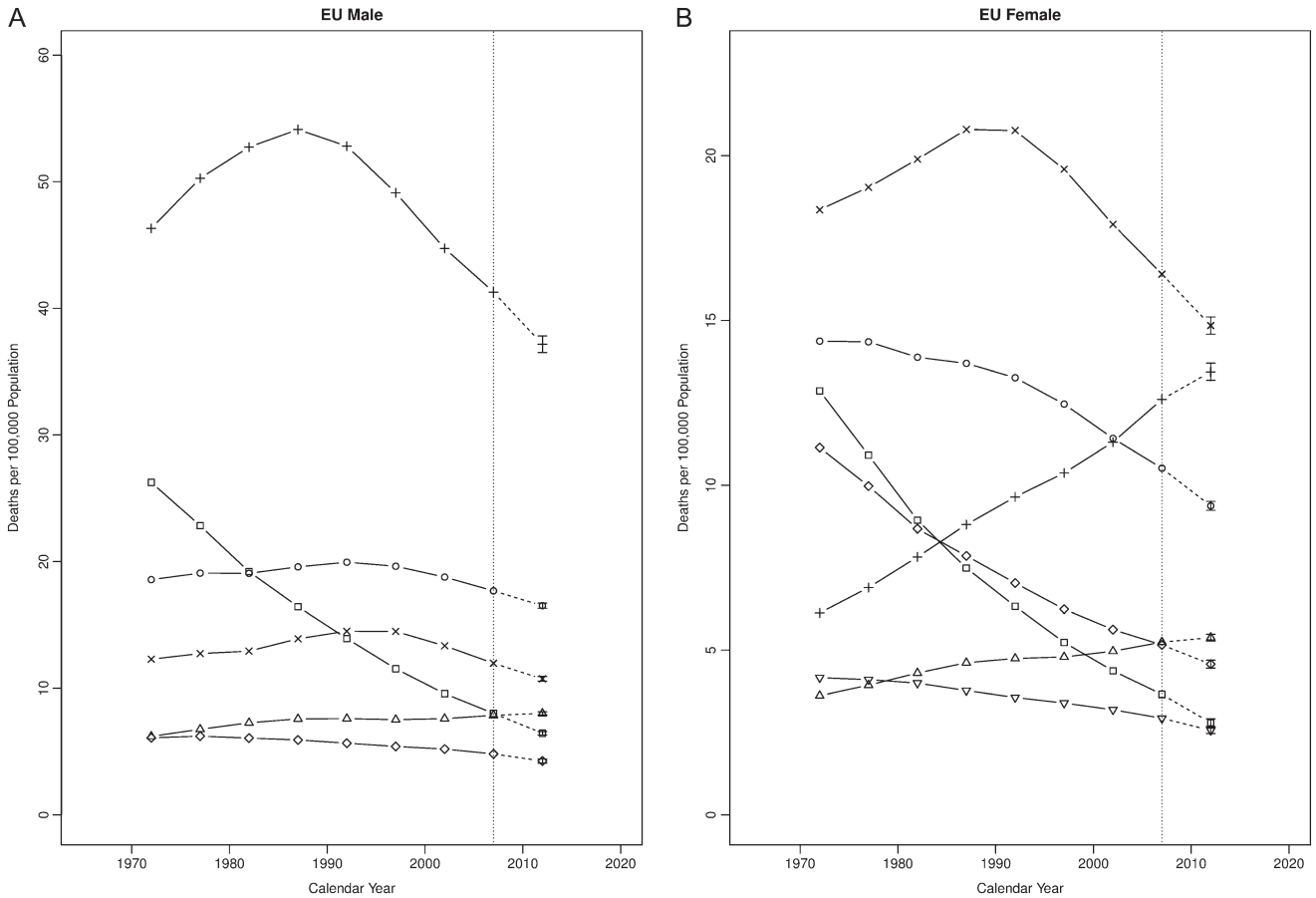

Figure 4. (A) Age-standardized (world population) European Union (EU) male cancer mortality trends in 5-year steps from 1972 to 2007 and the predicted rates for 2012: stomach (squares), intestines (circles), pancreas (triangles), lung (crosses), prostate (xs) and leukemias (diamonds). (B) Age-standardized (world population) EU female cancer mortality rate trends in 5-year steps from 1972 to 2007 and the predicted rates for 2012: stomach (squares), intestines (circles), pancreas (triangles), lung (crosses), breast (xs), uterus (diamonds) and leukemias (inverted triangles).

same 5-year period, mortality rates from five of the seven individual sites considered are predicted to decline, i.e. stomach (−23%), leukemias (−12%), uterus and colorectum (−11%) and breast (−9%), while increases in lung (+7%) and pancreatic (+3%) cancer mortality rates are expected.

The European Code Against Cancer had set a target to decrease cancer mortality in the EU (at the time composed by 15 member states) by 15% in the 15-year period from 1985 to 2000 [7]. This goal was only partially accomplished since the actual decrease was 10% in men and 8% in women [8]. In the year 2000, the mortality rate from all cancers in the EU27 was 169.2/100 000 in men and 97.5 in women. Thus, in 2007, the all-cancer mortality rates had already declined by over 9% in men and 7% in women, and the percent decline estimated by 2012 is 18% in men and 13% in women. Thus, the 15% decline in cancer mortality rates may already have been achieved after 12 years in men, and appears close for women, in spite of the unfavorable trends in female lung cancer rates. This is consistent with the 1.6% per year decline in cancer mortality (1.8% in men and 1.1% in women) observed in the United States between 2003 and 2007 [9].

Also within Europe, for all the six countries considered, declines are more marked in men than women, with however notable differences. In men, estimated declines in the period 2000–2012 were ∼21% in France, Germany and Italy, 18% in Spain, 15% in the UK and 11% in Poland. The UK male rate, however, was already low, compared with other countries, due to low gastric and lung cancer rates, and even if the decline has been somewhat less steep, the 2012 UK rate is still lower than that of the EU or of the other countries considered, except for Germany. Conversely, Poland had already the highest rates in 2000, and thus, the limited subsequent decline will widen the gap between Poland and the other countries. These data suggest that the gap in cancer mortality between central European 2004 accession countries and countries of the EU15 observed in the early 2000s [10] is not projected to decline, at least in proportional terms, over recent years.

For women, the decline in all-cancer mortality rates in the period 2000–2012 was estimated to be 15% for Germany, ∼11%–12% for France, Italy, Spain and the UK and 7% in Poland. Thus, for women also, the gap between the already higher rates in Poland and the other countries is likely to widen.

From the figures presenting trends in mortality rates by cancer site from 1970 onward for the six countries considered, some patterns emerge: (i) the steady continuing declines of stomach cancer mortality rates, reflecting long-term trends in both period and cohort effects [11]; (ii) the continued tendency

Table 2. Standardized breast cancer mortality death rates for all ages, 20–49, 50–69 and 70–79 years in the quinquennia 2000–2004 and 2005–2009 with percentage differences in the European Union and predicted total rate in selected countries

	All-ages standardized death rate 2000–2004	All-ages standardized death rate 2005–2009	Percentage difference 2000–2004 versus 2005–2009	Predicted all-ages standardized rate for 2012	20–49 years standardized death rate 2000–2004	20–49 years standardized death rate 2005–2009	Percentage difference 2000–2004 versus 2005–2009	Predicted 20–49 years standardized rate for 2012	50–69 years standardized death rate 2000–2004	50–69 years standardized death rate 2005–2009	Percentage difference 2000–2004 versus 2005–2009	Predicted 50–69 years standardized rate for 2012	70–79 years standardized death rate 2000–2004	70–79 years standardized death rate 2005–09	Percentage difference 2000–2004 versus 2005–2009	Predicted 70–79 years standardized rate for 2012
France	18.29	16.67	−8.89	16.23	9.18	8.09	−11.78	8.08	60.87	54.86	−9.87	51.92	102.62	96.42	−6.04	99.25
Germany	18.79	17.45	−7.15	16.48	8.31	6.94	−16.40	5.65	63.67	59.94	−5.86	60.50	110.30	106.97	−3.02	88.87
Italy	17.53	16.18	−7.71	15.24	8.55	7.56	−11.65	7.01	58.36	53.82	−7.77	51.28	99.01	92.45	−6.62	82.76
Poland	14.88	14.51	−2.48	14.45	7.54	6.23	−17.42	5.34	51.80	52.03	0.45	52.65	78.69	80.60	2.43	84.64
Spain	14.03	12.73	−9.21	11.73	7.86	7.35	−6.51	7.42	45.11	39.96	−11.42	32.80	75.34	68.45	−9.14	73.51
United Kingdom	20.58	18.39	−10.64	15.95	10.20	8.80	−13.78	7.69	66.18	58.51	−11.60	49.15	119.44	109.48	−8.34	96.73
European Union (27)	17.92	16.40	−8.44	14.85	8.77	7.61	−13.29	6.29	59.46	54.59	−8.19	50.06	101.14	94.99	−6.08	85.66

toward a homogenization of intestinal cancer mortality rates [12], with the exception of the less favorable trends for Polish men; (iii) the generalized unfavorable trends in pancreatic cancer mortality rates, with however, a leveling off in recent periods, at least in men [13]; (iv) the contrasting trends between sexes in lung cancer mortality rates, with increases in women and decreases in men from the 1990s onward, and the exceptionally high rates in Polish men and women; (v) the early rises and following marked reductions in breast cancer mortality rates, larger in the UK, that had higher rates in the past; (vi) the continuing steady declines in (cervix) uterine cancers, without, however, evidence of closing the gap between the higher rates in Poland and the other countries; (vii) the early rises followed by falls in prostate cancer rates, with again a less favorable picture for Polish men; (viii) the declines in leukemia mortality rates, more marked for women and (ix) the general declines in all-cancer mortality rates in women (since 1980 for the UK), with the exception of Poland, where rates have been rising up to 2000, and the early increases and subsequent declines in men, again with a more unfavorable pattern for Polish men.

Despite declines in breast cancer mortality over most recent periods in Europe and the Unites States [9, 14, 15], the breast is still the leading cancer mortality site in women in the EU as a whole, as well as in France, Germany, Italy and Spain, while lung cancer is the leading cancer mortality site in the UK and in Poland. For the year 2012, ∼88 000 women will die of breast cancer in the EU, corresponding to almost 16% of all cancer deaths in EU women, and the estimated rate in the EU is 14.9/100 000 women, 9% lower than the rate observed in 2007. Predicted breast cancer mortality rates in 2012 are lower in Spain (11.7) and between 14.5 and 16.5/100 000 in the other five countries. Spain had the lowest rate in 2000–2004 already and has also shown a steep decline in the following quinquennium (−9%). The UK had the highest rate in 2000–2004 (20.6), and despite the marked decline in the following quinquennium (−11%), the UK rate was still the highest in 2005–2009, albeit the gap with the other five countries was reduced. However, our model predicts that in 2012 the UK rate will be similar—or even slightly lower—than those of France and Germany.

In relative terms, younger women (20–49 years) are those who have shown the greatest reductions in rates between 2000–2004 and 2005–2009 (−13%) in the EU [15]. In this age group, Poland shows the most favorable trends (−17%) together with Germany (−16%). No declines in rates are predicted in Polish older women, in contrast to an overall decline in the EU breast cancer mortality rates of 8% in women aged 50–69 years and of 6% in women aged 70–79 years. Consequently, only modest declines have been observed between 2000 and 2009 and predicted up to 2012 in the Polish all-age breast cancer mortality rate. However, greater declines may occur in the future, if the favorable patterns in younger women will be maintained when these women get older.

The interpretation of the favorable pattern in breast cancer rates in the EU has raised several controversies, in particular as concerns the role of mammographic screening. In general, many important risk factors for breast cancer, including menstrual and reproductive factors, physical activity and

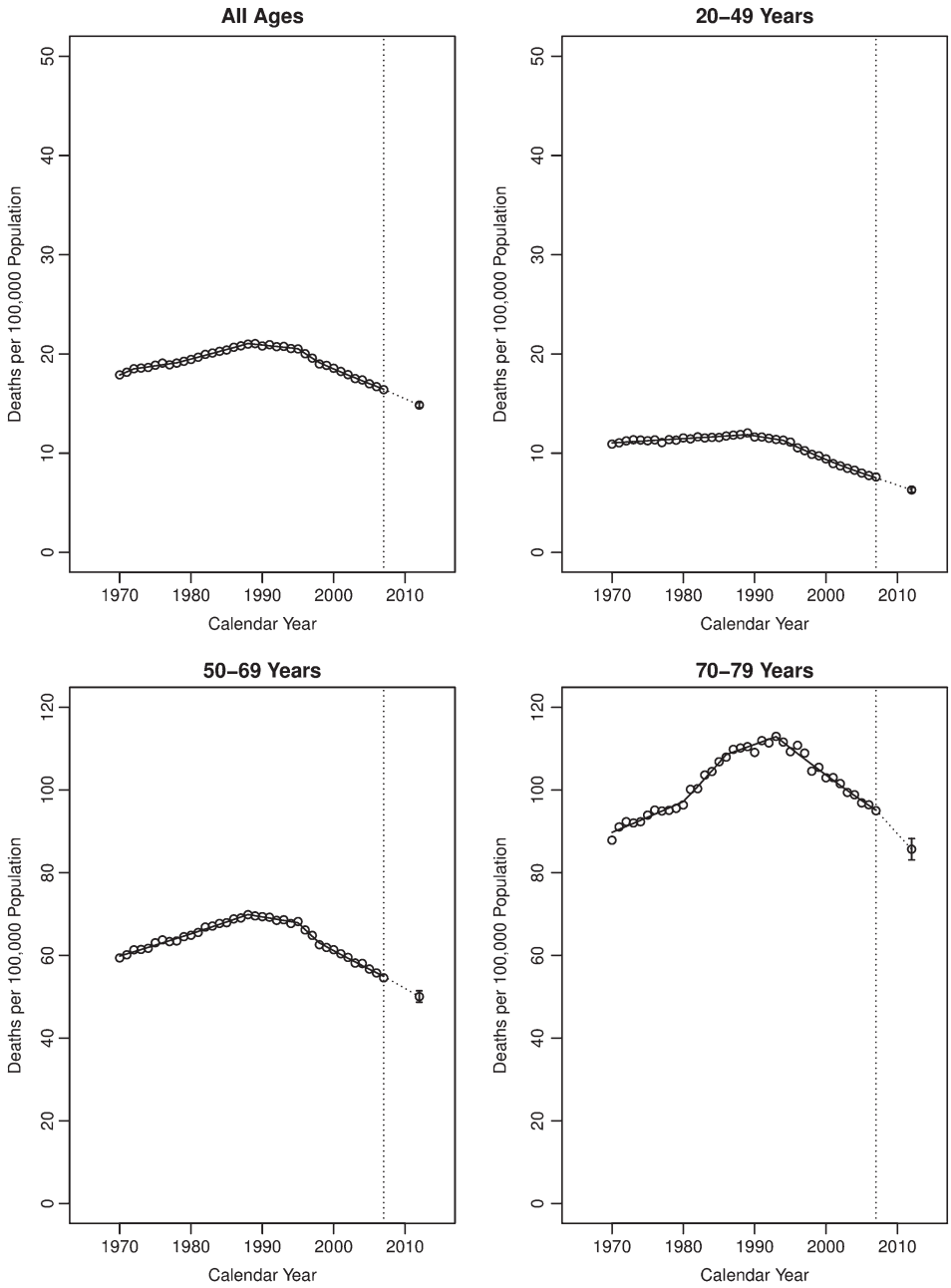

Figure 5. Annual female breast age-standardized death rates in the European Union (circles) per 100 000 population for all ages, 20–49, 50–69 and 70–79 years from 1970 to 2007 and joinpoint regression model (full line). With the predicted rates for the year 2012 (dotted line) with 95% prediction intervals.

obesity, have not changed favorably. This and the spread of mammographic screening, either spontaneous or organized, have led to increases in breast cancer incidence rates up to the early 2000s. Subsequent declines have been attributed, at least in part, to decreased use of hormone replacement therapy [16]. Important advancements in breast cancer treatment and management have played a major role in breast cancer mortality declines, while the role of breast cancer screening is difficult to quantify [17–19]. It has been pointed out that declines in breast cancer mortality have started earlier or simultaneously to the introduction of organized screening programs in several countries while the effects due to screening should have started at least a few years later. Moreover, these reductions have also taken place and been larger in relative terms, in younger women, while organized screening programs are mostly directed to women aged 50–69 years.

Obesity is a major risk factor for breast cancer, but only after the menopause. In an Italian case–control study, the pattern of risk was consistent with a duration–risk relationship, with higher relative (and absolute) risks at older ages [20]. The increases in overweight and obesity observed in several countries over the last decades [21] have likely unfavorably influenced breast cancer incidence trends in women >50 years and more strongly >70 years. Obesity has also been shown to negatively affect survival after breast cancer in both pre- and postmenopausal women [22]. While the fraction of breast

cancer deaths attributable to overweight and obesity may not be negligible in some countries, it is difficult to quantify the unfavorable role that increases in obesity prevalence has played on breast cancer mortality rates in different age groups.

As already discussed [1], even short term predictions can be misleading when an inversion of trends has taken place in most recent periods that the model is not able to detect. With one notable exception, the rates estimated for 2012 are in line with those for 2011 [1], indicating that the new data added to the WHO database do not indicate that such changes had occurred.

An exception is lung cancer in women in the UK, where for 2011, we predicted a stable or slightly decreasing rate of 20.3, while the model predicted a rate of 21.4 in 2012. This reflects the uncertain trends that lung cancer mortality rates have shown in UK women. Rates have increased from 13.5 in 1970 to 21.3 in 1988 and subsequently decreased to 19.6 in 2003. While in the first years of this century (from 2000 to 2005), rates were ~19.6–19.9, an abrupt increase took place thereafter with rates ~20.5–21 in 2006–2009. Last year, we had the rates up to 2007, and the model had not picked up the recent increases in trends. On the other hand, this year predictions appear unduly influenced by the particularly high rate observed in 2008 (21/100 000), while a lower rate was registered in 2009 (20.5). In such uncertainty, it is difficult to predict the actual rate in 2012, which may be lower than the one estimated by the model, i.e. between 20 and 21/100 000 women. It is anyway discouraging that lung cancer rates in UK women, that are already among the highest in the EU, do not appreciably decline over recent years.

Predicted standardized mortality rates may seem inconsistent with respect to the ones from the previous work [1]; this is because the model predicts numbers of deaths, while the rates also depend on the Eurostat population predictions and their age population structures, and although these may show small variations between 2011 and 2012, these are unlikely to have an appreciable effect on rates.

Apart for lung cancer in women and pancreatic cancer, the fall in mortality from major cancers in major European countries and the EU essentially reflects the decline in tobacco smoking in men and the continuing progress in cancer prevention, early detection and treatment.

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disclosure

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