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ORIGINAL ARTICLE

European cancer mortality predictions for the year 2023 with focus on lung cancer

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Available online XXX

Background: We predicted cancer mortality figures for 2023 for the European Union (EU-27), its five most populous countries, and the UK. We also focused on mortality from lung cancer.

Materials and methods: Using cancer death certification and population data from the World Health Organization and Eurostat databases for 1970-2018, we predicted numbers of deaths and age-standardized rates (ASRs) for 2023 for all cancers combined and the 10 most common cancer sites. We investigated the changes in trends over the observed period. The number of avoided deaths over the period 1989-2023 were estimated for all cancers as well as lung cancer.

Results: We predicted 1 261 990 cancer deaths for 2023 in the EU-27, corresponding to ASRs of 123.8/100 000 men (−6.5% versus 2018) and 79.3 for women (−3.7%). Over 1989-2023, ∼5 862 600 cancer deaths were avoided in the EU-27 compared with peak rates in 1988. Most cancers displayed favorable predicted rates, with the exceptions of pancreatic cancer, which was stable in EU men (8.2/100 000) and rose by 3.4% in EU women (5.9/100 000), and female lung cancer, which, however, tends to level off (13.6/100 000). Steady declines are predicted for colorectal, breast, prostate, leukemia, stomach in both sexes, and male bladder cancers. The focus on lung cancer showed falls in mortality for all age groups in men. Female lung cancer mortality declined in the young (−35.8%, ASR: 0.8/100 000) and middle-aged (−7%, ASR: 31.2/100 000) but still increased by 10% in the elderly (age 65+ years).

Conclusions: The advancements in tobacco control are reflected in favorable lung cancer trends, and should be pushed further. Greater efforts on the control of overweight and obesity, alcohol consumption, infection and related neoplasms, together with improvements in screening, early diagnosis, and treatments may achieve a further 35% reduction in cancer mortality in the EU by 2035.

Key words: lung cancer, cancer, Europe, mortality rates, prediction model, COVID-19

INTRODUCTION

Projected estimates on cancer mortality figures and rates are a useful instrument to evaluate disease control, since mortality integrates the effects of incidence, stage at diagnosis, and treatment.[1] In this paper, we present projected cancer mortality rates in the five most populous countries from the European Union (EU-27, defined as 27-member states), i.e. France, Germany, Italy, Poland, and Spain, plus the UK along with the EU-27 in the year 2023. In particular, we focus on lung cancer, with detailed analyses of rates in various age groups given the relevance of cohort effects on this disease.[2]

MATERIALS AND METHODS

From the World Health Organization (WHO) database,[3] we retrieved official death certifications for the following cancer sites: stomach, colorectum, pancreas, lung, breast, uterus (cervix and corpus), ovary, prostate, bladder, leukemia, and all cancers combined. The list of corresponding International Classification of Diseases codes according to the 10th Revision is available in Supplementary Table S1, available at https://doi.org/10.1016/j.annonc.2023.01.010. Resident population estimates were retrieved from the same WHO database. Figures were derived from 1970 to 2018 for the EU-27. For Italy the most recently available year was 2017 while for France it was 2016.

For each cancer and country considered, we computed sex- and age-specific mortality rates for each 5-year age group (from 0-4 up to 85+ years) and calendar year or quinquennium. Age-standardized (world standard population) mortality

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rates (ASRs) were calculated for all ages and for lung cancer also for selected age groups.[4] We analyzed ASR trends by fitting joinpoint regression models, including up to five joinpoints.[5]

For mortality-projected figures, we fitted a logarithmic Poisson joinpoint regression model testing up to five joinpoints to the number of deaths in each 5-year age group to identify significant changes in trends. Age-specific numbers of deaths for 2023 and the corresponding 95% prediction intervals (PIs) were estimated by fitting a linear regression model to the mortality figures for each age group over the most recent trend segment identified by the joinpoint model. We then calculated age-specific and age-standardized death rates (and related 95% PIs) by using the predicted age-specific number of death counts. Predicted populations were retrieved from the Eurostat database.[6] We then estimated the number of avoided deaths for the EU-27 and the UK for the period 1988-2023 by comparing observed and predicted deaths with those expected on the basis of the 1988 age-specific peak rate.

For all statistical analyses, we used SAS software version 9.4 (SAS Institute Inc., Cary, NC), R software version 4.1.1 (R Development Core Team, 2017), and Joinpoint software version 4.9.0.0.

RESULTS

Table 1 reports the number of predicted deaths and ASRs with the corresponding 95% PIs from selected cancer sites in the EU-27 and the UK for the year 2023, in comparison with observed data for 2018. Figure 1 shows the corresponding information presented in bar plots, for the EU-27 and the UK, according to sex and cancer site. In 2023, the total predicted number of cancer deaths in the EU-27 is 1 261 990 (702 214 men and 559 776 women), with the corresponding ASRs of 123.8/100 000 (−6.5% versus 2018) for men and 79.3 (−3.7% versus 2018) for women. The EU-27 projections are favorable for all cancer sites considered and both sexes except for lung and pancreas among women, which showed higher ASRs as compared with 2018: 5.9/100 000 (+3.4% versus 2018) for pancreas and 13.6 (+1.2% versus 2018) for lung cancer. In the UK, favorable ASRs are predicted for all cancers considered and both sexes. Although declining compared with 2018, female lung

Table 1. Number of predicted cancer deaths and mortality rates for the year 2023 and comparison figures for 2018, for the EU-27 and UK, with the 95% prediction intervals and the percentage differences between 2018 and 2023

Country	Sex	Cancer	Observed number of deaths 2018	Predicted number of deaths 2023 (95% PI)	Observed ASR 2018	Predicted ASR 2023 (95% PI)	% Difference 2023 versus 2018
EU-27	Male	Stomach	30 513	29 267 (28 518-30 017)	6.04	5.27 (5.12-5.42)	−12.66
		Colorectum	82 891	86 051 (84 424-87 677)	15.49	14.65 (14.35-14.94)	−5.46
		Pancreas	40 598	44 601 (44 034-45 168)	8.21	8.19 (8.07-8.31)	−0.17
		Lung	160 516	159 057 (155 897-162 217)	33.16	29.76 (29.01-30.51)	−10.24
		Prostate	66 484	70 845 (69 746-71 943)	10.15	9.49 (9.33-9.65)	−6.52
		Bladder	28 517	29 532 (28 209-30 855)	4.78	4.32 (4.16-4.48)	−9.73
		Leukemias	21 620	22 671 (22 149-23 194)	4.17	3.65 (3.46-3.83)	−12.61
		All cancers	676 189	702 214 (690 627-713 802)	132.28	123.75 (121.51-125.99)	−6.45
	Female	Stomach	19 570	16 796 (16 171-17 420)	2.83	2.29 (2.2-2.38)	−18.84
		Colorectum	66 957	66 130 (64 822-67 439)	8.89	8.11 (7.97-8.25)	−8.70
		Pancreas	40 039	44 461 (43 714-45 209)	5.69	5.88 (5.75-6.01)	3.39
		Lung	75 513	83 553 (81 890-85 215)	13.48	13.63 (13.29-13.98)	1.15
		Breast	84 410	88 283 (86 919-89 648)	14.24	13.58 (13.33-13.83)	−4.63
		Uterus	27 171	28 119 (27 583-28 656)	4.83	4.61 (4.5-4.72)	−4.56
		Ovary	26 337	26 533 (25 946-27 119)	4.58	4.26 (4.14-4.38)	−6.94
		Bladder	9473	9999 (9662-10 335)	1.10	1.10 (1.06-1.14)	−0.37
		Leukemias	17 403	17 822 (17 398-18 247)	2.51	2.18 (2.08-2.29)	−12.91
		All cancers	534 174	559 776 (552 696-566 857)	82.38	79.31 (78.46-80.17)	−3.72
UK	Male	Stomach	2696	2332 (2202-2463)	3.62	2.86 (2.67-3.05)	−20.96
		Colorectum	11 238	11 989 (11 660-12 317)	14.98	14.37 (13.94-14.81)	−4.02
		Pancreas	4954	5455 (5264-5645)	6.90	6.77 (6.47-7.06)	−1.85
		Lung	18 587	17 485 (17 120-17 851)	24.92	20.37 (19.83-20.91)	−18.24
		Prostate	11 886	12 454 (12 009-12 899)	12.52	11.24 (10.87-11.61)	−10.25
		Bladder	3697	4039 (3898-4180)	4.09	3.84 (3.67-4.02)	−5.89
		Leukemias	2747	2788 (2631-2944)	3.75	3.19 (2.96-3.41)	−14.97
		All cancers	91 059	92 111 (90 492-93 730)	120.26	106.54 (104.03-109.05)	−11.41
	Female	Stomach	1524	1135 (960-1310)	1.67	1.24 (1.03-1.45)	−25.86
		Colorectum	9647	10 322 (10 035-10 609)	10.16	10.01 (9.68-10.35)	−1.48
		Pancreas	4618	4956 (4732-5181)	5.10	4.93 (4.61-5.25)	−3.20
		Lung	16 012	15 861 (15 370-16 351)	18.80	16.20 (15.55-16.86)	−13.79
		Breast	11 516	11 301 (10 917-11 685)	15.07	13.49 (12.92-14.06)	−10.46
		Uterus	3351	3509 (3350-3669)	4.41	4.19 (3.93-4.45)	−4.96
		Ovary	4223	4073 (3870-4276)	5.46	4.69 (4.39-4.99)	−14.06
		Bladder	1760	1833 (1727-1938)	1.55	1.51 (1.4-1.61)	−3.01
		Leukemias	1951	1924 (1788-2059)	2.20	1.84 (1.64-2.04)	−16.20
		All cancers	79 631	80 203 (78 591-81 815)	92.55	83.48 (81.13-85.84)	−9.79

ASR, age-standardized rate; PI, prediction interval.

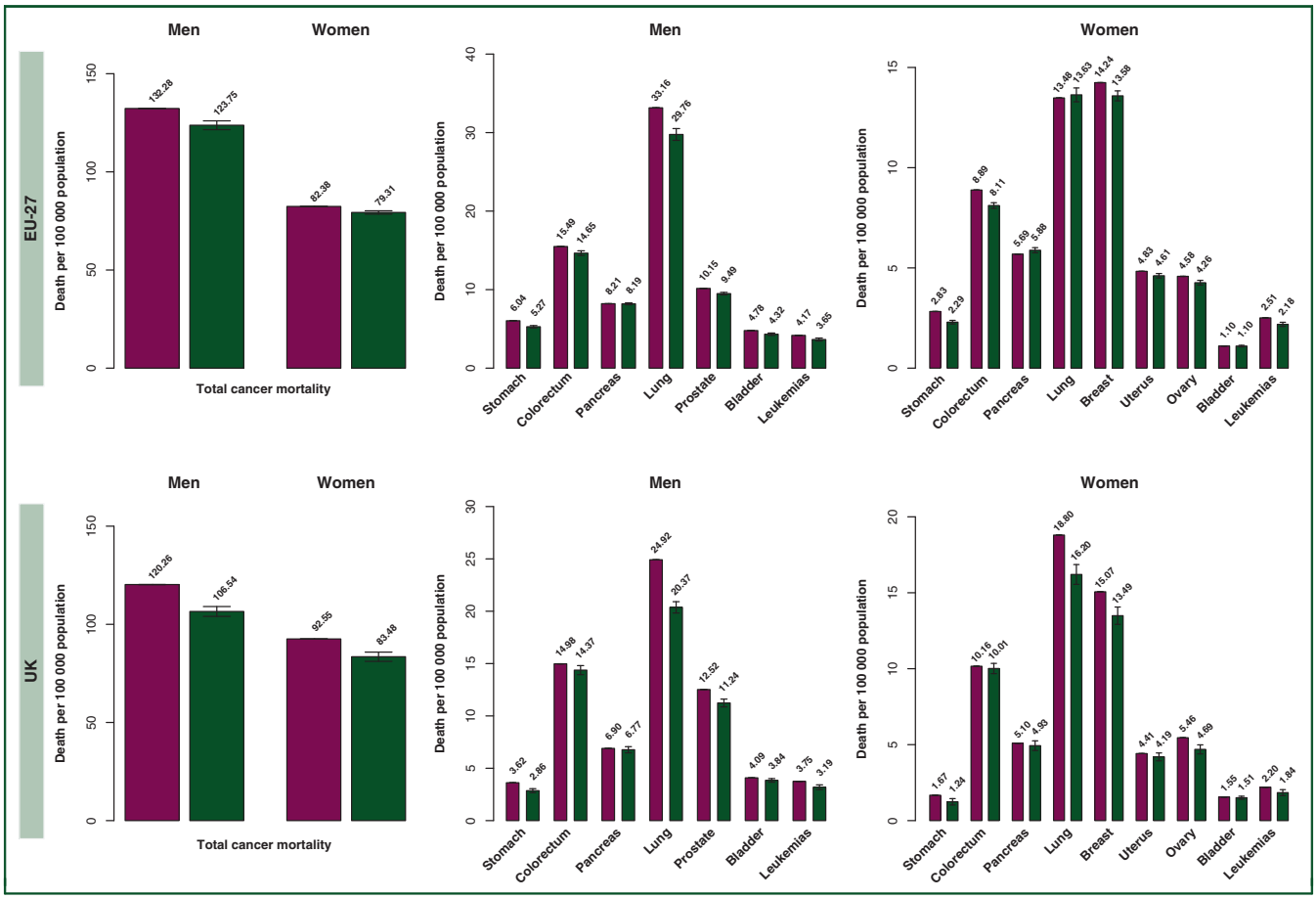

Figure 1. Bar plots of age-standardized (world population) mortality rates per 100 000 persons for the year 2018 (purple) and predicted rates for 2023 (green) with 95% prediction intervals for all cancers combined and major cancer sites according to sex in EU-27 (top panel) and UK (bottom panel).

cancer was the first ranked site in women in the UK too (16.2/100 000, −13.8% versus 2018), followed by breast (13.5, −10.5% versus 2018) and colorectal cancer (10.0, −1.5% versus 2018). Country-specific ASR projections according to sex and cancer site are provided in Supplementary Tables S2-S6 while Tables S7A and B, available at https://doi.org/10.1016/j.annonc.2023.01.010, show the results from joinpoint analyses, for men and women. Table 2 gives the observed ASRs for lung cancer in the six European countries considered and the EU-27 in 2010-2014, 2015-2019, and the projected ones in 2023 with the 95% PIs according to sex for all ages, and for the EU-27 by age group as well. Among men, all countries considered reported a favorable change between projected ASRs and observed ones in 2015-2019. Declines varied between −21.3% in Germany and −16.4% in France. Poland

Table 2. Age-standardized lung cancer mortality rates for all ages in selected European countries, and for the EU-27 at all ages, 25-44, 45-64, 65-74, and 75+ years in the 2010-2014 and 2015-2019 quinquennia and predicted rates for 2023, with percentage differences between 2015-2019 and 2023

Country	Age, years	Males				Females			
		ASR 2010-2014	ASR 2015-2019	Predicted ASR 2023 (95% PI)	% Difference 2023 versus 2015-2019	ASR 2010-2014	ASR 2015-2019	Predicted ASR 2023 (95% PI)	% Difference 2023 versus 2015-2019
France		38.16	35.22	29.44 (28.01-30.87)	−16.42	11.75	12.28	13.98 (13.37-14.6)	13.88
Germany		32.29	29.10	22.91 (21.86-23.95)	−21.29	14.42	15.17	14.21 (13.68-14.73)	−6.35
Italy		34.22	30.35	23.96 (23.03-24.88)	−21.06	10.25	10.80	11.41 (11.06-11.75)	5.64
Poland		53.17	45.94	37.87 (35.47-40.28)	−17.57	16.85	17.87	16.82 (15.92-17.73)	−5.83
Spain		39.31	34.93	29.12 (28.21-30.02)	−16.64	7.94	9.17	9.63 (9.17-10.09)	5.00
UK		29.36	25.35	20.37 (19.83-20.91)	−19.65	20.28	18.91	16.20 (15.55-16.86)	−14.30
EU-27	All ages	38.31	34.52	29.76 (29.01-30.51)	−13.78	12.94	13.53	13.63 (13.29-13.98)	0.74
	25-44	2.41	1.96	0.82 (0.48-1.17)	−57.88	1.62	1.29	0.83 (0.68-0.98)	−35.82
	45-64	83.25	70.45	57.24 (54.05-60.43)	−18.75	34.07	33.58	31.24 (29.79-32.69)	−6.95
	65-74	274.70	262.36	238.60 (230.47-246.72)	−9.06	80.55	93.31	102.22 (98.43-106.01)	9.55
	75+	405.29	374.50	336.96 (329.58-344.35)	−10.02	100.30	106.94	118.23 (114.54-121.93)	10.56

ASR, age-standardized rate; PI, prediction interval.

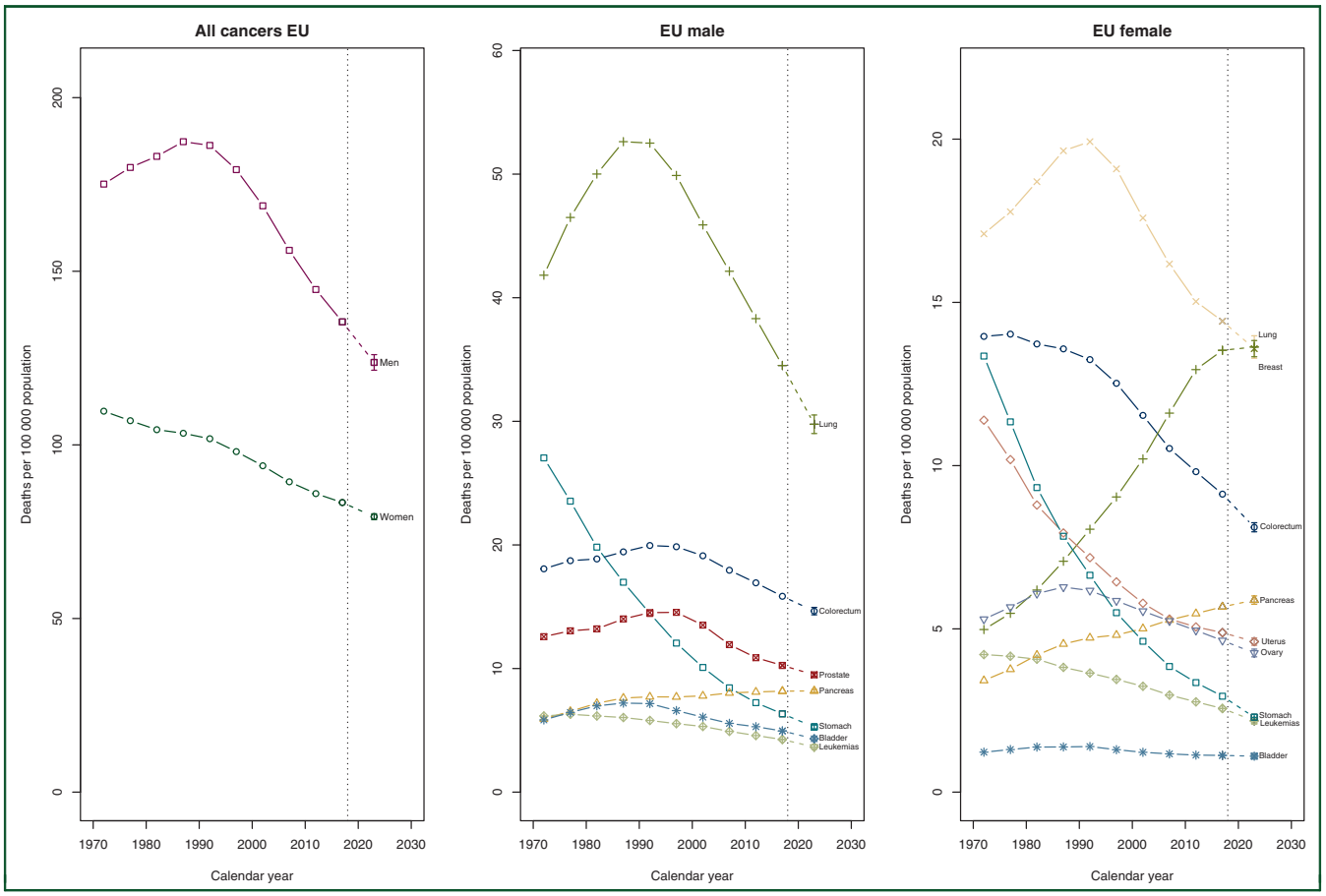

Figure 2. Quinquennial age-standardized (world population) cancer mortality rate trends from 1970-1974 to 2015-2019 and predicted rates for 2023 with 95% prediction intervals, for all cancers combined and both sexes (left) and for major cancer sites in men (centre) and women (right), in the EU-27.

had the highest observed rates in 2010-2014 (53.2/100 000) and 2015-2019 (45.9) and in the projected one (37.9) while the UK reported the lowest observed ASRs (29.4 and 25.4) as well as the projected one (20.4). Among women, France (+14%), Italy (+5.6%), and Spain (+5%) showed unfavorable projected rates for 2023 as compared to the observed ASRs in 2015-2019, while Germany (−6.4%), Poland (−5.8%), and the UK (−14.3%) reported a decrease in ASR. Poland and the UK ranked first for the observed ASR in 2015-2019 (17.9 and 18.9/100 000) as well as the predicted ones (16.8 and 16.2/100 000, respectively), while Spain showed the lowest rates (9.2 observed in 2015-2019 and projected 9.6/100 000 in 2023). In both sexes in the EU-27, the age group for which we estimate the highest decline in ASR is 25-44 years (−57.9 and −35.8%, respectively, for men and women). We estimate a decrease for women also in the age group 45-64 years (−6.95%) while unfavorable trends for 2023 versus 2015-2019 are registered for all ages (+0.74), 65-74 years (+9.6), and 75+ years (+10.6). Detailed results for lung cancer according to age group, sex, and country are reported in Supplementary Table S8, available at https://doi.org/10.1016/j.annonc.2023.01.010.

Figure 2 displays trends in total cancer mortality rates by 5-year calendar periods, in men and women separately, from 1970-1974 to 2015-2019, and predicted rates for 2023 with the corresponding PIs. Among men, stomach cancer ASR decreased over the whole period, while trends for the other cancer sites showed a decline since the late 1980s or early 1990s. In women, mortality rates for cancers of the stomach, colorectum, uterus, and leukemia have been falling since the 1970s while ASRs from breast and ovarian cancers started declining from the early 1990s. Pancreas and lung cancers showed unfavorable trends over the whole period. The projected lung cancer ASR is estimated to reach that of breast cancer in 2023. The corresponding trends and projections to 2023 for the UK are reported in Supplementary Figure S1, while Figures S2 and S3, available at https://doi.org/10.1016/j.annonc.2023.01.010, provide results for cancer-specific trends and predictions, respectively, in males and females from the six individual European countries analyzed.

Figure 3 shows the estimated number of avoided cancer deaths in EU-27 in both sexes between 1988 and 2023, assuming constant age-specific rates in 1988 (light grey area). During the 35-year period, in EU-27 5 863 000 deaths from all cancers have been avoided (3 998 000 in men and 1 865 000 in women). In the UK, the corresponding figure is 1 240 000 deaths (840 000 men and 400 000 women, Supplementary Figure S4, available at https://doi.org/10.1016/j.annonc.2023.01.010).

Figure 4 displays joinpoint analysis results for the EU-27 and UK annual lung cancer ASR for all ages, and for

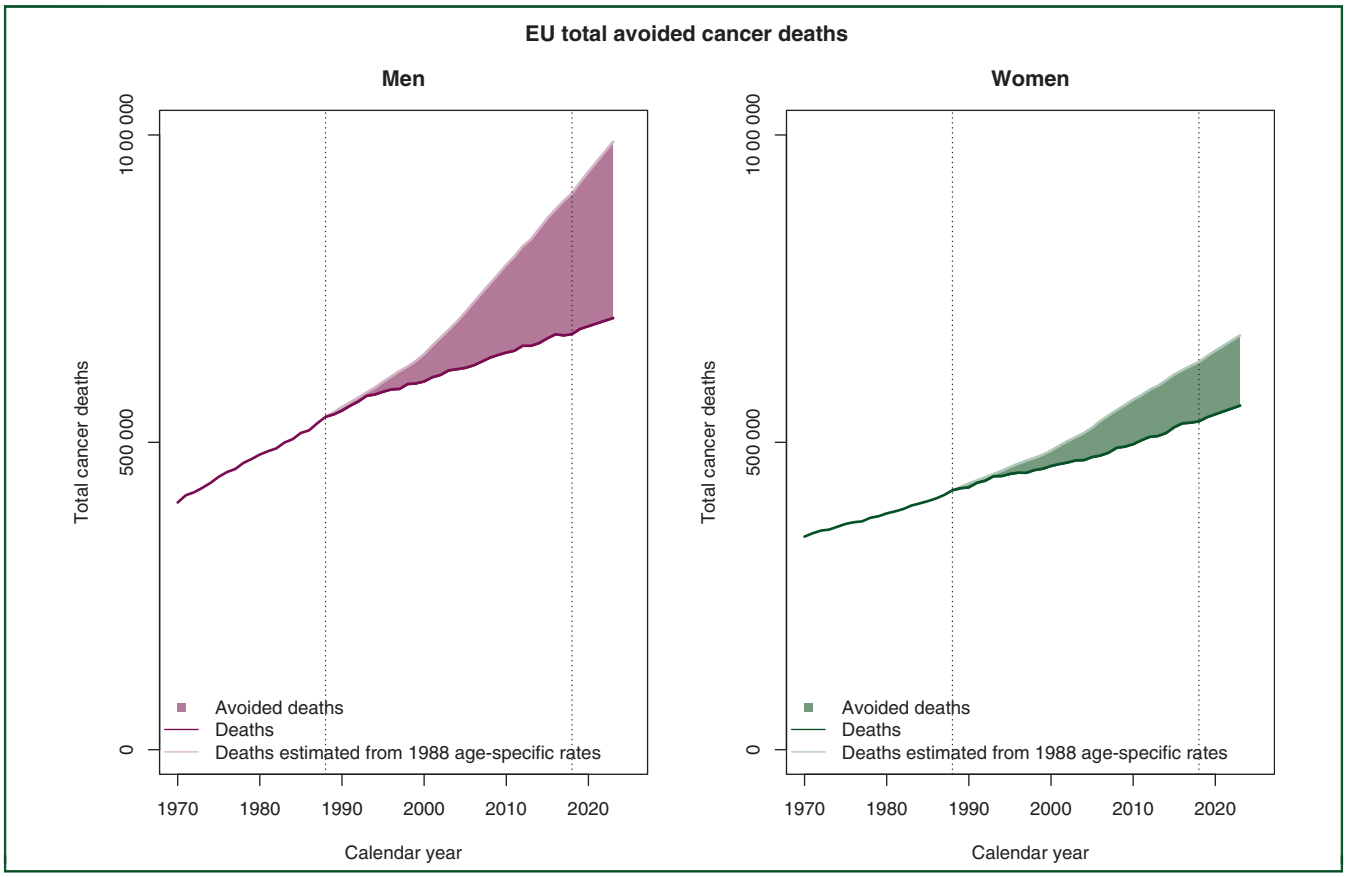

Figure 3. Total avoided cancer deaths for EU-27 men and women between the top rate in 1988 and 2023; observed numbers of cancer deaths from 1970 to 2018 and predicted cancer deaths from 2019 to 2023; estimated numbers of total cancer deaths by applying 1988 age-specific peak mortality rate. During the 35-year period, 5 862 600 deaths from cancer have been avoided (3 998 000 in men and 1 864 600 in women). In 2023 alone 286 800 in men and 114 000 in women, for a total of 400 800, are predicted to be avoided.

selected age groups between 1970 and 2023 and the avoided deaths between the observed top rate (1988 for the EU and 1983 for the UK) and 2023. In the EU-27, lung cancer mortality trends for all ages and truncated ages 25-44 years started to decline after 1985; men aged 65-74 and 75+ years showed later falls. In the UK, men of all ages and those aged 65-74 years showed a decline since 1970. A fall was observed in men aged 75+ years (started in the late 1990s). Women did not show favorable trends over time in EU-27 as well as in the UK at all ages and truncated ages. Results from the joinpoint analyses are reported in Supplementary Tables S9A and B, available at https://doi.org/10.1016/j.annonc.2023.01.010, respectively, for males and females. In EU-27, 1 375 000 male deaths were avoided during the period 1988-2023, and 650 000 male deaths were avoided in the UK during the period 1983-2023. No avoided deaths from lung cancer were observed in women, both for EU-27 and the UK.

DISCUSSION

The 2023-predicted mortality figures for cancer in the EU, five major EU countries, and the UK remain favorable. Rates fell by 6% in men and by 3.72% in women in the EU. However, the number of deaths were rising due to population growth and ageing to a total of 1 261 990 expected deaths in 2023 (702 214 males and 559 776 females).

The focus of this year's work is lung cancer, which was previously examined in 2017.[7] The UK has now left the EU, hence they are analyzed separately. Lung cancer accounts for 20% of total deaths in the EU (almost 23% and 15%, respectively, in males and females) while in the UK it accounts for around 19% (19% in males and 20% in females). The major determinant of lung cancer trends is tobacco smoking across generations.[8] The UK had earlier and larger smoking prevalence patterns in both sexes, but smoking cessation and non-initiation due to tobacco control measures were also earlier, particularly in men.[9] As a result, the highest historical rates for lung cancer in the UK were sensibly higher than in other major European countries. In the UK, smoking and consequently lung cancer mortality patterns are closer to those of the USA, particularly in men.[10,11] In the EU as a whole, data are favorable in males with falls predicted in all age groups and greater falls in the young and middle-aged. Results in EU women are also the cause for cautious optimism, since lung cancer mortality has stopped rising in women of all ages, and declines are predicted in the young and moderate ones in middle-aged women.[12] However, moderate rises were still predicted in the older age categories. Importantly, the greatest predicted falls in lung cancer mortality were in the young, reflecting

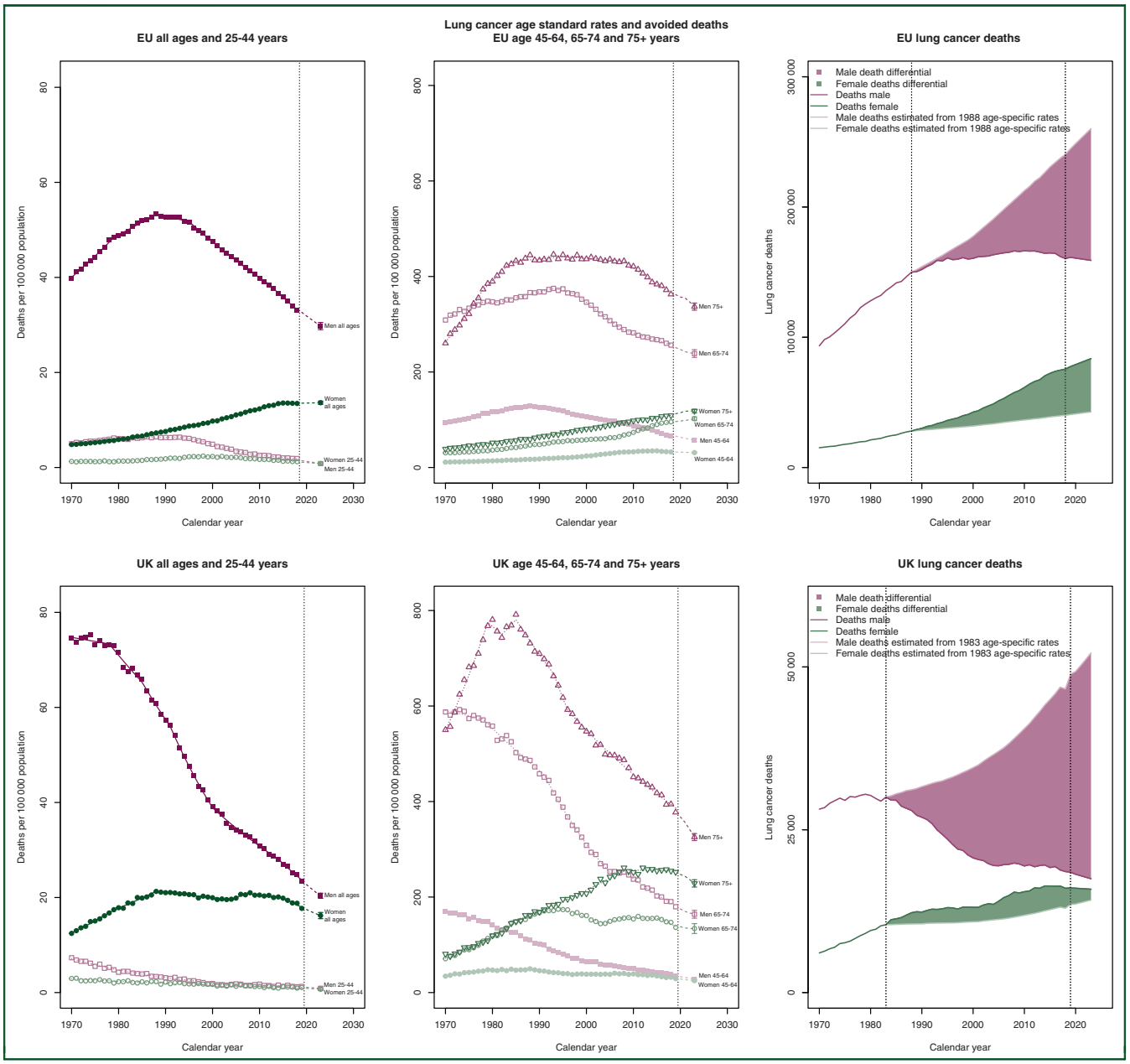

Figure 4. Joinpoint analysis for mortality from lung cancer for all ages and 25-44 years (left), 45-64, 65-74, and 75+ years age groups (center) during the period 1970-2018, the predicted rates for the year 2023 with 95% prediction intervals, and the total avoided lung cancer deaths between the top rate in 1988 and 2023; observed numbers of cancer deaths from 1970 to 2018 and predicted cancer deaths from 2019 to 2023; estimated numbers of total cancer deaths by applying 1988 age-specific peak mortality rate in EU-27 and the 1983 rate in the UK (right).

the impact of tobacco control policies (particularly towards non-initiation) in this age group.[13] Tobacco smoking became comparable in the two sexes, and male-to-female sex ratios approach unity.[13,14]

Control of environmental (outdoor and indoor) pollution, asbestos, and other occupational exposures also contribute to favorable lung cancer mortality rates across European men.[15] Survival in lung cancer patients is strongly dependent on the stage at diagnosis;[16-18] consequently, there are expectations towards new low-dose computed tomography showing mortality reductions of at least 20%.[19,20] However, there are no organized national programs in Europe and therefore the impact of screening on EU lung cancer mortality is undefined. In the UK, programs are underway following the positive results of the UK Lung Cancer Screening trial; however, their impacts on lung cancer mortality remain difficult to evaluate.[21,22]

Better and more efficient use of targeted therapies also had some impact on lung cancer mortality, though difficult to quantify. Surgery where clinically possible both for the initial curative resection and during follow-up to treat recurring lesions and as palliative care,[17,23] tyrosine kinase inhibitors for epidermal growth factor receptor mutations, anaplastic lymphoma kinase inhibitors, and immunotherapy with inhibitory immune checkpoint blocking antibodies are successful applications of precision medicine in non-small-

cell lung cancer treatment.[24] Furthermore, recent advances in combination chemo/immunotherapy for small-cell lung cancer are promising but difficult to quantify on national mortality rates.[25,26]

With smoking prevalence declining in the EU and UK, the attributable fractions of lung cancer are also slowly shrinking, leading to an ever larger proportion of lung cancers in non-smokers,[27] the main risk factors for these cases being second-hand smoke, air pollution, and radon.[28,29]

Stomach cancer projections for 2023 confirm previous data and projections showing consistent mortality falls in both sexes in the whole of EU. This success may be mainly ascribed to the decline in *Helicobacter pylori* infection and tobacco control as well as healthier diets and food conservation.[30,31] However, a variable proportion of these deaths is from neoplasms of the cardia, which are associated with overweight and obesity, the prevalence of which is widely rising.[32] About one-third of stomach cancers in European men and $<$20% in women originated in the cardia, with higher proportions in low-incidence countries such as France and Germany, and lower in Italy and other high-incidence countries.[32]

The second cause of cancer deaths, colorectal cancer, has shown favorable mortality trends, both recorded and projected in the EU, with Poland showing higher rates. However, the lack of progress in UK females is cause for concern. Rises in both incidence and mortality from young-onset colorectal cancer have been recorded[33] in the UK, similarly to the USA, Canada, and Australia; further unfavorable mortality patterns were also seen in cohorts of patients born after the 1960s in French and German women.[34] The falls in colorectal cancer mortality are largely attributable to progress in early diagnosis, screening, treatment, and overall management of the disease.[35,36] The higher rates in Poland (and other eastern EU countries) are at least partially explained by the slower adoption and implementation of these protocols, as well as differences in risk factor exposures. The differences in rates between the sexes derive from both differences in exposures, as well as from a cohort effect of screening in men born after the 1950s and a period effect in women from the 1990s possibly due to female hormone use.[14,37,38] The slower progress or lack thereof in some countries is also explained by prevalence patterns in overweight and obesity, and alcohol and tobacco consumption.[39,40]

Pancreatic cancer is the third cause of cancer deaths and the only one showing a continuous lack of progress, with either stable or a slight fall (Italy and Poland) in male rates, and a rising or stable rate in females. These trends cannot be satisfactorily explained by past patterns of smoking prevalence which is the major known determinant of pancreatic cancer.[41,42] A limited role in the lack of progress may also have been played by overweight, obesity, and diabetes, as well as heavy alcohol drinking.[43] Similar rising patterns are also observed in the United States.[44] Survival for pancreatic cancer remains depressingly low, with limited advancements in early diagnosis, treatment, and management of the disease.[45]

Projected trends and 2023 rates for breast cancer remain favorable, with Spain having rates $\sim$30% lower than the highest ones in Poland. These patterns are coherent with that observed in North America.[44] These falls cannot be explained by changes in risk factors (reproductive, dietary, or body mass—related) that, if anything, are changing unfavorably, as reflected by the slowly but consistently rising breast cancer incidence trends.[46] The results on mortality are plausibly the consequence of successful diagnosis, treatment, and management of the disease and of the high participation in organized mammography screening programmes.[47,48]

Cancer of the uterus (cervix and corpus) continues to show diminishing trends, with all the examined countries showing non-significant projected changes except for the favorable rate in Poland, which, however, has rates twice as high as Germany and Spain. The rise in overweight, obesity, and diabetes may be affecting the rates of endometrial cancer.[49,50] A similar pattern was observed in the United States where uterine corpus and not otherwise specified cancer of the uterus have shown the highest rise in cancer mortality in US women.[44]

The favorable pattern in ovarian cancer trends is confirmed in these projections, with the exception of Spain where the projected trend is stable. These trends are driven by the long-term protective effects of oral contraceptive use,[51] and on a lesser scale, the reduction in hormone replacement therapy use in countries where it was more widespread.[52] Advances in early diagnosis and treatment have also provided some contribution to the favorable trends.[53]

The main drivers of the declining trends in prostate cancer mortality are the improvements in treatment and management of the disease, together with some impact of prostate-specific antigen (PSA) testing and early diagnosis.[54] Lifestyle factors such as obesity and lack of physical activity are recognized risk factors, but their prevalence patterns and trends do not align with the favorable trends.[49] The differences in prostate cancer mortality across Europe, with lower rates in Mediterranean countries, remain unexplained.[55] High mortality in the UK is attributable to the limited use of PSA testing for screening and early diagnosis, but may also reflect higher incidence of the disease as compared with southern Europe. Poland is the only country showing projected rises, similarly to other central and eastern European countries.[56]

Bladder cancer is mostly linked to smoking and past occupational exposures,[57] explaining the large disparity in rates between men and women. Trends tend to follow historic patterns in tobacco smoking. Besides eliminating occupational exposure to aromatic amines and controlling smoking, the adoption of new early diagnosis and treatments and innovative disease management have some favorable impacts on bladder cancer rates.[58] The impact of these factors on national rates remains a complex issue to quantify.

The long-standing favorable trends and projected rates for leukemia are to be ascribed to the steady advancements

in the protocols for diagnosis, treatment, and management of these diseases, particularly in the young.[59-61] However, these results depend on access to high-quality specialized care centers that is heterogeneous even within the EU.[62]

Caution should be taken in the interpretation of predicted statistics, since they estimate values on the premise that no changes occur to the determinants of the current data. Consequently, our estimates cannot account for the effects of severe acute respiratory syndrome coronavirus 2 since it is posterior to the data available. The coronavirus disease COVID-19 pandemic may have an effect on cancer mortality in 2023 as a result of delayed visits and procedures, influencing both secondary prevention and treatment, and disease management for cancer.[63,64] A meta-analysis calculated that cancer screenings have been subjected to a significant decline (−47% breast cancer, −45% colorectal cancer, and −52% cervical cancer) during January-October 2020 because of the COVID-19 pandemic.[65] Similar estimates have been obtained for cancer treatments, evidencing in particular a reduction in surgery interventions, as well as for cancer diagnosis, which resulted delayed.[66] We could not account for this in our projections and it must be considered when interpreting the present data.

To maintain and improve favorable trends in EU cancer mortality, it is important to continue pursuing tobacco control strategies including uniformly rising cigarette pricing across Europe, and defining birth cohorts beyond which tobacco products will no longer be purchasable.[67] Also, further work on the identification of at-risk populations (also among nonsmokers) for lung cancer screening would make the practice more viable on a larger scale.[68]

More attention towards controlling overweight and obesity, improving dietary habits including the control of alcohol consumption, as well as organized screening programs for breast and colorectal, besides cervical cancer, and vaccination against hepatitis B virus (HBV) and human papilloma virus are priority measures for cancer control across Europe.[69] Treatment of HBV and HCV[70] and possible elimination of HCV[71] are also priorities to control hepatocellular carcinomas. Particular attention should be paid to countries that are still showing the greatest gaps in cancer mortality in the EU.[72-75]

Assuming that the trends in cancer mortality are maintained across the EU over the past decade, the target of reducing cancer mortality by 35% in 2035 may be met.[76]

FUNDING

This work was supported by the Italian Association for Cancer Research (AIRC) [grant number N. 22987].

DISCLOSURE

The authors have declared no conflicts of interest.

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