

# Assessing Cancer Related Premature Mortality and Productivity Loss in Lung, Melanoma, and Breast Cancers in European regions: Temporal Trends in 2010-2019

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## Background

- Across Europe, 2.2 million lives were lost to cancer in 2020<sup>(1)</sup>, with cost due to productivity losses from premature mortality estimated at €42.6 billion in 2009<sup>(2)</sup>.
- In Europe, the primary cause of cancer-related death is lung cancer<sup>(3)</sup>. Breast cancer was reported as the third most common cause of cancer death (141,765 deaths).<sup>(3)</sup> Melanoma is the 17<sup>th</sup> most common cause of cancer death<sup>(3)</sup>, but incidence has been rapidly increasing<sup>(4)</sup>.

Objective

To estimate the indirect economic losses incurred across the European regions in 2010, 2015 and 2019 and report on the temporal change in years of life lost (YLL), years of productive life lost (YPLL), and the present value of future lost productivity (PVFLP).

## Methods

- Country-specific mortality data were sourced from Eurostat<sup>(5)</sup> using ICD-10 codes for the following cancer types: lung cancer: C33-34; malignant neoplasm of trachea, bronchus and lung), breast cancer (ICD-10: C50; malignant neoplasm of breast), and skin cancer (ICD-10: C43; malignant melanoma of skin). Data was stratified by age and sex and sourced for three timepoints: 2010, 2015 and 2019.
- YLL was calculated using the age at death compared to life expectancy<sup>(6,7)</sup>. YPLL was calculated using YLL, labor force participation and country- and gender-specific retirement ages<sup>(8)</sup>. PVFLP was calculated using YPLL and gender-specific average annual wages sourced from Eurostat<sup>(9)</sup>. A 3% annual discount rate was applied to bring future costs into the present value.
- Outcomes were calculated independently for each country. Regional estimates for Northern Europe (NE), Eastern Europe (EE), Southern Europe (SE), and Western Europe (WE) were calculated by summing outcomes across countries to provide a regional estimate. Regions were defined as per the United Nations.<sup>(10)</sup>
- To allow comparison across regions, which have different population sizes, the sum of YLL or YPLL was divided by the total number of deaths to calculate YLL/death or YPLL/death.

## Results

- In 2019 compared to 2010, the annual lost productivity costs due to premature mortality reduced by €2,995M (26%) for lung cancer, €466M (10%) for breast cancer, and €295M (25%) for melanoma across Europe (Table 1).
- The number of deaths remained relatively stable, whereas YLL/death trends were more variable.
- YPLL/death decreased across all European regions between 2010, 2015 and 2019 for all three cancers. PVFLP trends heavily correlated with YPLL trends as PVFLP applied wage to YPLL.
- Lung cancer
  - YLL/death was stable across regions (5%) between 2010-2019. YPLL/death decreased across all regions (32%) with the largest reduction observed in EE (42%).
- Breast cancer
  - YLL/death trends were stable (0%). A 20% reduction in YPLL/death was observed across all European regions, with the largest reduction observed in EE (21%).
- Melanoma
  - A 9% and 32% reduction was observed for YLL/death and YPLL/death respectively across European regions in 2010-2019.

## Limitations

- Some European countries (e.g., United Kingdom, Ukraine, Denmark amongst others) could not be included in the analysis as they did not have data available across all three timepoints. Trends identified may not hold true for missing countries.
- Life expectancy increased over the three timepoints across the European regions which may have impacted the YLL/death trends observed for lung, breast, and melanoma cancer. YPLL showed a clearer trend as retirement age did not change across time.
- Only costs due to productivity losses (measured by wage) due to premature mortality were captured. Morbidity, caregiver burden or direct costs were not captured. Therefore, these results are a conservative estimate of the economic burden.

## Conclusion

- Although the number of deaths remained stable over time, the decreasing YLL and PVFLP seen across indications would suggest that deaths are occurring at an older age. This could be a result of improved survival of the cancer types over time and reducing burden on workforce.
- Continued efforts to prioritize cancer health policies to improve prevention, early diagnosis and activation of early treatment pathways, as well as the development of innovative therapies could serve to reduce loss of life and improve productivity.

Table 1. Years of life lost (YLL) per death and years of productive life lost (YPLL) per death due to lung cancer, breast cancer, and melanoma for Europe and European regions over time: 2010, 2015, and 2019

	YLL/death			YPLL/death			PVFLP		
	2010	2015	2019	2010	2015	2019	2010	2015	2019
<b>Lung cancer</b>									
Eastern Europe	8.71	9.43	9.05	3.02	2.27	1.76	€ 1,005,536,942	€ 789,091,404	€ 589,457,481
Northern Europe	9.17	9.42	9.81	1.79	1.33	1.11	€ 370,855,008	€ 278,109,619	€ 229,126,764
Southern Europe	10.90	11.25	11.69	2.85	2.47	2.13	€ 2,841,938,215	€ 2,645,388,575	€ 2,291,243,928
Western Europe	11.79	11.97	12.16	3.21	2.72	2.23	€ 7,358,865,220	€ 6,788,531,781	€ 5,472,212,020
Across all European regions	10.70	11.06	11.21	2.99	2.48	2.04	€ 11,577,195,386	€ 10,501,121,378	€ 8,582,040,193
<b>Breast cancer</b>									
Eastern Europe	13.70	14.04	13.62	3.28	2.78	2.60	€ 246,249,673	€ 237,345,790	€ 232,412,743
Northern Europe	14.72	14.18	14.89	3.64	2.89	2.95	€ 236,508,395	€ 182,245,227	€ 194,285,003
Southern Europe	15.90	15.71	16.36	4.90	4.15	4.03	€ 1,258,276,228	€ 1,164,786,663	€ 1,167,412,826
Western Europe	15.18	14.59	14.98	4.25	3.49	3.41	€ 2,834,342,602	€ 2,575,453,219	€ 2,515,436,609
Across all European regions	15.11	14.79	15.11	4.24	3.51	3.41	€ 4,575,376,899	€ 4,159,830,899	€ 4,109,547,181
<b>Melanoma</b>									
Eastern Europe	12.08	12.22	10.63	5.02	4.16	3.16	€ 75,732,647	€ 71,729,367	€ 54,946,288
Northern Europe	13.10	12.75	12.84	4.15	3.23	2.86	€ 96,690,764	€ 82,583,891	€ 64,912,549
Southern Europe	16.34	15.13	15.02	6.73	5.29	4.74	€ 285,162,841	€ 259,506,767	€ 241,323,978
Western Europe	15.01	13.49	13.54	5.65	4.30	3.87	€ 734,560,664	€ 633,186,700	€ 535,670,398
Across all European regions	14.62	13.60	13.28	5.67	4.43	3.88	€ 1,192,146,917	€ 1,047,006,726	€ 896,853,213

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