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ORIGINAL ARTICLE

Financial toxicity and socioeconomic impact of cancer in Europe

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Background: Even with universal health care, patients living with cancer often face substantial treatment-related costs and income loss in Europe. Insights into the socioeconomic impact of cancer within and across countries are needed to create awareness, inform policy, and develop targeted measurement instruments. The SEC study aims to explore the socioeconomic impact and financial toxicity of cancer and identify vulnerable patient groups across Europe.

Patients and methods: To investigate experiences of a large number of patients, data were collected in a collaborative effort of hospitals and patient organizations across Europe through convenience sampling. Patients undergoing treatment currently or treated within the past 2 years could participate. A 44-item survey was developed to measure the socioeconomic impact following a cancer diagnosis. The primary outcome was the level of financial toxicity, measured by the Financial Index of Toxicity (FIT) score. To identify vulnerable groups, multiple regression analyses were used to investigate the association between the FIT score, clinical characteristics, and socioeconomic demographics, including cancer type, employment status, and country of residence.

Results: A total of 2507 patients across Europe met the inclusion criteria. Fifty-six percent of the patients reported income loss and 86% additional treatment-related expenses. Sixteen percent of patients delayed or avoided medical visits, buying medication, surgery, or other health services. Next to a significant association of the country of residence, our regression models demonstrated that divorced, self-employed patients who were younger (−0.02; $P = 0.000$) and lower educated (0.75; $P = 0.000$) with a lower household income (1.21; $P = 0.000$) and children (0.21; $P = 0.000$) at the time of diagnosis reported significantly higher FIT scores compared with older patients who were married (−0.56; $P = 0.000$), retired (−1.55; $P = 0.000$), or employed (−0.56; $P = 0.000$).

Conclusions: In every European Union country, a substantial number of patients with cancer report serious financial consequences and stress. Further research is critical to inform well-tailored policies and interventions to limit the socioeconomic impact on patients with cancer.

Key words: financial toxicity, Europe, oncology, socioeconomic impact, non-treatment adherence, income loss

INTRODUCTION

Significant advancements in technology and the introduction of new cancer medications have greatly improved the chances of survival for cancer patients.[1] However, the high cost of these advancements has placed a significant financial burden on national health care systems, sparking debates about the sustainability of funding for medical care and expensive treatments.[2] These discussions have focused

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on societal or payer perspectives, often overlooking the experiences of patients themselves. Especially in the past decade, recognition of the financial impact of cancer on patients and their households has grown, recognizing it as a source of distress and inequity.[3]

After patients receive a cancer diagnosis, the gravity of their concerns exceeds pure health-related considerations. Many will also worry about the financial implications for themselves and their families. In addition to direct and indirect treatment-related out-of-pocket costs, patients are especially at risk of experiencing a reduced ability to work.[4] If out-of-pocket costs and income loss are severe, some patients may have to resort to financial coping mechanisms to manage the financial implications,[5] such as seeking financial assistance, borrowing money, or maladaptive coping behavior such as making treatment decisions that may not be in the best interest of their health (e.g. delaying or avoiding medical visits).[6] This highlights that socioeconomic consequences are not solely a policy concern but also a clinical issue that can affect a patient's health outcomes.[2]

Prior research on socioeconomic impact has mostly been conducted in the United States, given the high treatment costs, out-of-pocket expenditures, and relatively limited social security protections.[7] However, it is a misconception that patients living in countries with a universal health care coverage are protected from socioeconomic impact.[8] Recent studies across Europe highlight the significant socioeconomic impact of cancer, with disparities in financial burden, health care access, and patient outcomes. A study conducted in Germany reported that many cancer patients experience income loss and out-of-pocket medical expenses.[9] In the UK, Cancer Research UK found that cancer death rates are disproportionally high, with a 60% increase in the most deprived areas compared with affluent regions, largely due to higher smoking prevalence and barriers to timely health care access.[10] In the Netherlands, the Dutch Cancer Registry released a 2024 report highlighting that individuals with lower socioeconomic status not only have a shorter life expectancy and cancer incidence but also face significant differences in cancer diagnosis, treatment access, and health care utilization. Further, the report indicates that financial difficulties affect 22% of lower-income cancer patients, compared with 12% in higher-income groups.[11] On a broader scale, the European Cancer Inequalities Registry identified significant disparities in cancer mortality across European Union (EU) countries, calling for systematic monitoring and targeted policy interventions to reduce socioeconomic inequalities in cancer care.[12]

According to the World Health Organization, monitoring health inequalities is crucial for developing evidence-based policies aimed at reducing disparities and promoting health equity.[13,14] However, within the EU region, limited cross-country patient-reported data on cancer's socioeconomic impact hinder the creation of policies that safeguard vulnerable populations and advance health equity. Additionally, existing research on the financial burden of cancer in Europe remains fragmented and lacks a uniform methodology.[15,16] Variability in concepts such as financial burden, hardship, and stress, alongside inconsistent definitions and measurement approaches, complicates cross-country comparisons. Studies employ varying concepts (e.g. *financial burden*, *hardship*, *stress*) with little consensus on definitions or metrics,[16] which hampers cross-country comparisons. Using the financial question of the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire - Core 30 (EORTC QLQ-C30) instrument, *ad hoc* questionnaires, or the USA-validated COmprehensive Score for financial Toxicity (COST) questionnaire, national studies in a few EU countries have revealed substantial socioeconomic impact across cancer types.[6,17-19] However, according to the EORTC, existing tools are either only narrowly validated, restricted to a certain health care system or specific cancer site, and often do not cover all relevant domains of financial toxicity.[20]

Before moving toward a formally validated European instrument, more data are needed to explore country-specific items as well as those that are comparable across countries. Given the varying levels of governmental involvement in health care financing, regulation, and provision of social security across EU countries, the degree of socioeconomic impact is likely to differ among populations within and between countries.[21] Understanding the extent and context of socioeconomic impact is a pre-requirement to guide effective and patient-centered regulations and support programs. It offers the opportunity of best practice learning and is particularly important to develop patient-centered policies that protect vulnerable patient populations and their families.[22] The objective of this study is to explore the socioeconomic impact following a cancer diagnosis across Europe and to identify vulnerable patient groups.

PATIENTS AND METHODS

The SocioEconomic impact of Cancer (SEC) study is a cross-sectional European study and conducted to investigate the socioeconomic impact of cancer from a patient perspective. Patients currently undergoing anticancer treatment or treated within the past 2 years were included. Data were collected using an online patient-reported questionnaire addressing various aspects of socioeconomic impact. Descriptive statistics and multiple regression analyses were carried out to explore the association between financial toxicity and demographics, as well as to identify vulnerable patient groups within different EU countries.

Development of the survey and the Financial Index of Toxicity

In the literature, various terms such as financial burden and financial toxicity are used to describe (parts of) the socioeconomic impact of a cancer diagnosis.[23] For this study, socioeconomic impact refers to the changes in the social and economic aspects of patients' lives due to their cancer diagnosis, including out-of-pocket expenses and income loss.[24] Based on scientific literature[6,25-28] and expert input from the Organisation of European Cancer Institutes (OECI) Health Economics Working Group, a survey was developed. The final 44-item survey included demographic items,

clinical items, items on objective and subjective financial burden, and the EuroQol 5-Dimension 5-level (EQ-5D-5L).[29]

The level of financial toxicity among cancer patients was measured using the Financial Index of Toxicity (FIT).[30] The instrument was validated with Canadian head and neck cancer patients and was chosen because the Canadian health care system is close to the European context. Another frequently used outcome we considered was the US-developed COST.[23] Although the COST showed strong correlations with the European financial impact item of the EORTC QLQ-C30, the instrument was eventually not selected, as it provided limited known group validity in the first European study in Italy. According to the authors, this was due to the characteristics of the social security system in Italy.[19]

The FIT combines psychological and practical elements of financial toxicity into a single score, consisting of nine items grouped into three subscales, each with individual scores:

- The financial stress subscale evaluates the ability of patients to pay for food, housing, and medications since their cancer diagnosis.
- The financial strain subscale evaluates the satisfaction of the patients' finances and the perceived comparison with their peers since their cancer diagnosis.
- The lost productivity subscale evaluates if the patient and/or caregiver had to permanently quit their job due to their cancer diagnosis.

Each item is scored from 0 to 1, allowing to calculate the total FIT score (=sum of items $\times$ 100/9). This results in a total FIT score which ranges from 0 (lowest toxicity = patient is able to afford basic necessities and medication, and is satisfied and not worried about finances, and did not permanently lose their employment due to the cancer diagnosis) to 100 (highest toxicity = patient is unable to afford basic necessities and medication, and is very unsatisfied and worried about finances, and along with their caregiver permanently lost their employment due to the cancer diagnosis).[30] More details are provided in Supplementary Appendix S1, available at https://doi.org/10.1016/j.esmoop.2025.105293.

Data collection

Due to the exploratory nature of the study, priority was given to include a large sample of patients and countries. A convenience sampling strategy was chosen, collecting data in a collaborative effort from hospitals affiliated with the OECI and patient organizations between September 2021 and September 2022 across 25 EU countries. Informed consent was obtained from all patients before their inclusion in the study. The inclusion criteria for the study were as follows: patients residing in an EU country, currently undergoing treatment or treated for cancer within the past 2 years, and aged $\geq$18 years. Patients who did not complete the survey (<58% completion, which makes it unable to calculate the FIT score) or were not treated in the past 2 years were excluded. In hospitals, clinicians and nurses at the participating sites informed eligible patients before or after their consultations. Due to the European data sharing regulations, data had to be collected anonymously and were only collected pseudo-anonymously if patients decided to participate on paper.

Statistical analysis

Descriptive multivariate analysis was conducted to explore patient characteristics related to socioeconomic impact in each country with a sample size >15. Multiple linear regression analysis, incorporating socioeconomic demographics and the FIT score, was used to identify vulnerable populations. By including the patients' country of residence in the models, national differences in social support, governmental programs and health care systems, and insurance were addressed. The country with the lowest average FIT score was chosen as the reference country (the 'gold standard'). To evaluate multicollinearity, heatmaps were utilized to visualize pairwise correlations among the independent variables. Furthermore, variance inflation factors (VIFs) were calculated for all independent variables to quantify the degree of collinearity. Variables exhibiting a VIF >5 were systematically reviewed and potentially excluded to enhance model stability. The final selection of variables was guided by existing literature and expert judgment. Model refinement was conducted through comparative analysis of multiple regression models, employing analysis of variance tests and adjusted R^2 values derived from the linear regression output in R. Three logistic regression models were carried out per subscale, using the same independent variables as the multiple regression model for the FIT score. All tests were two-sided with a significance level (α) of 0.05. Data imputation was not carried out for missing values but patients with incomplete responses were excluded from the regression analysis using case-wise deletion. Additional details are presented in the Supplementary Appendices S1-S9, available at https://doi.org/10.1016/j.esmoop.2025.105293.

Ethical considerations

The study received ethical approval separately from all institutions that required ethical review, including the Netherlands Cancer Institute, Maastricht UMC, Rijnstate hospital, Institut Català d'Oncologia, Oslo universitetssykehus HF, HUS Helsinki University Hospital, and University of Heidelberg.

RESULTS

Descriptive statistics: exploring socioeconomic impact of cancer

From September 2021 to September 2022, 4074 patients provided their consent to participate in the SEC study. Of these participants, 3150 patients completed the survey sufficiently according to the inclusion criteria. Patients who were non-European residents (n = 53) or had not been treated within the past 2 years (n = 590) were excluded. Ultimately, a total of 2507 patients from 25 EU countries were eligible for inclusion (Table 1). Further, we present the

Table 1. Patients' characteristics

Patients' characteristics	$n = 2507$	%
Gender		
Female	1832	73.1
Male	612	24.4
Non-binary	63	2.5
Age (years)		
Mean (SD)	54	12.5
Range	18	91
Marital status		
Married or partnered	1708	68.3
Single	378	15.1
Divorced	303	12.1
Widowed	110	4.4
Missing data	8	
Education		
Doctoral studies	127	5.1
Bachelor's/master's degree	979	39.1
Vocational education	677	27.0
High school	426	17.0
Primary school	200	8.0
Other	98	3.9
Country		
Spain	520	20.7
The Netherlands	413	16.5
France	241	9.6
Germany	208	8.3
Bulgaria	201	8
Norway	196	7.8
Cyprus	192	7.7
Denmark	176	7
Finland	127	5.1
Belgium	96	3.8
Switzerland	47	1.9
Czech Republic	25	1
Greece	22	0.9
UK	15	0.6
Lithuania	8	0.3
Croatia	7	0.3
Other countries ($n = 6$)	6	0.2
Romania	3	0.1
Portugal	2	0.1
Sweden	2	0.1
Treatment		
Treated before time of questionnaire (<2 years)	683	27.2
Currently treated	1824	72.8
Treatment types		
Chemotherapy	1639	65.4
Surgery	1532	61.1
Radiotherapy	1246	49.7
Hormonal therapy	813	32.4
Immunotherapy	434	17.3
Targeted therapy	295	11.8
Other	300	12.0
Cancer category[a]		
Malignant neoplasms of breast	1181	47.1
Malignant neoplasms of digestive organs	302	12.1
Malignant neoplasms of female genital organs	196	7.8
Neoplasms of hematopoietic or lymphoid tissues	189	7.5
Malignant neoplasms of middle ear, respiratory, or intrathoracic organs	175	7
Malignant neoplasms of male genital organs	114	4.5
Malignant neoplasms of urinary tract	82	3.3
Malignant neoplasms of skin	65	2.6
Neoplasms of brain or central nervous system	60	2.4
Malignant neoplasms of lip, oral cavity, or pharynx	44	1.8
Malignant neoplasms of endocrine glands	22	0.9
Malignant neoplasms of ill-defined or unspecified primary sites	14	0.6
Other	63	2.5
Presence of metastasis		
Not metastasized	1550	61.8
Metastasized	927	37.0
Unknown	30	1.2
Occupation before diagnosis		
Employed	1490	63.5
Retired	298	12.7
Self-employed	283	12.1
Disabled, not able to work	86	3.7
Not employed, looking for work	85	3.6
Not employed, not looking for work	72	3.1
Student	31	1.3
Missing data	162	
Household income before diagnosis[b]		
High income	1003	45.4
Medium income	529	24.0
Medium/low income	428	19.4
Low income	244	11.1
Missing data	303	

[a]Cancer types were clustered into cancer categories of the International Statistical Classification of Diseases and Related Health Problems (ICD-11) (Supplementary Appendix S2, available at https://doi.org/10.1016/j.esmoop.2025.105293).
[b]Categorization of the household income of patients was calculated based on the purchasing power parity of the country and the mean national income) (Supplementary Appendix S2, available at https://doi.org/10.1016/j.esmoop.2025.105293).

descriptive statistics for 11 countries with $n > 30$ inclusions. For the complete results ($n > 15$), please refer to the Supplementary Appendices S1-S9, available at https://doi.org/10.1016/j.esmoop.2025.105293. It should be noted that 47.1% of our sample are patients with breast cancer and 73.1% are female.

Income loss, employment, and working hours changes after a cancer diagnosis

Fifty-six percent of the included patients reported income loss (Figure 1). The lowest rates of income loss were observed in the Netherlands (51%) and Spain (52%), while the highest rates were found in Finland (63%) and Cyprus (66%). Regarding the magnitude of income loss, the plurality of patients (28%) reported a decrease ranging from €200 to €800 per month. However, in Switzerland (28%), Denmark (17%), and Cyprus (15%), some patients reported losing >€1200 monthly. It is to be noted that Figure 1 has not been adjusted for purchasing power parity, but the median monthly earnings per capita[31] were added for context.

Changes in employment were observed before and after diagnosis (36%; range 28%-52%). There was a decrease in employment (−41%), self-employment (−39%), and student status (−45%). Conversely, there was an increase in retirement (+58%), unemployment (+133%), and disablement (+485%). Among employed patients, ∼70% (range 42%-84%) of patients adjusted their working hours: more patients worked <12 h (+542%) or 12-16 h per week (+214%). Conversely, a decrease was observed in patients working more than 16 (−23%) or 36 h per week (−59%). This trend was consistent across all included countries.

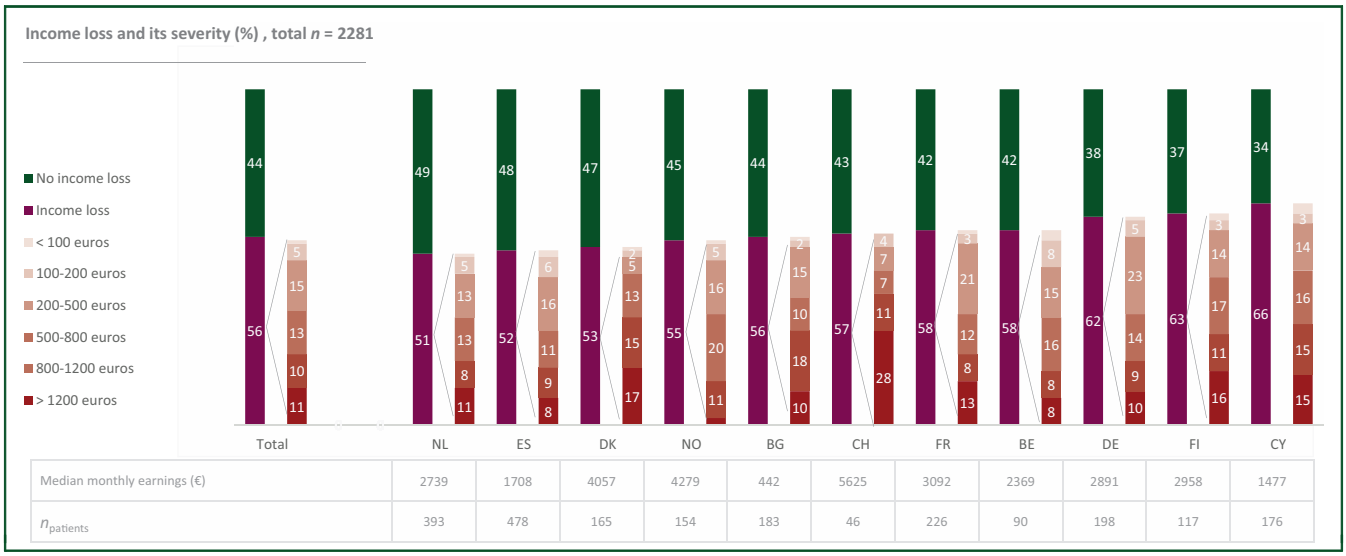


Figure 1. Income loss and median monthly earnings per country, not adjusted for purchasing power parity.
BE, Belgium; BG, Bulgaria; CH, Switzerland; CY, Cyprus; DE, Germany; DK, Denmark; ES, Spain; FI, Finland; FR, France; NL, The Netherlands; NO, Norway.

Figure 2 shows trends in selected countries, and the complete dataset is presented in the Supplementary Appendices S1-S9, available at https://doi.org/10.1016/j.esmoop.2025.105293.

Additional treatment-related expenses and financial and maladaptive coping behavior per country

A majority of patients (86%; range 40%-99%) reported additional expenses related to their treatment (Figure 3A). These were most commonly travel expenses (51%; range 8%-72%) and unreimbursed prescribed and non-prescribed treatments (41%; range 15%-73% and 37%; range 14%-73%, respectively). Specifically, travel expenses were more prevalent in Bulgaria (72%), Finland (71%), and the Netherlands (71%). Additional prescribed treatment-related expenses were most prevalent in Bulgaria (63%) and Finland (73%).

A significant proportion of patients (58%; range 37%-89%) reported attempts to increase their resources to financially cope with the treatment-related expenses (Figure 3B). Attempts to increase resources included patients using their savings (35%), applying for financial assistance (13%), cutting back on luxury expenses (29%), and even reducing spending on basic goods (22%). Tapping into savings was reported more frequently in Bulgaria (67%), Finland (46%), and Belgium (43%). Applying for financial assistance was more commonly reported in Cyprus (32%), Finland (20%), and Norway (19%).

In terms of maladaptive coping behavior, 16% (range 8%-38%) reported delays or avoidance of medical services due to financial constraints (Figure 3C). This behavior was more prevalent among patients in Bulgaria (38%), Belgium (23%), and France (21%). The specific medical services that were most often delayed or avoided included medical visits (6%) and purchasing medication (7%). Notably, the avoidance or delay of chemotherapy, radiotherapy, and surgery was less frequently reported across the countries, although Bulgaria exhibited a slightly higher prevalence. Further information can be found in the Supplementary Appendices S1-S9, available at https://doi.org/10.1016/j.esmoop.2025.105293.

Inferential statistics: identification of vulnerable populations

Across all included countries, patients were experiencing financial toxicity, as indicated by the European average FIT score of 31 [standard deviation (SD) 22] and the observed SDs ranging from 17 to 25 (Supplementary Appendix S6, available at https://doi.org/10.1016/j.esmoop.2025.105293). The Netherlands was chosen as a reference country for the regression analyses as it displayed the lowest average FIT scores in our sample. The multiple linear regression model yielded statistically significant findings regarding factors associated with the FIT score (Figure 4A and B). Country of residence was found to have a significant association, with Bulgaria showing a 1.08 increase and Cyprus showing a 1.42 increase compared with the Netherlands (reference category) (Figure 4A). Regarding the other patients' demographics (Figure 4B), education exhibited a significant association, with primary education showing a 0.75 increase of FIT score compared with bachelor's/master's degree (reference category). Marital status demonstrated a significant association, with a decrease of 0.57 for being married or partnered compared with being divorced (reference category). Employment status exhibited a significant association, with a decrease of 0.56 for employed compared with self-employed patients (reference category). Household income displayed a notable association, with a 1.21 impact for low income compared with high income (reference category). Age exhibited a negative influence, with a decrease of 0.02 per year. Other factors with a more limited yet statistically significant association with the FIT score were having children (+0.21 per child) and quality of life (−0.03). Notably, almost all categories related to cancer type, metastasis, and treatment characteristics did not significantly associate with the FIT score.

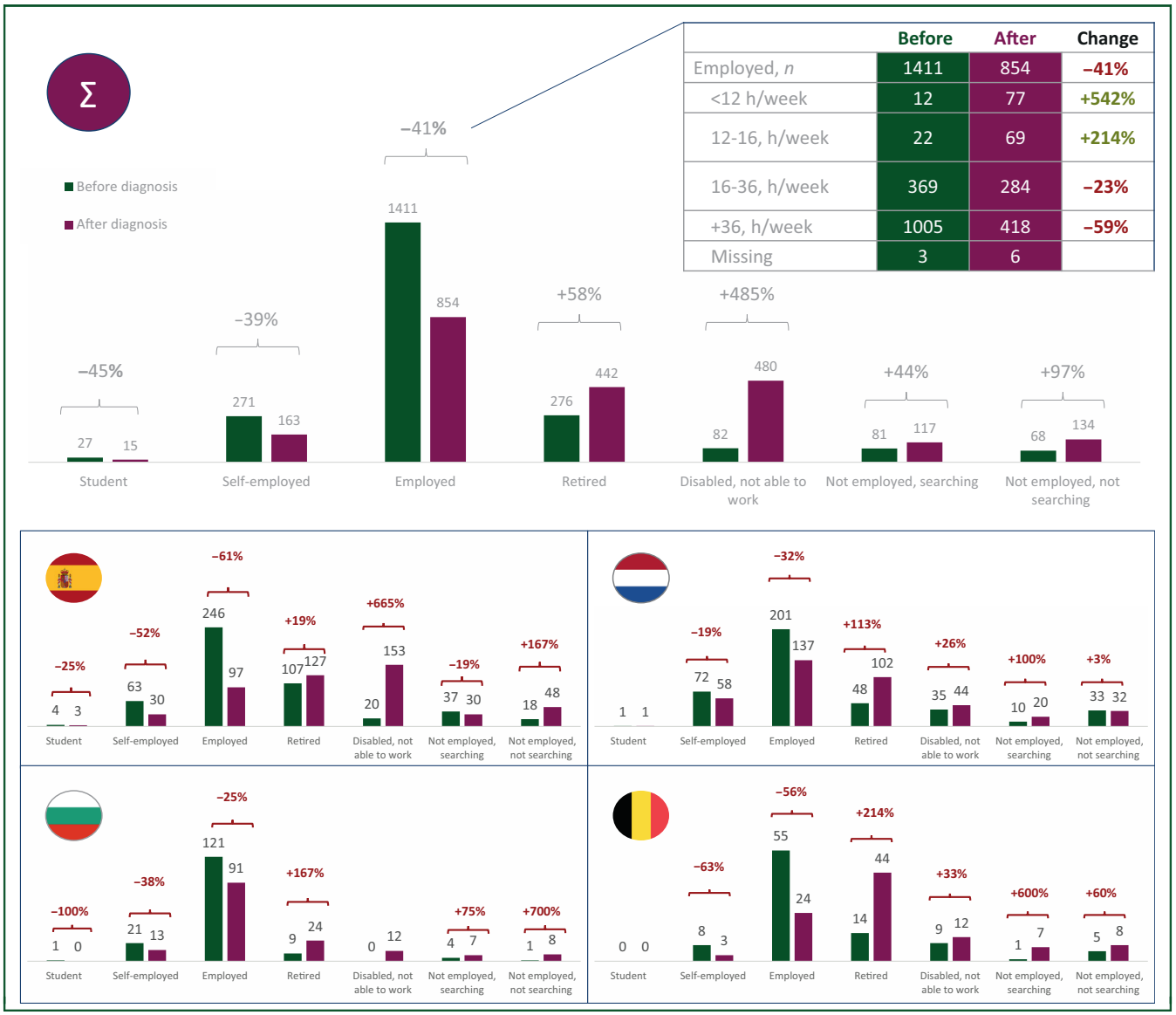


Figure 2. Employment changes in total and per country. Occupational and working hours changes in total and per country are presented.

In the logistic regression models on the subscales, several factors were found to be significantly associated with the subscales of the FIT. Country of residence was significantly associated with all three subscales: financial strain, loss of productivity, and financial stress (Figure 4C). Specifically, patients living in Finland, Cyprus, and Bulgaria had significantly higher financial strain scores compared with the Netherlands. Financial stress scores were significantly higher for patients in Bulgaria, Cyprus, Belgium, and Finland. Lost productivity scores were significantly lower for patients living in Norway and higher for patients living in Spain. Detailed information on these models can be found in Supplementary Appendix S8, available at https://doi.org/10.1016/j.esmoop.2025.105293.

DISCUSSION

Our findings reveal a significant impact of a cancer diagnosis on patients' financial well-being throughout Europe. In all countries, patients reported negative socioeconomic implications following their cancer diagnosis. Factors such as education, country of residence, marital status, employment, and household income were found to significantly affect the FIT score, pointing toward vulnerable population groups, which are likely to benefit from financial support programs. The study's exploratory findings provide insights into the unique challenges faced by different health care systems, countries, and population groups.

Country specificities

The European average FIT scores and high SDs suggest that patients experience financial toxicity in all included countries, also in those with a relatively higher gross domestic product (GDP). While changes in the employment status were associated with income loss in all countries, its relationship was not consistent. For example, Spain had the highest odds ratio of productivity loss among all countries (0.99), yet a lower rate of income loss (52%) compared with the total sample (56%). Similarly, despite a lower median

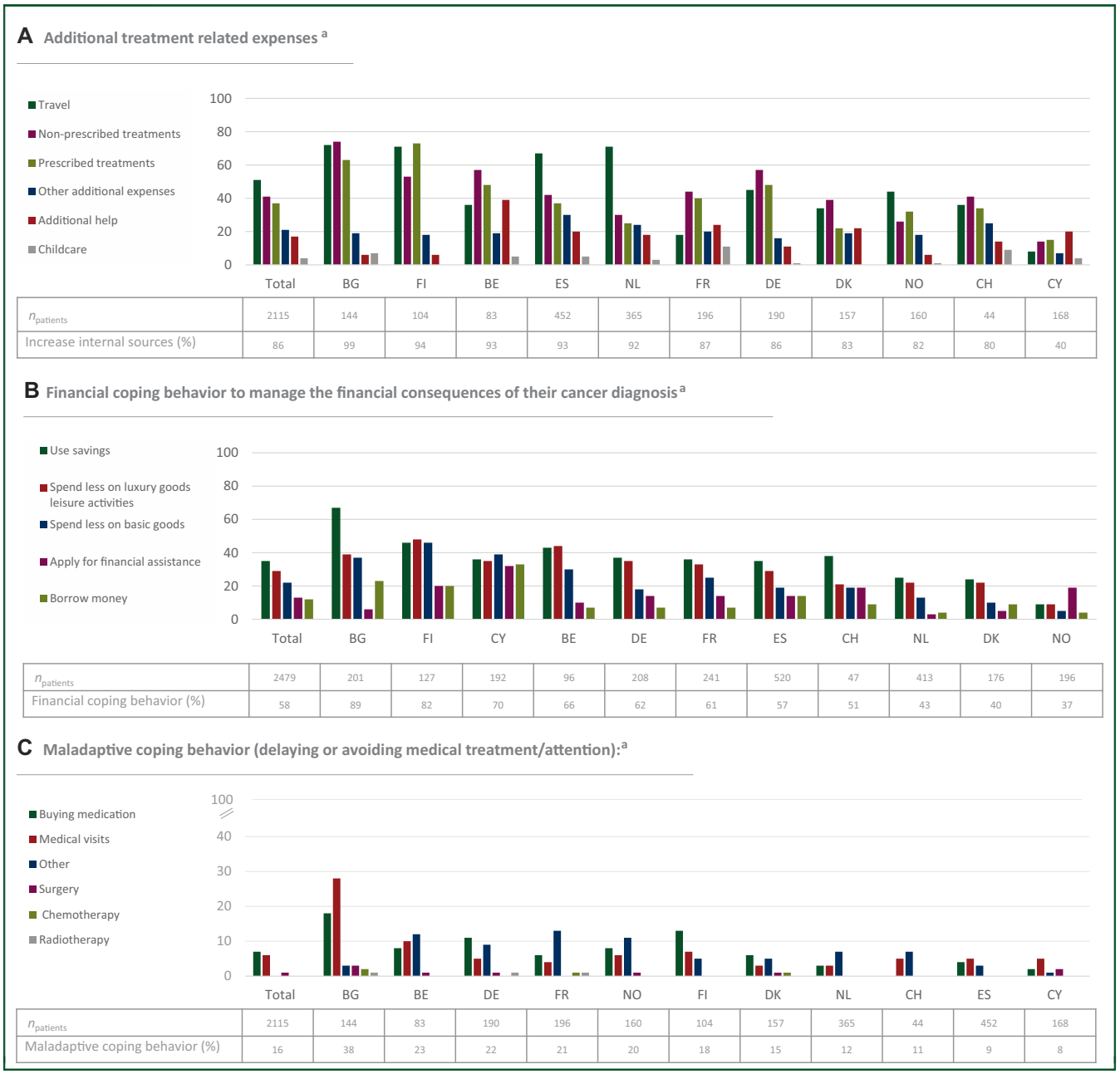
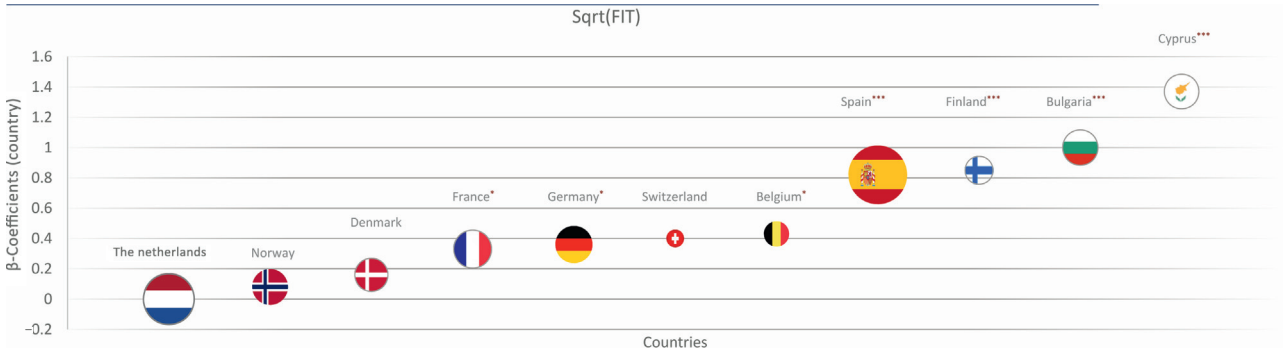


Figure 3. Overview of certain socio economic consequences of a cancer diagnosis. Additional treatment-related expenses (A), financial (B), and maladaptive (C) coping behavior per country.
BE, Belgium; BG, Bulgaria; CH, Switzerland; CY, Cyprus; DE, Germany; DK, Denmark; ES, Spain; FI, Finland; FR, France; NL, The Netherlands; NO, Norway.
[a]Double counting.

income, Cyprus had a relatively high percentage (15%) of patients experiencing monthly income loss exceeding €1200. In comparison, only countries with higher purchasing power parity such as Denmark, Finland, and Switzerland had higher percentages. These findings suggest that variations in labor market, social support, and health care financing play a significant role in determining the extent of socioeconomic impact experienced by patients.[32]

Next to the national employment and social security landscape, socioeconomic impact of cancer is also affected by specific reimbursement policies and the health care system overall.[32] For example, 16% of our sample reported to have delayed or avoided treatment due to its related expenses. This behavior was more frequently reported in countries, which reported higher income loss rates and treatment-related expenses. Especially, in Bulgaria, which has high out-of-pocket cost expenditures,[33] 99% of patients reported to have additional treatment-related expenses. They also reported delaying or avoiding medical visits (28%), purchasing medication (18%), and undergoing surgery (3%) more frequently than the rest of our sample. This was also reported in more affluent countries but to a lesser degree. Our findings also reflect the presence of well-designed policies and national support systems. For

A Graph demonstrating the associations between the patients' country of residence and the financial index of toxicity



B Complementing table with other significant associations between the patients' demographics and the financial ibdex of toxicity

Variables	Estimate	SE	Variables	Estimate	SE
(Intercept)	8.46***	1.88	**Education**		
Gender			**Master's/bachelor's degree**	REF	REF
Women	REF	REF	**Doctoral studies**	−0.33	0.18
Men	0.01	0.12	**Vocational**	0.47***	0.10
Non-binary person	0.06	0.24	**High school**	0.40***	0.12
Age	−0.02***	0.00	**Primary school**	0.75***	0.17
Marital status			**Other**	0.37	0.22
Divorced	REF	REF	**Pre-diagnosis occupation**		
Married or partnered	−0.56***	0.13	**Self-employed**	REF	REF
Single	−0.13	0.15	**Employed**	−0.56***	0.12
Widowed	−0.77***	0.22	**Student**	−0.37	0.40
Pre-diagnosis income			**Retired**	−1.55***	0.17
High income	REF	REF	**Disabled, not able to work**	−1.03***	0.24
Medium income	0.74***	0.11	**Not employed, looking for work**	−0.03	0.23
Medium/low income	0.62***	0.15	**Not employed, not looking for work**	−1.74***	0.24
Low income	1.21***	0.14	**Children**	0.21***	0.05

C The associations between the patients' country of residence and the subscales of the financial index of toxicity

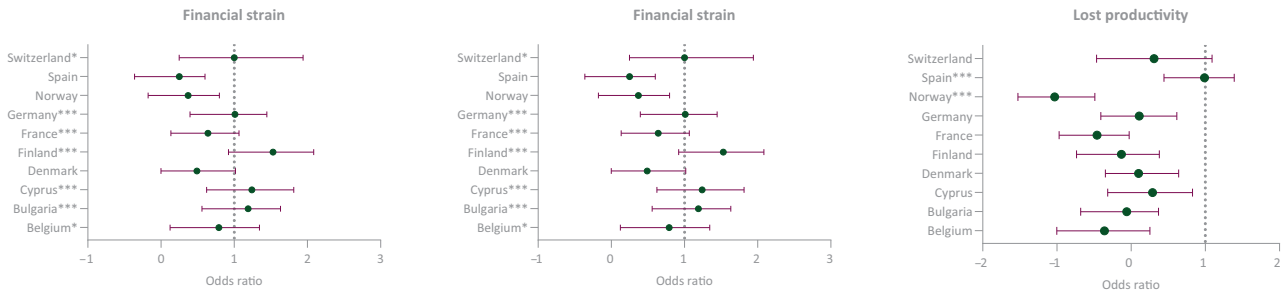


Figure 4. Results of the regression models. Graphs demonstrating the association between the patients' country, the FIT score (A), and its subscales (C) with the Netherlands as reference country; the table highlights significant associations between the patients' demographics and the FIT score (B) (full table in Supplementary Appendix S9, available at https://doi.org/10.1016/j.esmoop.2025.105293).
FIT, Financial Index of Toxicity; NL, The Netherlands; SE, standard error.
*Statistically significant difference observed with NL. ***Significant.

example, 19% of patients in Norway applied for financial assistance instead of using their own savings (9%) to pay for their treatment-related expenses.[34] They also needed less to decrease their spending on luxury (5%) and basic goods (9%) compared with other countries (29% and 22%). These findings demonstrate the impact that differences in health care systems and reimbursement policies can have on patients with cancer.

Vulnerable population groups

Using the regression models, our study explored several sociodemographic characteristics that suggested identification of vulnerable patients. Consistent with previous literature, education, age, marital status, employment status, and household income had a significant impact on financial toxicity.[9] Especially age (−0.02 per year) was associated with the FIT score and should be a focus point for support

programs. Previous research suggests that younger cancer patients [adolescents and young adults (AYAs)] are especially vulnerable as they face different financial challenges having limited resources compared with older patients.[35,36] Contrary to literature, we found no significant differences in the influence of sex, cancer stage, or treatment characteristics on the FIT score.[37] This could suggest that financial toxicity may rather be influenced by socioeconomic than disease-related factors. However, it is important to acknowledge that our sample has a strong focus on a young and female breast cancer population. Furthermore, even though collecting data regarding race, ethnicity, and migration in EU countries can be a sensitive and complex process, it is important to incorporate it into the European validated questionnaire and tailor the item(s) to each country's specific context yet also yield toward comparable results.

Differences in health care systems, social security policies, and labor market dynamics in dealing with disease influence the socioeconomic impact of cancer across the EU. Universal health care coverage and strong social welfare systems, such as in Sweden and the Netherlands, tend to provide better financial protection for cancer patients, reducing out-of-pocket costs and income loss.[38] In contrast, countries with more limited coverage or higher co-payments, like some Eastern and Southern EU countries, often place a higher financial burden on patients. For instance, per-capita health spending on cancer ranges from €75 in Eastern EU countries, such as Bulgaria or Poland, to about €300 in wealthier countries such as Germany or Switzerland.[38] Depending on social security policies, patients can face substantial out-of-pocket expenses for other aspects indirectly but significantly related to their treatments. For instance, according to a report by the Organization for Economic Co-operation and Development, out-of-pocket expenses can be subject to capped fixed co-payments (e.g. Ireland), uncapped fixed co-payments (e.g. France, Hungary, and Italy), capped co-insurance (e.g. Denmark), or uncapped co-insurance (e.g. Latvia).[39] Additionally, labor market policies influence patients' financial stability. Cancer survivors have a 40% higher unemployment risk and face greater reintegration difficulties particularly in countries with weaker labor protections and social support systems.[40] Countries with robust sick leave compensation and employment protections help mitigate income loss, while those with limited worker protections and high job insecurity expose patients to greater financial hardship. In at least 11 EU countries, no measures are taken in regard to the 'right to be forgotten' related to various financial services.[41] Specifically for AYAs, we investigated the knowledge of and availability of services across EU countries and found that 40% of the AYAs faced challenges in obtaining financial services, like mortgages, highlighting the need for targeted socioeconomic support and national guidelines tailored to AYAs.[42] Addressing these inequalities requires cross-country policy comparisons and coordinated EU-wide efforts to ensure equitable access to cancer care and financial protection for patients.

Recommendations

Firstly, enhancing health insurance coverage and reimbursement policies by reducing treatment-related out-of-pocket costs is critical to ensuring consistent and equitable access to anticancer treatments.[32] Health systems can identify specific treatments and cost-sharing mechanisms that disproportionately impact cancer patients and adapt coverage or compensation arrangements. Secondly, it is essential to develop methods for identifying subgroups at the onset of treatment and providing tailored social support. For example, personal wealth and financial resilience can be influenced by family circumstances, making research into the potential impact of a family history of hereditary cancer particularly relevant. Additionally, strengthening local support systems through patient-oriented programs, such as income assistance and financial counseling, is essential to help patients navigate cancer-related financial burdens.[43] These initiatives could be funded through public—private partnerships. Our findings highlight the need for targeted support for vulnerable patient groups, including young adults, divorcees, parents, and self-employed individuals. Thirdly, enhancing employment protections and facilitating work reintegration is vital. Policies that promote job security, flexible working arrangements, and reasonable accommodations can alleviate financial strain by enabling patients to maintain employment while undergoing treatment or returning to work after recovery.[44] Fourthly, raising awareness among health care providers and policymakers about the socioeconomic consequences of cancer is essential. Improved awareness can strengthen referral pathways to financial and social support services, ensuring patients receive necessary assistance throughout their treatment and recovery. Finally, further EU-wide research is needed to standardize socioeconomic impact assessments across member states. Moreover, research collaborations should be expanded to generate comprehensive data for evidence-based policymaking. Simultaneously, educational campaigns can improve patient awareness of financial and social support options, while public awareness initiatives can drive advocacy and policy measures to mitigate financial hardships for cancer patients.[33]

Limitations

Our study has several limitations. The online survey format may have introduced selection bias, as patients with greater interest in the topic or better digital capabilities may have been more likely to participate. Also, the involvement of patient organizations provided valuable insights into the development of the survey and facilitated data collection in countries where no hospitals were participating. However, this made it difficult to calculate a response rate, which was accepted given the study's exploratory nature. It is to be noted that still 77.3% of patients who gave informed consent filled in the survey sufficiently for analysis. Furthermore, the FIT questionnaire was preliminarily validated for head and neck cancer patients in Canada. However, its cut-

off point, translations, and applicability to different cancer types and EU countries remain to be further developed and validated. Cultural bias and recall bias might have affected the results, as indicated by lower inclusion rates and hesitation to share financial details among certain countries like especially the UK. Exclusion of certain countries with low inclusions from inferential statistics limited the generalizability, although similar patterns were observed in countries with higher inclusions. Moreover, as data were collected between September 2021 and September 2022, waves of coronavirus disease (COVID) might have affected our results. Countries showed different reactions to economic disruptions, job losses, and financial insecurity caused by COVID-19, and in some cases this could have exacerbated financial toxicity. However, as the pandemic involved almost all countries, the comparative picture over all countries might still be valid. Additionally, several responses in the open survey fields mentioned concerns related to the continuity of treatment, although we did not receive responses explicitly indicating a direct financial effect of COVID-19. Also, our sample was strongly represented by female and breast cancer patients. Lastly, we did not compare our data to a healthy population, which could provide valuable context for our results.

Strengths

To the best of our knowledge, this is the first study to explore socioeconomic impact across Europe. The large collaboration involving numerous hospitals and patient organizations allowed us to include this substantial sample of over 2500 patients with various cancer types, providing valuable country-specific data. We are committed to sharing data on specific patient populations, aiming to raise awareness and improvement of these socioeconomic challenges at national and European levels.

Conclusion

Our study demonstrates significant socioeconomic impact and financial toxicity in all involved European countries, highlighting the need for targeted interventions and support for cancer patients. The findings shed light on country-specific and patient-specific factors that influence socioeconomic impact. They also provide insights into relevant features of health care and social security systems. Further research is essential to deepen our understanding of socioeconomic impact of cancer in the European context and to develop comprehensive approaches to address this multifaceted issue.

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DATA SHARING

The data supporting the findings presented in this article, including text, tables, figures, and supplementary appendices, are available upon request from the corresponding author. To grant access, interested parties will need to sign the SEC data access agreement. Furthermore, the study protocol, statistical analysis plan, and informed consent form are accessible upon request.

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