Cancer Dashboard for Portugal

Andreas Pousette and Thomas Hofmarcher

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Purpose and content

This report is a part of an international initiative aiming to facilitate the exchange of best practices in cancer care among European countries. The core of the report is a dashboard for Portugal with an illustrative description of a selected set of key indicators. Although a multitude of metrics is needed to fully describe the cancer control status in Portugal, the selected indicators relate to outcomes, resources, and process metrics in all areas of cancer control. The indicators benchmark the current status quo in Portugal against target values specified in the National Cancer Control Strategy (NCCS 2030), targets set by international organizations, or the EU average.

The dashboard is intended to encourage the implementation of the NCCS 2030 in Portugal and other ongoing initiatives to improve cancer control in the country. The description seeks to support Portuguese policymakers in the decision-making and prioritization of initiatives in cancer care.

Contents

Prepared by IHE - The Swedish Institute for Health Economics

Authors: Andreas Pousette & Thomas Hofmarcher

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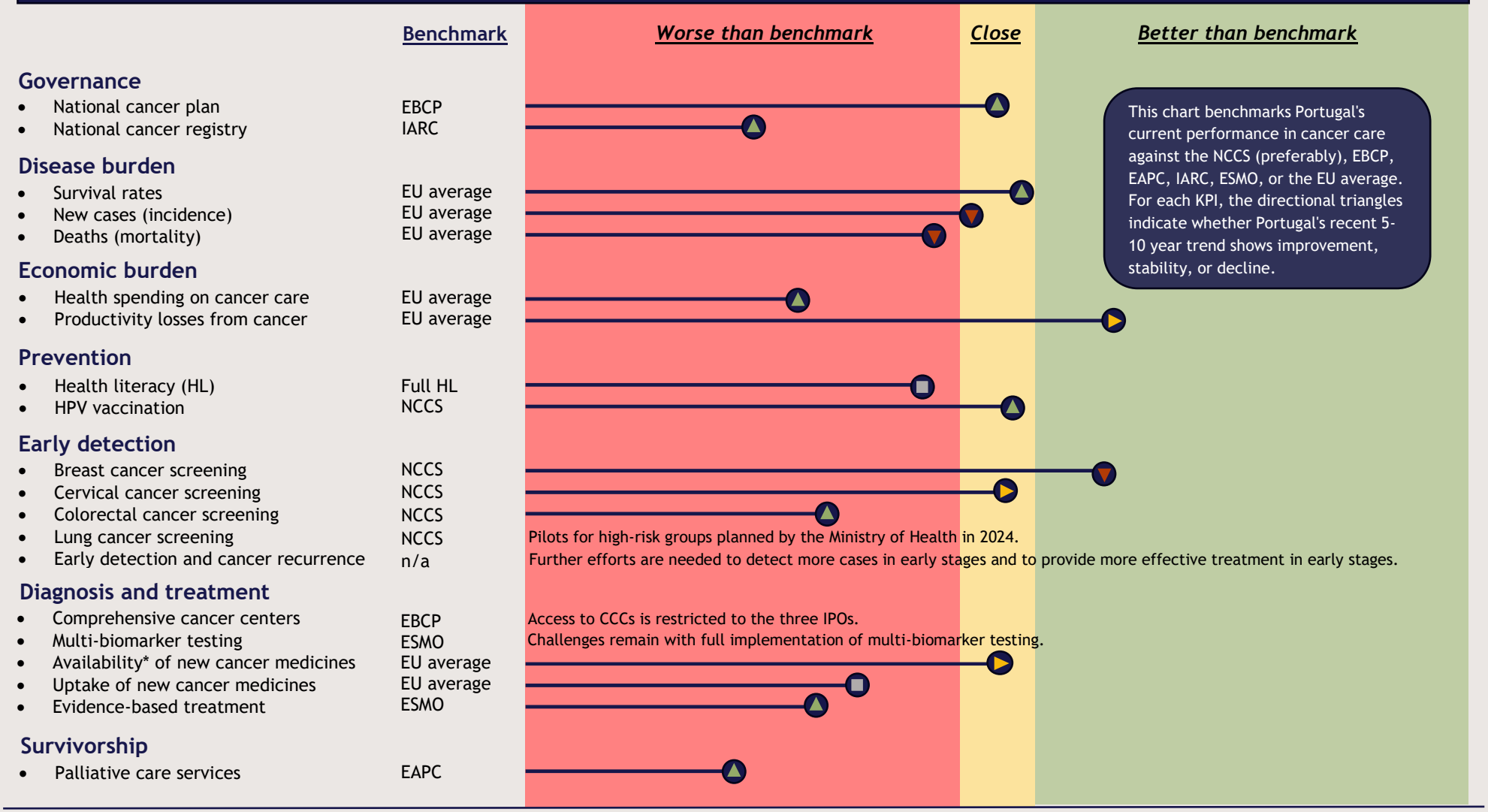
Dashboard overview Portugal

Comparative Performance: Portugal vs. Benchmark



Legend: ▲ Positive national trend, ▶ Stable national trend, ▼ Negative national trend, ▢ No data or not applicable

Notes: EBCP = Europe's Beating Cancer Plan, NCCS = National Cancer Control Strategy (Estratégia Nacional de Luta Contra o Cancro), EAPC = European Association for Palliative Care, ESMO = European Society for Medical Oncology, IARC = International Agency for Research on Cancer, KPI = key performance indicator, CCC = Comprehensive Cancer Center. n/a = not applicable. * Availability refers to both the rate of reimbursement and the time to reimbursement.

High-level recommendations

The number of cancer cases and cancer deaths in Portugal has witnessed consistent growth over recent decades, contributing to a parallel escalation in the economic burden of cancer. While the survival rates for cancer patients in Portugal typically surpass the EU average, numerous challenges persist. A recurring issue is the unequal access to care experienced by patients, influenced by their socioeconomic status and geographic location. The adoption of the National Cancer Control Strategy – Horizon 2030 (NCCS 2030) in December 2023 signifies a significant stride in tackling these challenges and enhancing cancer care.

Governance and funding

- ✓ Ensure full implementation of the NCCS 2030 through a collaborative effort by all health care stakeholders and monitor the progress towards achieving the specified strategies and aims in annual reports.
- ✓ Strengthen the funding for cancer care to support the planned actions in the NCCS 2030 and to improve equal access to high-quality, evidence-based cancer care for all patients across the country.
- ✓ Enhance the accuracy and timeliness of data in the national cancer registry in order to be able to use the data as a source to monitor and evaluate progress with the NCCS 2030.

Prevention

- ✓ Promote health literacy through targeted strategies that allow to communicate effectively with the less literate population.
- ✓ Facilitate the adoption and maintenance of healthy behaviors and lifestyles.
- ✓ Support efforts to maintain the high HPV vaccination rates in girls and boys, and work towards HPV elimination, considering implementing catch-up programs for boys and young men.

Early detection

- ✓ Promote participation of the eligible population in all screening programs, focusing especially on improving the literacy of people with low socioeconomic status and people living in regions with lower participation rates.
- ✓ Expand the target age group of the breast cancer and the cervical cancer screening programs in line with the 2022 recommendations by the Council of the European Union.
- ✓ Initiate the evaluation and implementation of new screening programs: lung, prostate and gastric.

Diagnosis and treatment

- ✓ Improve the integration between primary care and hospital care, leveraging the ongoing NHS reform as an opportunity to establish clear referral pathways for cancer patients and ensure more equal access to comprehensive cancer centers.
- ✓ Set up next-generation sequencing (NGS) testing capabilities in NHS hospitals or improve partnerships with private laboratories to ensure timely genomic testing and to facilitate the broad introduction of personalized medicines.
- ✓ Leverage the imminent application of the EU HTA regulation in 2025 as an opportunity to streamline the national HTA process for cancer medicines.
- ✓ Ensure adequate funding and a value-based framework for equitable access to innovative treatments.

Survivorship

- ✓ Increase capacity in palliative care (facilities and personnel) to cater for the increasing number of cancer patients.
- ✓ Improve the referral criteria for palliative care in line with the aims of the national Strategic Plan for the Development of Palliative Care.

Background

Cancer is the second-leading cause of death after cardiovascular diseases in men and women in Portugal and in the EU (1). The high burden of cancer has triggered policy initiatives both at the European level and in Portugal. The European Commission launched Europe's Beating Cancer Plan (EBCP) in February 2021 (2). The plan is a key public health initiative that sets out actions to support Member State's efforts at every stage of the disease: from prevention, early detection, diagnosis and treatment, to improve the quality of life for patients and survivors. The plan includes 10 flagship initiatives and 32 supporting actions to be implemented over the coming years. In addition, the EU Cancer Mission as part of the Horizon Europe research and innovation program 2021–2027 aims to "improve the lives of more than 3 million people by 2030 through prevention, cure and for those affected by cancer including their families, to live longer and better" (3). By joining efforts across Europe with citizens, stakeholders and Member States, the EU Cancer Mission together with the EBCP hopes to provide a better understanding of cancer, allow for earlier diagnosis and optimization of treatment, and improve cancer patients' quality of life during and beyond their cancer treatment.

National Cancer Control Strategy - Horizon 2030 (NCCS 2030)

In Portugal, the National Cancer Control Strategy – Horizon 2030 (NCCS, Estratégia Nacional de Luta contra o Cancro, horizonte 2030) was adopted on December 27, 2023 (4). The NCCS 2030 is aligned with the United Nations 2030 Agenda for Sustainable Development and the EBCP of the European Commission. The main objectives of the NCCS 2030 are to reduce the incidence of potentially preventable cancers, improve patient survival and quality of life, optimize strategies for early diagnosis, increase equity in access to healthcare, support the social and professional reintegration of survivors and support for caregivers.

Placing the citizen at the center, the strategy defines specific objectives and actions structured around four pillars:

- **Prevention** – Tobacco consumption control; controlling excessive consumption of alcoholic beverages; prevention of environmental and occupational exposure to carcinogens; promotion of healthy lifestyles (focusing on overweight/obesity, food consumption, physical activity); prevention of cancer associated with oncogenic viruses (HPV and hepatitis B and C).
- **Early detection** – Optimization of existing screening programs for breast, cervical, and colorectal cancer, focusing, e.g., on improving information systems and program adherence and reducing inequalities in access to these programs. Introduction of new screening programs in line with the recommendation by the Council of the EU (lung, prostate and gastric). Focus on people with hereditary cancer (Lynch syndrome and BRCA1/2 mutations).
- **Diagnosis and treatment** – Improve quality of care, equity in access, and research. The NCCS recognizes that healthcare resources are asymmetrically distributed in the country and institutions follow different management models. To enhance the quality of care, the proposal is to establish a hospital referral network of specialized cancer centers. To address inequities, adherence to the legal maximum waiting time for surgery, radiation therapy and surgery shall be improved. Access to clinical trials and cancer research should be promoted.
- **Survivorship** – Identify the needs of cancer survivors by implementing the measurement and monitoring of morbidity, disability, and quality of life. Transpose EU directives regarding work-life balance for parents and caregivers, and protection and equal access for patients and survivors to financial services, including insurance.

The NCCS defines four levels of governance/responsibility for the implementation of the strategy, with the Ministry of Health at the top level (4). The work with the strategy is coordinated by an Executive Committee led by the Director of the National Program for Cancer. The Executive Committee will also coordinate with the National Health Institute Dr. Ricardo Jorge (INSA) the publication of an annual report, to be presented to the Ministry of Health, with the main results of the implementation of the strategy and operational challenges. The ambition to enhance cancer care and patient outcomes until 2030 will likely require adequate resourcing enabled by a funding plan.

In the past decade, the governance of cancer care in Portugal has been supported by the adoption of several legal acts that intend to reinforce access to cancer care and improve the quality of life of survivors. Four examples are the following:

- The creation of reference centers for cancer (Ordinance no. 194/2014, September 3) aimed to improve and concentrate the provision of cancer care, through the recognition of the positive relationship between volume and quality of care provision. Reference centers for seven cancer types (rectal cancer, pancreatic cancer, esophageal cancer, sarcomas, testicular cancer, eye cancer, pediatric cancer) were established.

According to the NCCS 2030, the creation of reference centers did not translate into improvements in compliance with the maximum guaranteed response times for surgery in these centers (4).

- The Guaranteed Maximum Response Times (TMRG) stipulates a maximum waiting time for the provision of health care by the National Health Service (NHS, Serviço Nacional de Saúde) (Ordinance no. 153/2017, May 4); see section "Unmet need in access to health care" for more information. The TMRG ensures the right of access for NHS users to different types of non-urgent health care, within a time considered clinically adequate for their condition (5). However, according to the NCCS 2030, this legislation has not proven to be fully adequate, specifically regarding maximum response times for treatment with radiation therapy and cancer medicines (4).
- A law adopted in 2021 provides incentives to develop extra capacity for surgical activity. It establishes financial payments to target specific types of surgery with longer waiting lists and waiting times exceeding the waiting time guarantee (1).
- The "Right to be Forgotten" is a law that ensures equal access to financial services for cancer survivors (Law no. 75/2021, November 18th) applicable as of January 2022. It prevents people who have overcome serious illness, such as cancer, are being discriminated against in their access to loans or insurances. No health information regarding a previous cancer diagnosis may be collected by credit institutions or insures 10 years after treatment completion for adults, and 5 years if the diagnosis occurred before the age of 21 (6).

National Cancer Registry

A national population-based cancer registry is an essential tool to monitor cancer incidence, mortality, and other disease specific indicators. Cancer registry data help to inform decision makers in their strategies and efforts to reduce the cancer burden. The International Agency for Research on Cancer (IARC) spearheads efforts to support countries around the world to implement population-based cancer registries and provide relevant statistics, such as survival rates to assess the effectiveness of cancer services (7, 8).

In 2018, the Portuguese National Cancer Registry (RON) was established through a merger of three existing regional registries in continental Portugal, the Pediatric Cancer Registry, and the registries of the two autonomous regions (9). Currently, the RON is linked to all public health institutions (primary health care and hospitals) in Portugal, and to some private institutions (hospitals and laboratories) that have signed a sharing agreement with the registry. Collected information includes patient identification, diagnosis, tumor characteristics, treatment, and follow-up, including cancer staging, biomarkers, and treatment outcomes (10).

Despite the nationwide coverage, the RON is faced with several challenges. From a comparative perspective, including recommendations from IARC mentioned above, the RON could be improved by addressing the following aspects:

- **Data accuracy**: Although the RON has been integrated with other information systems, such as the death certificate information system and the surgery registration list, full inter-operability has not been achieved yet (11). Furthermore, the quality and accuracy of the data might be impaired by the lack of a standardized system for clinicians to input data to the registry (10).
- **Data openness and relevance**: The RON has so far published three reports for the years 2018-2020 that summarize top-level information on cancer incidence and mortality. However, the online database at the RON's website is not accessible to the public. The publicly available annual RON reports lack information such as on survival rates, which would help to assess the quality of care; and information on the stage distribution of new cancer cases, which would help to assess the effectiveness of screening programs and awareness campaigns. Information on treatment patterns is not provided either. Sweden is a country of reference on national quality registers for several tumor types that publicly report data on diagnostic procedures and treatments used (12). In Germany, a federal law adopted in 2013 obliged all states to collect additional clinical data in their population-based cancer registries as an active tool for monitoring and improving the quality of cancer care, increasing transparency, and promoting health research (13). These changes enable Germany to analyze detailed treatment patterns across the country.
- **Timeliness of data**: There is a considerable delay in the publication of the latest statistics on incidence by the RON. For example, the annual report for 2020 was only published on December 28, 2023 (14). Sweden, Finland, and Denmark are examples that publish nationwide cancer incidence statistics within 12 months (15-17).

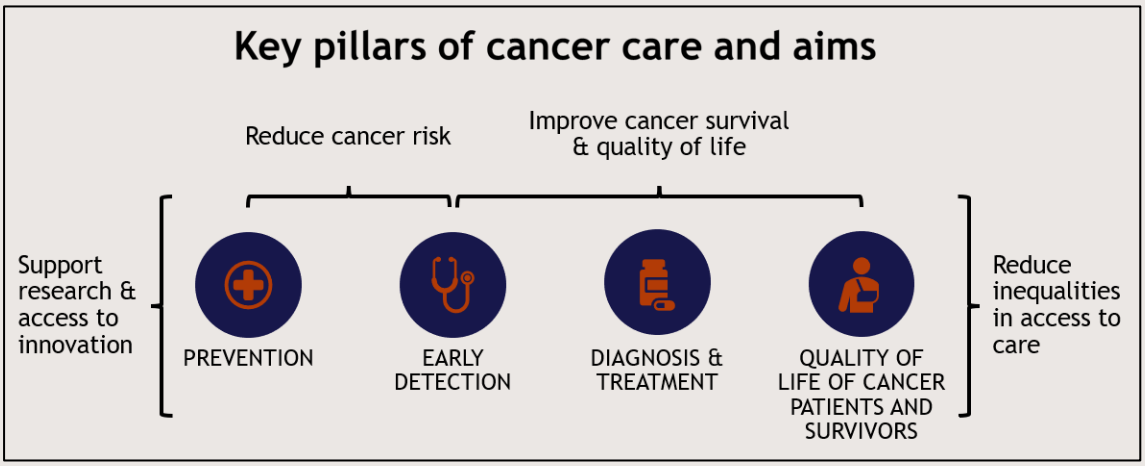
The aims in the NCCS 2030 for RON are to (i) create the first indicator for palliative medicine consultation, (ii) to identify and propose measures to monitor the quality of life of adult and pediatric cancer patients and survivors until 2026, and to (iii) design a model for systematic, population-based assessment of the quality of life of adult and pediatric cancer patients until 2026. Besides the new outcomes proposed, it is critical to identify specific strategies to improve data accuracy, data openness, or reporting timelines of the RON (4).

NHS reform

The NHS is currently undergoing a major reform (18). In 2024, all hospitals and primary care units within the NHS will be integrated into local health units. A recently established management body – the NHS Executive Directorate – will coordinate the operations of NHS health providers. The current restructuring of the NHS, with the dissolution of the Regional Health Administrations (ARS) and the creation of Unidades de Saúde Locais (ULS), required the transfer of the coordination and management of the three population-based cancer screening programs for breast cancer, cervical cancer, and colorectal cancer to the recently created "National Coordination Center for Population-Based Screening Programs" (19). This newly created entity will be responsible for the coordination and implementation of the national screening programs and will be under the direct supervision of the NHS Executive Directorate. It is critical that this change is viewed as an opportunity for further evolution of early cancer diagnosis and treatment.

Structure of the dashboard

The structure of this report is based on the aims and pillars of the EBCP and the NCCS 2030. These plans define four key pillars of cancer care – **prevention, early detection, diagnosis & treatment, survivorship** – as shown in the figure below. They follow the entire disease pathway. Major objectives include reducing the risk of getting cancer and improving survival and the quality of life of patients. Cross-cutting aims include reducing inequalities in access to care (e.g., of different socioeconomic groups to screening) and supporting research and access to innovation to be able to advance cancer care from the status quo.



This report starts with a comprehensive description of the disease burden and the economic burden of cancer. It emphasizes the role of investment in cancer care to achieve reductions in the disease burden, which will have a positive impact on both patients and the economy.

Choice of indicators for the dashboard

For each pillar of the EBCP, several key indicators were selected. The proposed indicators are in alignment with the NCCS 2030 as well as the EBCP.

- **Prevention** (2 indicators): Health literacy, human papillomavirus (HPV).
- **Early detection** (4 indicators + 1 case study): Screening for breast, cervical, colorectal, and lung cancer. Case study on early detection and cancer recurrence of cervical and lung cancer.
- **Diagnosis and treatment** (5 indicators): Comprehensive cancer centers, multi-biomarker testing, availability and uptake of new cancer medicines, evidence-based treatment.
- **Survivorship** (1 indicator): Palliative care services.

For each indicator, this report provides:

- General description of why this indicator is important and how it relates to the EBCP and the NCCS 2030
- Description of the current status in Portugal and comparison with other countries
- Recommendations for improvement

The sources of data and information used for the analysis are public and have been selected based on the original list of indicators assembled by IHE for the European Cancer Pulse. For the comparison with other countries, this report benchmarks Portugal against the EU average.

Disease burden of cancer

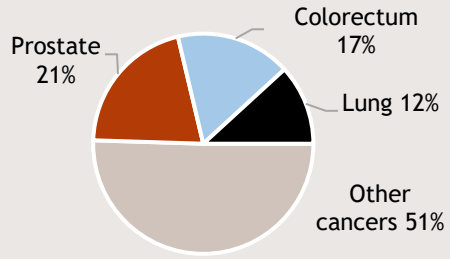
In 2022, the estimated number of new cancer cases was 66,600 in Portugal (20). The three most commonly diagnosed cancer types in men are prostate, colorectal and lung cancer, and in women they are breast, colorectal, and lung cancer. They account for half of all cancer cases. Cancer incidence in Portugal has surpassed the EU average in recent years, and it is predicted to continue to rise by 24%, driven by population aging until 2040.

Year 2022	Portugal	EU-27
Life expectancy at birth (years) (Source: Eurostat)	81.7	80.7
New cancer cases (estimated) (Source: ECIS)	66,600	2,742,447
New cancer cases per 100,000 (estimated crude rate) (Source: ECIS)	643	614
Cancer deaths (estimated) (Source: ECIS)	33,503	1,292,600
Cancer deaths per 100,000 (estimated crude rate) (Source: ECIS)	324	289

The number of cancer deaths has been gradually increasing in both men and women in country, reaching over 28,000 in 2020 (21). In men, the mortality rate started to exceed the EU average around 2010 and has continued to rise since then. In women, the gap in the mortality rate has almost converged to the EU average.

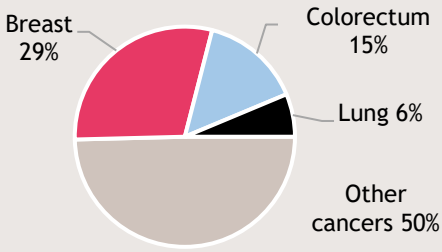
The 5-year survival rates (diagnosis period 2010-2014) in Portugal have been estimated to be just above the EU average for the most common cancer types (breast, colon, lung, prostate, and stomach) (22). They were also estimated to have improved compared to earlier periods in 2000-2004. However, no official survival rates by the RON have been published so far.

Number of new cases in 2022, men



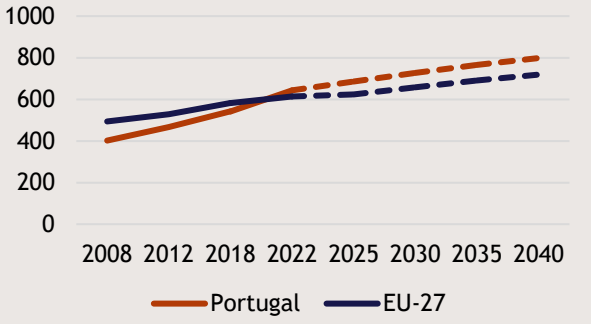
Source: ECIS

Number of new cases in 2022, women



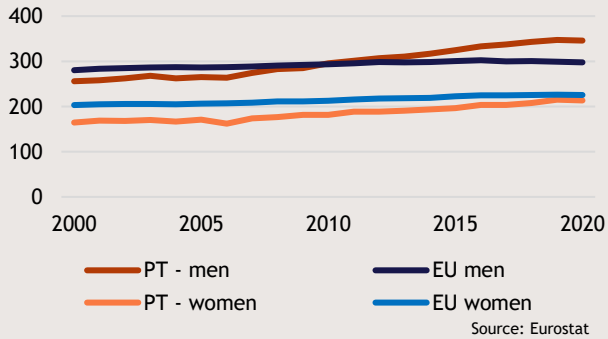
Source: ECIS

New cancer cases per 100,000 inhabitants (crude rates)



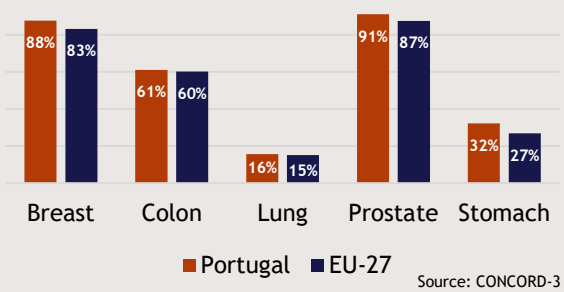
Source: ECIS and IARC

Cancer deaths per 100,000 inhabitants (crude rates)



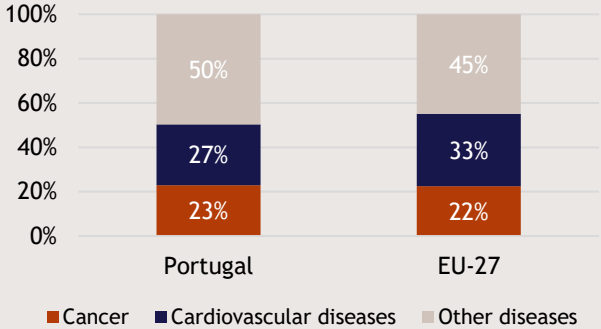
Source: Eurostat

5-year survival rates (2010-2014) for the five most common cancer types



Source: CONCORD-3

Leading causes of death (year 2020)



Source: Eurostat

Economic burden of cancer

In Portugal, the overall economic burden of cancer amounted to €215 per capita in 2018 (23). Most of the burden is caused by health care expenditure (45%) and by lost productivity of working-age patients (38%).

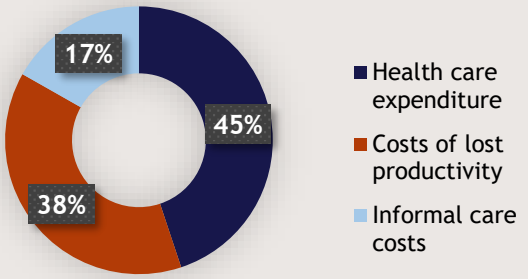
The economic burden of cancer consists of:

Health care expenditure (direct costs):
- Resources of the healthcare system (medical equipment, staff, medicines, etc.) funded both by public and private sources

Costs of lost productivity (indirect costs):
- Productivity losses from sickness absence, permanent incapacity/disability, and premature mortality of working-age patients

Informal care costs:
- Value of the time forgone by relatives and friends to provide unpaid care

Composition of the economic burden of cancer in Portugal in 2018

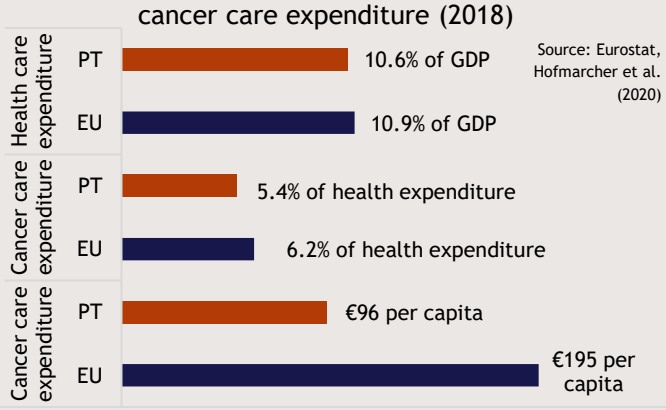


Source: Hofmarcher et al. (2020)

The economic burden of cancer (excluding informal care costs for which no trend data are available) in Portugal is estimated to have increased from €140 to €178 per capita from 2000 to 2018 (in 2018 prices). In a study by Lopes et al. (2017) (24), the health expenditure on cancer care were estimated to be €867 million (based on price data from 2015 and 2016). This corresponds to around 5.4% of total health expenditure, which is below the EU-average of 6.2%. The lower proportion of total health expenditure spent on cancer care partly explains why health spending on cancer care in Portugal (€96 per capita, and €114 per capita after adjusting for purchasing power parity) was around half of the EU average (€195 per capita) in 2018. In order to support the implementation of all planned actions in the NCCS 2030 and to improve equal access to high-quality cancer care for the growing number of cancer patients across the country, continued investment in cancer care seems warranted and requires adequate resources.

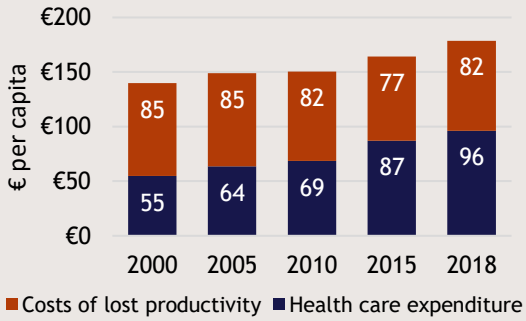
In Portugal, there is no systematic collection and monitoring of health expenditure on cancer care. As a result, there is a lack of information about how efficiently money is being spent on cancer care in relation to patient outcomes. For instance, the current financing model for hospitals via the state budget is not adapted or correlated to the costs of medicines (25), which constitute a large share of cancer care expenditure in Portugal (31.5%), according to Lopes et al. (2017) (24).

Health care expenditure (2020) and cancer care expenditure (2018)



Source: Eurostat, Hofmarcher et al. (2020)

Economic burden of cancer in € per capita (2018 prices)



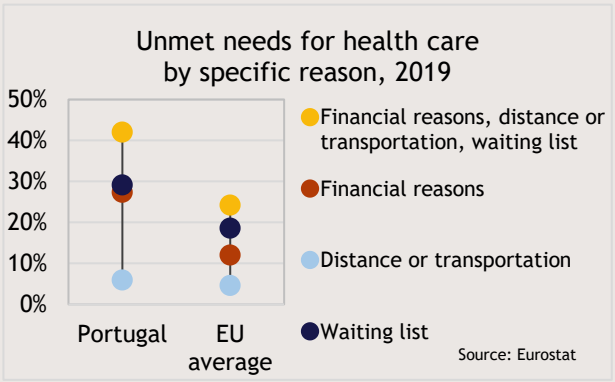
Source: Hofmarcher et al. (2020)

The costs of lost productivity of cancer patients were stable at around €80 per capita between 2000 and 2018 (in 2018 prices). After adjusting for purchasing power parity, the cost of lost productivity in 2018 amounted to €97 per capita. The stagnation of these costs despite a continued increase in the number of cancer cases is a positive sign and a consequence of the increasing survival rates in Portugal. In the EU, the costs of lost productivity even declined by 14% from €154 to €133 between 2000 and 2018. The reductions in these losses represent the monetary benefits for the economy from investing in cancer care leading to improved survival rates (23).

Unmet need in access to health care

At the EU level, unmet need in access to health care is monitored through the European Health Interview Survey (EHIS) and the EU statistics on income and living conditions (EU-SILC) survey (26).[1] According to the latest data from the EHIS (2019) for persons aged 15 years and older, 40% people in Portugal reported an unmet need for health care due to reasons of finances, distance/transport, and/or waiting lists (27). This is well above the EU average of 26%. Delayed access to health care due to long waiting lists was the most common reason for an unmet need in Portugal, closely followed by financial reasons.

Regarding financial reasons for unmet need in access to health care, out-of-pocket payments (OOP) constitute a burden for citizens. Portugal is one of few EU countries where the public share of overall health expenditure has decreased over the last two decades (between 2000 and 2021) (28). In 2021, OOP constituted 29% of overall health expenditure in Portugal, much higher than the EU average of 15% (29). The majority of the OOP is related to spending on outpatient care services.



In terms of long waiting lists, the Portuguese Health Regulatory Entity (ERS) monitors waiting times within primary and secondary care and compares regions with a benchmark value of guaranteed maximum response times stipulated in the TMRG legislation (5). A summary of waiting times relevant for oncology patients from the latest report by the ERS (year 2022) is provided below.

Waiting time to specialists (non-cancer specific)

At the end of 2022, there were around 600,000 people waiting for their first appointment with a specialist, of which 47% have had a waiting time longer than the legal limit (this limit varies by priority level: high priority = 30 days, medium priority = 60 days, normal priority = 120 days).

Waiting time to first consultation with an oncologist

At the end of 2022, 1,258 patients with suspicion or confirmation of cancer were waiting for their first appointment with an oncologist. 70% of these patients were waiting longer than the legal limit (priority level: deferred urgency = 0 days, high priority = 7 days, priority = 15 days, normal priority = 30 days).

Waiting time for surgery in oncology

Out of the surgeries performed at the end of 2022, only 37% were given normal priority as compared to 56% which were given a higher level of priority. 6,923 patients were awaiting surgery in the oncology area and 24% of them already exceeded the legal limit (priority level: deferred urgency = 72 hours after surgical indication, high priority = 15 days, priority = 45 days, normal priority = 60 days). According to statistics from 2022, around 40% of patients scheduled for prostatectomy were on the waiting list for more than 90 days (30).

According to the OECD, a contributing factor to the difficulties in adhering to the guaranteed maximum response times may be the lack of human resources (specifically medical oncologists and medical physicists) in NHS hospitals and their unequal geographical distribution across the country (10, 31).

Prolonged waiting times are also a considerable problem for accessing palliative care in Portugal. The National Palliative Care Network (RNCP) outlines the government's responsibility in matters of palliative care which involves early and timely intervention in the course of chronic, complex or life-limiting diseases (32). At the end of 2021, the NHS had operational Palliative Care (PC) teams in all but two hospitals and local PC teams in all districts. However, access to PC teams has been reported not to be equal across all levels of care (hospital, primary health care and PC networks) (32). A study by Marques et al. (2023) evaluated the existing PC strategies and concluded that the current model that separates PC from other forms of health care makes it inadequate to adapt to different local settings and that there is evidence of inefficient service coordination (33).

[1] The EU-SILC measures the unmet need as a proportion of the whole population studies whereas the EHIS only includes those who had a need of health care (19).

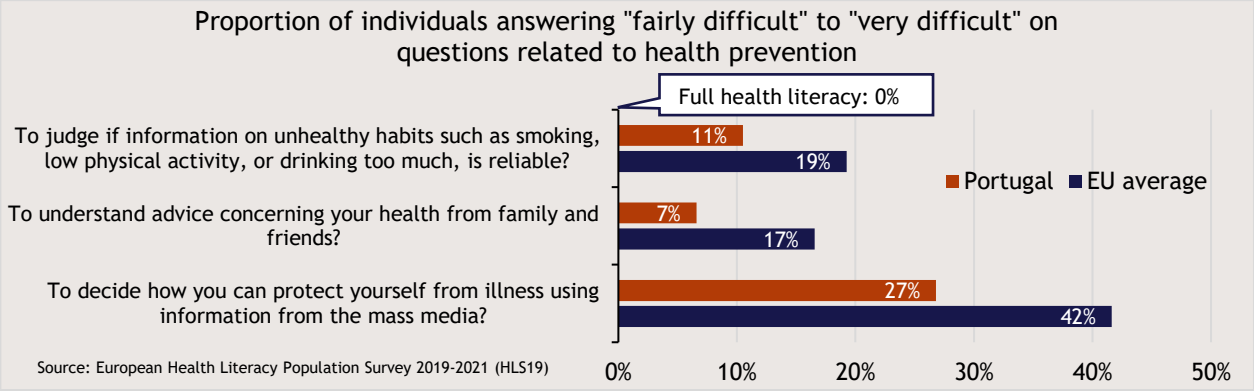
Prevention
Health literacy

Background

- The World Health Organization (WHO) indicates that 30–50% of new cancer cases are theoretically preventable, because they are caused by modifiable risk factors (34). The awareness of major risk factors – such as smoking, obesity, alcohol consumption, UV radiation from the sun – is therefore a key step towards changing the behavior of people and enticing them to adopt a healthy lifestyle. The European Code Against Cancer includes 12 actions that individual citizens can take to help prevent cancer (35).
- At the political level, the EBCP includes the aim of making at least 80% of the EU population aware of the European Code Against Cancer by 2025 (2). The NCCS 2030 includes aims to address several major risk factors (smoking, alcohol, overweight/obesity, food consumption, physical activity, etc.), and it specifically mentions the objective to promote health literacy among adolescents and young people, particularly at basic school level, regarding the risks of consuming tobacco products, new nicotine products and electronic cigarettes (4).
- Health literacy is a concept that has gained an increasing interest at an international level (36). It has been defined as the cognitive and social skills that allow individuals to gain access to, understand and use information to promote and maintain good health (37). Low levels of health literacy are associated with poor comprehension of medical and health information, low compliance with screening protocols, low adherence to treatment, and low overall health (38, 39).

Current status in Portugal

- The European Health Literacy Population Survey 2019-2021 (HLS19) measures health literacy in the general population in Portugal and 12 other EU countries (study sample of around 1000–3600 people per country) (40). According to this survey, the health literacy level in Portugal higher than the EU average. However, there is still a gap in ensuring full health literacy among the entire population in Portugal. In the figure below, three survey questions relating to health prevention ("preventive health literacy") illustrate these differences.



- A study commissioned by the Directorate-General of Health in Portugal in 2020-2021 used a version of the HLS19 which also included optional modules on digital health literacy of the general population (n=1525). Overall, 5% were classified as having an excellent level of general health literacy, 65% a sufficient level, 22% a "problematic understanding", and 8% an inadequate level. However, for organizational health literacy (i.e., the ability for people to navigate, understand, and use information and services to take care of their health (41), the prevalence levels of "problematic understanding" and "inadequate level" were much higher (65% combined); and the same was found for digital health literacy (53% combined) (42). A more recent Portuguese study highlighted that older age, low socio-economic status, low education level, and low perceived health were all factors that were associated with a low level of health literacy (43).

Recommendations

- Improve the health literacy of citizens and cancer patients by making health information more accessible, easier to understand and act on. Use the European Code Against Cancer as a guide to focus on major cancer-related risk factors.
- Conduct an assessment of current health literacy-enhancing procedures, such as the creation of patient materials and staff training, and involve patient advocacy groups in this review process.
- Adapt information materials to population groups that are more likely to have a low level of health literacy (e.g., elderly people, people with a low socioeconomic status).

Prevention

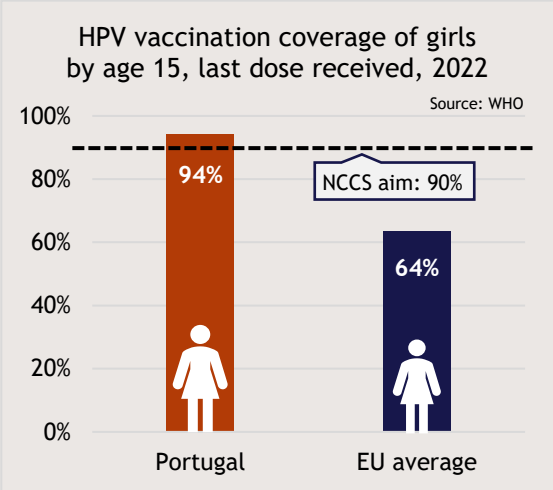
Vaccination against human papillomavirus (HPV)

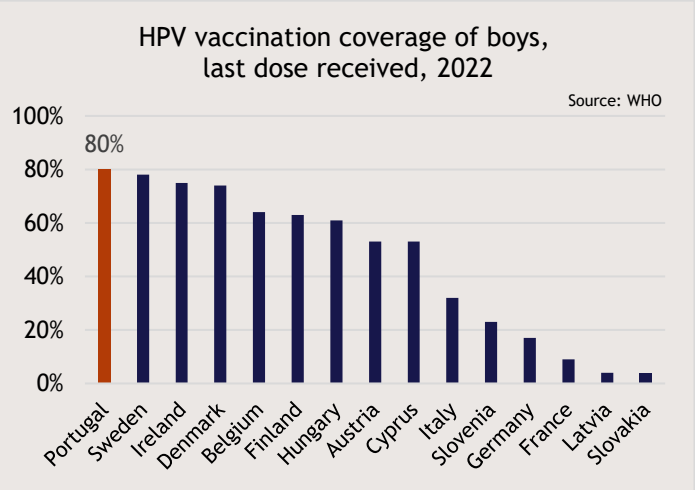
Background

- HPV is a group of sexually transmitted viruses that causes around 2.5% of all cancers in women and men in Europe (44). Vaccination against HPV became initially available in the EU in 2006. It has been found to be an effective and cost-effective intervention to prevent cervical cancer and other types of HPV-related cancers, including cancers of the vulva and vagina (44). According to the WHO, the primary approach should be to vaccinate girls and boys around age 9-14, just before puberty and the start of sexual activity (45). There is additional value in vaccinating older teenagers and young adults, at least up to the age of 26 because it can protect against a new infection or re-infection and block transmission to a new partner (44).
- In Portugal, HPV vaccination was introduced in the national immunization program in 2008 for girls aged 13, with a catch-up program for girls until 17. In 2017, vaccination was anticipated for girls aged 10 (46). In 2020, vaccination was extended to boys aged 10. A national consensus paper with recommendations on vaccination, including also special population groups, was published by the Portuguese Society of Gynecology in 2017 (47).
- The EBCP includes the aim of a 90% HPV vaccine coverage rate (VCR) of girls in the EU and to significantly increase the VCR in boys by 2030 (2). The NCCS 2030 has the objective to maintain the VCR of children born after 2009 at values above 90% until 2030 (4). A proposal by the European Commission for a Council recommendation on vaccine-preventable cancers from 2024 emphasizes the importance of targeted catch-up campaigns for young adults and targeting 'disadvantaged groups', such as migrants, asylum seekers and refugees, displaced persons from Ukraine, Roma, persons with disabilities, and LGBTIQ people (48).

Current status in Portugal

- The HPV VCR for girls in Portugal has been the highest in the EU over the past decade. In 2022, 94% of all girls by age 15 were fully vaccinated (49). This is well above the EU average and Portugal is the only country in the EU already reaching the EBCP aim of 90%. In addition, Portugal topped the list of the HPV VCR for boys with 80% in 2022 among EU countries with available data (49).
- According to a study by the European Commission, Portugal is the EU country with the highest reported vaccine confidence among the general population (50). In this study, vaccine confidence was measured by the population's opinion on vaccines' safety, importance, effectiveness, and compatibility with one's beliefs. A consistent high trust in the public health system is likely a major reason why the HPV vaccination program has been and continues to be very successful in Portugal.





Notes: The definitions of HPV VCR for girls and boys used in the figures above are not identical (see Appendix for more information). An EU average is not presented for the HPV VCR for boys because many countries do not yet report vaccination data due to the recent inclusion of boys in the national vaccination programs.

Recommendations

- Continue current efforts to maintain the HPV vaccination rate in girls above 90% and explore measures to achieve an equally high HPV VCR in boys as in girls.
- Consider catch-up vaccination for boys and young men, until the age of 26, who did not get vaccinated before the vaccine program was extended for boys in 2020.
- Work towards HPV elimination by extending the vaccination program to vulnerable groups, such as people living with HIV, MSM (men who have sex with men), and women with precancerous cervical lesions to reduce the recurrence of disease.

Early detection

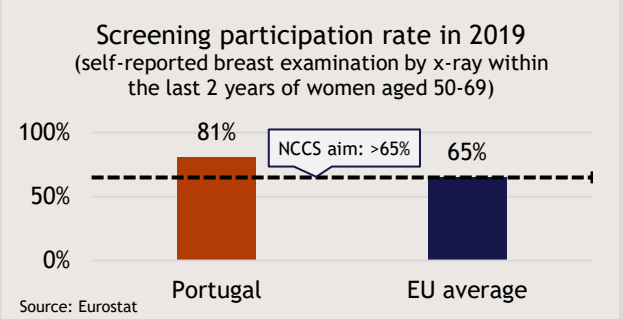
Breast cancer screening

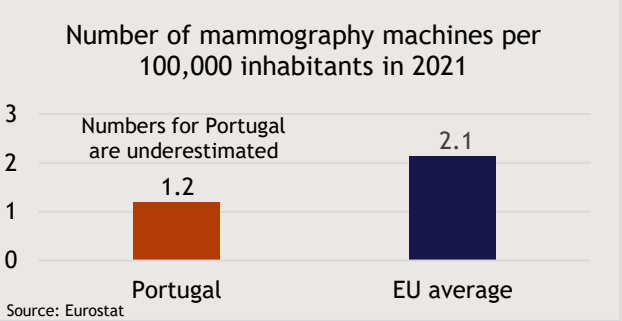
Background

- Breast cancer screening allows to detect a tumor as early as possible when it is still small and amenable to curative treatment (51). In early disease stages, survival rates are highest and treatment costs lowest (52).
- The EBCP includes the aim to invite 90% of the target population in each country for breast cancer screening by 2025 (2). Moreover, the updated screening recommendation by the Council of the EU from 2022 states that breast cancer screening with mammography should be conducted in women aged 45–74 years (previously 50–69 years), with women aged 45-49 screened every 2 or 3 years, women aged 50-69 screened every 2 years, and women aged 70-74 screened every 3 years (53, 54).
- In Portugal, the breast cancer screening program targets women aged 50-69 to be screened with mammography every 2 years (55). The NCCS 2030 includes the objective to reach 100% geographical coverage (per primary health care unit), 95% population coverage (actively invited target population), and a participation rate of above 65% among eligible women by 2030 (4).

Current status in Portugal

- Before the creation of the "National Coordination Center for Population-Based Screening Programs" as part of the ongoing NHS reform in 2024 (19), the Regional Health Administrations (ARS) were responsible for the identification of eligible women and for providing this information to external entities which run the scheduling and performed the test. These entities are the Portuguese League Against Cancer (LPCC) (in continental Portugal with the exception of the Algarve region) and the Oncology Association of Algarve in the Algarve Region (56). In the Autonomous Regions, the breast screening program is managed by the local health systems and executed by public entities. The primary tests are carried out in mobile units or fixed screening units (56).
- According to the Directorate General of Health, the geographical coverage of the breast cancer screening program reached 100% in continental Portugal and the Autonomous Regions in 2022 (56). 98% of the eligible population was invited to a mammography in 2022. The participation rate was 51% in 2022, which was below the NCCS 2030 target and continued a declining trend observed since 2019 when the participation was at 65% (56).
- According to self-reported data from 2019, 81% of women aged 50–69 had undergone mammography within less than two years, similar to the level in 2014 (84%), and higher than the EU average of 65% (57). Furthermore, self-reported screening rates in 2019 did not vary noticeably by education level (81% for women with lower education) and urbanization status (83% for women living in rural areas). However, a study by Quintal et al. (2023) that used self-reported data from the Portuguese Health Interview Survey in 2019 found that the screening rate varied between 86% in the North region and 71% in the Algarve region (55).
- The availability of mammography machines in Portugal (1.2 machines per 100,000 inhabitants) was lower than the EU average in 2021. However, the data from Portugal might be underestimated as they only cover machines in hospitals and not among ambulatory care providers. A limited availability of mammography machines may result in longer waiting times for screening appointments, and for women with symptoms of breast cancer who need a mammography for diagnostic confirmation.





Recommendations

- Expand the target age group of the screening program from 50-69 to 45-74 years in line with the latest recommendation by the Council of the EU. This expansion would increase the eligible population by around 49% or 0.75 million women, requiring planning for more mammography machines and healthcare professionals.
- Analyze and promote the standardization of successful methodologies for invitation across the country and explore why certain regions (e.g. Algarve region) have lower participation rates.
- Monitor changes in the participation rate following the implementation of the new invitation standard, which involves sending an SMS or a letter with the date and the health unit that a woman should go to be screened.

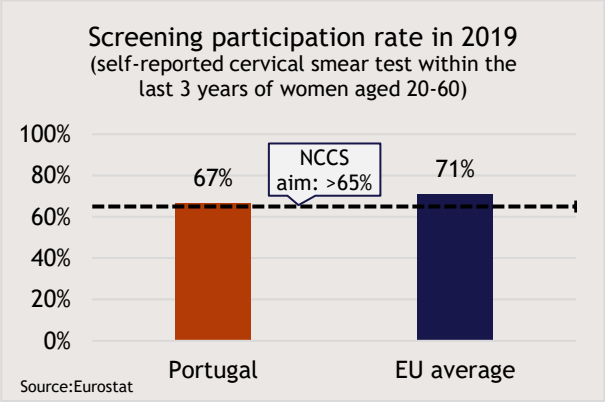
Early detection
Cervical cancer screening

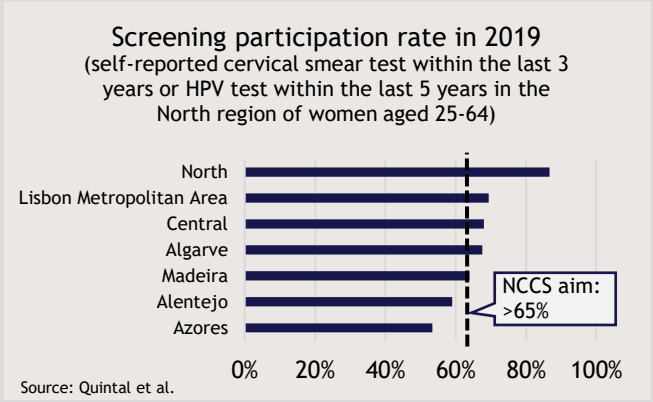
Background

- Cervical cancer screening allows to detect a cancer before the onset of symptoms or even earlier in its pre-stages. In early disease stages, survival rates are highest and treatment costs lowest (58, 59). The screening used to be done with a Pap smear test every three years. The discovery of HPV as the cause of cervical cancer has led to the development of HPV DNA-based tests as a screening method (45).
- The EBCP includes the aim to invite 90% of the target population in each country for cervical cancer screening by 2025 (2). Moreover, the updated screening recommendation by the Council of the EU from 2022 states that countries should use HPV tests and screen women aged 30–65 at an interval of five years or more (53).
- In Portugal, the cervical cancer screening program targets women aged 25-60 to be screened with an HPV test every 5 years (55). The NCCS 2030 includes the objective to reach 100% geographical coverage (per primary health care unit), 95% population coverage (actively invited target population), and a participation rate of above 65% among eligible women by 2030 (4).

Current status in Portugal

- Before the creation of the "National Coordination Center for Population-Based Screening Programs" as part of the ongoing NHS reform in 2024 (19), the Regional Health Administrations (ARS) identified eligible women, who were called to participate in the screening program by their family physician (56). For women not assigned to a family physician, the Director of the Clinical Council of the primary health center cluster handles the invitations. In the Azores, the Azores Oncology Center (COA) manages this process (56).
- According to the Directorate General of Health, the geographical coverage (per primary health care unit) of the cervical cancer screening program was 100% in continental Portugal and 91% in the Azores in 2022 (56). 64% of the eligible population was invited to a screening in 2022, which was the highest value since 2017 but still below the NCCS 2030 target. Among the invited women, the participation rate was 94%, which was as high as in 2021 and higher than in previous years (56). Approximately 1.7 million people in continental Portugal are not assigned to a general practitioner (family physician) (60), and it is unclear to what extent they get an invitation to get screened. According to a study (n=764 in 2017-2018) by Teixeira et al. (2022), 60% of eligible women, who reported not to have been screened, had received no screening invitation (61). The same study found that another barrier to access cervical cancer screening was a low level of health literacy.
- According to self-reported data from 2019, 67% of women aged 20–69 had a screening within the last 3 years, similar to the level in 2014 (71%), and slightly below the EU average of 71% (62). A study by Quintal et al. (2023), which used self-reported data from the Portuguese Health Interview Survey in 2019, found considerable geographical differences in the screening rate (87% in the North region and 54% in the Azores) (55). In the same study, screening rates were found to be higher among women with a higher socioeconomic status, with the inequalities being most pronounced in the Azores, Madeira, Lisbon and to a lesser extent in the North region.





Recommendations

- Adjust the target age group of the screening program from 25-60 to 30-65 years in line with the latest recommendation by the Council of the EU. Consider adapting ages and screening intervals to a woman's risk based on her HPV vaccination history. Ensure that invitations for screening are sent out to all eligible women.
- Explore the possibility of introducing HPV self-sampling kits to improve participation among non-responders to screening invitations.
- Identify and address barriers in regions with below-average screening rates (Azores, Alentejo, Madeira).

Early detection

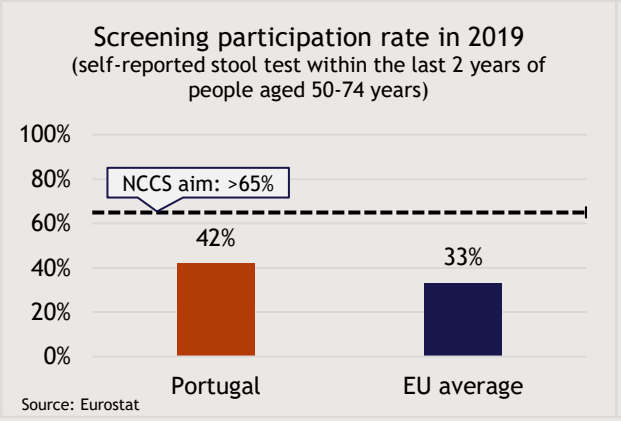
Colorectal cancer screening

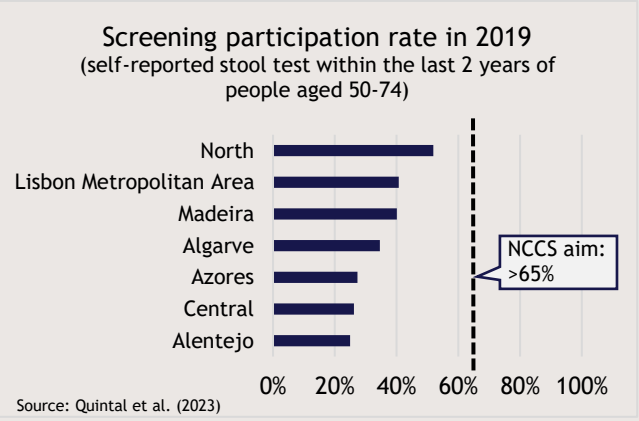
Background

- Colorectal cancer (CRC) is to a large extent curable if diagnosed early and if appropriate treatment is provided (63). Treatment costs are also lowest in early stages of the disease (59, 64). There are multiple CRC screening methods, including stool-based tests (fecal immunochemical test, FIT; guaiac fecal occult blood test, gFOBT; multitarget stool DNA test), blood-based tests, and imaging-based tests (colonoscopy, computed tomography colonography, colon capsule, flexible sigmoidoscopy) (65).
- The EBCP includes the aim to invite 90% of the target population in each country for CRC screening by 2025 (2). Moreover, the updated screening recommendation by the Council of the EU from 2022 confirmed the previous screening recommendation for CRC in all people aged 50–74 years, and it established FIT as the preferred triage test for referring individuals for follow-up colonoscopy (53). Quality guidelines from 2012 note that the screening interval with FIT should not exceed three years (66).
- In Portugal, the CRC screening program targets men and women aged 50-74 to be screened with a FIT test every two years. Madeira was the last region to switch from an opportunistic to an organized program in 2022 (55). The NCCS 2030 includes the objective to reach 100% geographical coverage (per primary health care unit), 95% population coverage (actively invited target population), and a participation rate of above 65% among eligible people by 2030 (4).

Current status in Portugal

- Before the creation of the "National Coordination Center for Population-Based Screening Programs" as part of the ongoing NHS reform in 2024 (19), the identification and invitation of the eligible individuals was performed by the Regional Health Administrations (ARS) (56). In the Azores, the Azores Oncology Center (COA) is responsible for this process. Test kits are usually sent to people's homes unless a person has indicated their unavailability for screening. Alternatively, eligible individuals can obtain test kits from their primary care center. Individuals perform the stool test at home and return the kit to either their primary care health unit or directly to the laboratory conducting the FIT. The tests were conducted in the public health laboratories of each ARS or COA. If the FIT test yields a positive result, the person is invited for a colonoscopy.
- According to the Directorate General of Health, the geographical coverage (per primary health care unit) of the CRC screening program was 100% in continental Portugal and 90% in the Azores in 2022 (56). 33% of the eligible population was invited to a screening in 2022, which was the highest value since 2017 but far below the NCCS 2030 target. Among the invited people, the participation rate was 41%, which was lower than in 2021 (51%) but higher than in 2019 (32%) (56). The more recent implementation of the CRC screening program in all regions might explain why CRC screening participation rates are lower than for the other screening programs (55).
- According to self-reported data from 2019, 42% of people aged 50-74 years had a screening within the last 2 years, higher than the level in 2014 (36%), and above the EU average of 33% (67). However, large geographical differences exist as highlighted in a study by Quintal et al. (2023), which found that the screening rate ranged from 25% in Alentejo to 52% in the North region (55). (see Appendix 2 for additional information)





Recommendations

- Run countrywide campaigns to raise awareness of the benefits of participating in CRC screening.
- Identify and address barriers in regions with below-average screening rates (Azores, Central, Alentejo).
- Facilitate participation by sending out invitation letters along with test kits by default to all eligible people.

Early detection
Lung cancer screening

Background

- Lung cancer is the leading cause of cancer death among men in Portugal and the EU (20). Detection at earlier stages results in higher survival rates and lower treatment costs (59, 68).
- Due to the mild and non-specific symptoms of lung cancer in early stages, more than 50% of the cases are diagnosed at a metastatic stage in Portugal (25, 69, 70). Results from several randomized-controlled trials show that targeted screening, of former and current heavy smokers, with low-dose computed tomography (LDCT) results in an extensive shift of patients to an earlier stage at detection and reduction in mortality (71). Lung cancer screening with LDCT has the possibility to reduce lung cancer mortality by at least 20% (72). The number needed to be screened to avoid one cancer death has been estimated to be around 130-220 individuals, which is considerably lower than for breast cancer (645-1724 individuals) (71).
- The updated screening recommendation by the Council of the EU from 2022 states that countries should explore the feasibility and effectiveness of LDCT to screen individuals at high risk for lung cancer, including heavy smokers and ex-smokers, and link screening with primary and secondary prevention approaches (53). Furthermore, EU countries are also encouraged to conduct research on how to reach and invite the target group, as population registries do not contain information on people's past and current smoking behavior. To facilitate this, a large EU project (SOLACE funded under the EU4Health Program) is ongoing in multiple EU countries, aiming to support the implementation of and optimization of LDCT screening programs (72).
- At present, Croatia is the only EU country that has started to roll out a national lung cancer screening program since 2020 (73). Other countries, such as Czechia and Poland, have initiated pilot programs (73, 74).

Current status in Portugal

- Late diagnosis of lung cancer is a reality recognized as a challenge in Portugal by stakeholders (see Appendix 2 for more details) (75).
- The NCCS 2030 includes the objective of ensuring the operationalization of the Council recommendations on screening, which includes lung cancer screening (4). This includes drafting new screening standards and an evaluation of the effectiveness and cost-effectiveness of the screening program.
- The approved State Budget for 2024 intents to broaden the screening programs to include lung cancer, gastric cancer, and prostate cancer (76). The Ministry of Health plans to launch pilot projects to screen for lung cancer in high-risk groups in certain communities in the first half of 2024 (77). These projects are supported by advocacy groups such as Pulmonale (Portuguese Association for the Fight Against Lung Cancer) (78).

Key considerations

- The International Association for the Study of Lung Cancer (IASLC) has assembled the following list of factors to consider for a successful implementation of a lung cancer screening program (71):

Governance	Clear definition of roles between national, regional or local levels in terms of decision-making, organization, and deployment of screening, with centralized monitoring of data and a national protocol guiding all implementation
	Opportunities for the involvement of relevant professional societies and patient organizations in decision-making on lung cancer screening
Information	Comprehensive data management system, covering all aspects of the program
	Full interoperability between screening program and health data systems to capture outcomes for all screening attendees and ensure regular updating of invitation database
	Widespread information campaign conveying appropriate, accessible information about screening through all possible channels
Health workforce	Comprehensive workforce planning to ensure sufficient personnel to perform scans and follow-up care
	Training and accreditation criteria are defined for all imaging personnel and applied in all participating screening centers
	Full engagement of primary care physicians, with appropriate training in place
Service delivery	Screening program fully integrated into multidisciplinary care pathways
	Preemptive addressing of any deficits along the lung cancer pathway that may result in delays in diagnosis and access to care
	Full integration of lung cancer screening program with an existing smoking cessation program

Early detection

Case study on early detection and cancer recurrence

Background

The detection of cancer in an early stage - when the tumor is still small and has not spread across the body - provides the best chances for survival, provided effective treatment is received after the diagnosis (2). However, even patients who are diagnosed at an early stage are by no means guaranteed to survive their disease (79). In addition, treating cancer in early stages is associated with significantly lower costs, both direct and indirect costs (59, 80).

The initial treatment of early-stage cancers usually involves surgery to remove the tumor, followed (but sometimes also preceded) by radiation therapy and/or cancer medicines for a limited period of time. However, after the initial treatment is completed and a patient is declared cancer-free, the cancer may come back (called "recurrence" or "relapse"). Cancer recurrence is relatively common after completing initial treatment and up to 5 years after diagnosis (81). The importance of "treating better" in early-stage cancer has recently received new impetus by the regulatory approval of several immunotherapies and target therapies in multiple cancer types. Clinical trials of these medicines have demonstrated their ability to reduce the risk of cancer recurrence and improve overall survival (79).

This section aims to illustrate the importance of earlier detection further and the need for more effective treatments in earlier stages. Cervical and lung cancer are used here as examples.

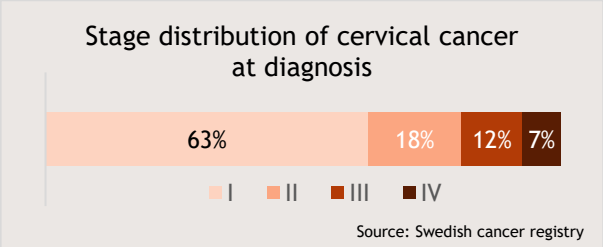
Method

A target literature search was conducted to find relevant data for the following parameters of cervical and lung cancer that are relevant to the Portuguese context:

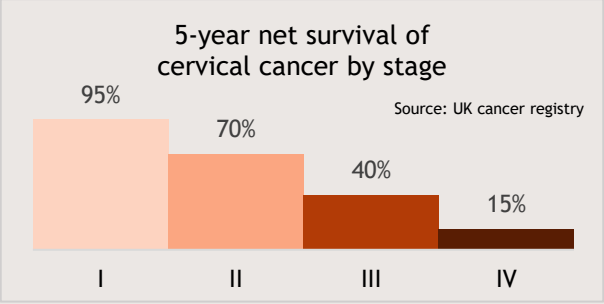
1. Stage distribution at diagnosis
2. Survival rate by stage at diagnosis
3. Treatment costs by stage at diagnosis
4. Recurrence rate and treatment costs of recurrence

Results: Cervical cancer

Data on the stage distribution of cervical cancer at diagnosis was not available for Portugal. Instead, data from the Swedish cancer registry was used (82). The stage distribution presented here is based on cases detected in 2012-2020 from all regions in Sweden (n = 5,595). It shows that most patients (63%) are diagnosed in stage I, whereas only 7% are diagnosed in stage IV. It is likely that the stage distribution at diagnosis in Portugal has more patients in stage III-IV since screening rates in Sweden are higher (around 88% as compared to 67% in Portugal, based on self-reported data in 2019) (62).



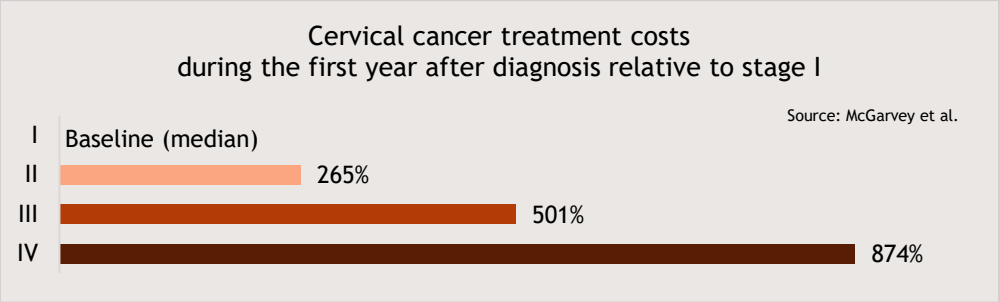
With regards to survival by stage at diagnosis, data from the Office of National Statistics in the UK was used (83). The data are based on cases diagnosed in 2013-2017. As the figure illustrates, the 5-year net survival is highest in stage I (95%) and gradually decreases to 15% in stage IV.



Data on treatment costs by disease stage were based on a publication by McGarvey et al. (2022) (59). This study was used to estimate the percentage increase in costs by stage relative to stage I. The study is based on patients diagnosed between 2016-2020 in the US (n = 1,866). Median annual costs (total and cancer-specific costs[2]) were reported for each stage during the first year after diagnosis. As the figure below illustrates, the total costs increase

[2] Total costs were defined as any costs among patients diagnosed with cancer, while cancer-specific costs, a subset of the total costs, required the presence of an ICD-9-CM or ICD-10-CM diagnosis code of the cancer type of interest.

by stage and are substantially higher for stage II (almost a 3-fold increase compared to stage I) and for stages III and IV (a 5-fold and almost 9-fold increase, respectively).

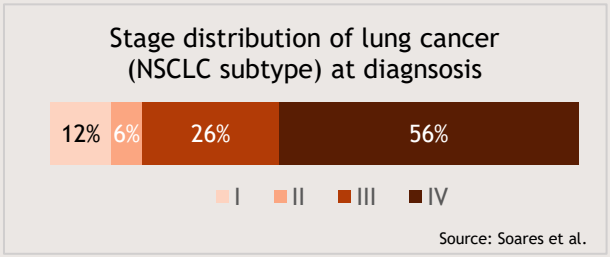


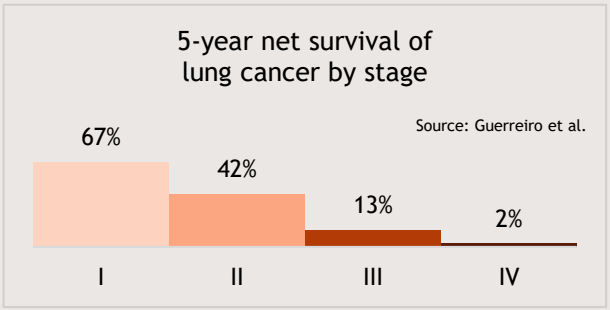
The prognosis of cervical cancer patients who experience a recurrence after initial treatment in the early-stage setting is poor, especially if the recurrence is metastatic as it is usually considered incurable (84). A nationwide Danish study (n=1,523, cases from 2005-2013) of stage I (IA1 to 1B1) patients found a 5-year recurrence rate of 6% (85). This shows that even in the very early disease stages, more effective treatments are still needed to prevent recurrence. A single-center study in France (n=239, cases from 1999-2018) of patients initially diagnosed in stage I-II (IA1-IIA1) reported a relapse-free survival of 87% after 5 years (i.e., the other 13% experienced recurrence or death) (86). This study also found that recurrence rates were higher in cases with bigger tumor sizes (i.e., more advanced cases) at initial diagnosis. A small study by Moreira et al. (2020) for Portugal conducted a retrospective analysis of cervical cancer patients with a recurrence, using data from the Algarve University Hospital Center (n=48 with a recurrence in 2016-2018) (87). The study found that a median of 15 months elapsed between the end of initial treatment and recurrence and that patients with more advanced disease seemed to recur sooner. Studies that have investigated the economic burden of recurrent cervical cancer are scarce. Available studies on treatment costs often group patients with recurrence together with those that have newly diagnosed metastatic disease (88, 89). No cost studies comparing early-stage patients with and without recurrence could be identified, but the general cost pattern may be similar to that of lung cancer described further below.

In summary, to what extent the current cervical cancer screening program in Portugal is able to prevent diagnosis in later stages is challenging to interpret without Portuguese data on the stage distribution. Similarly, survival data by stage would be needed to understand the effectiveness of current treatments. Nevertheless, the data gathered in this section clearly show the benefit of detecting cervical cancer in earlier stages in order to improve patient outcomes and reduce treatment costs. In addition, more effective treatments are needed in the early-stage setting to prevent recurrence and subsequent clinical and economic burden after the initial treatment.

Results: Lung cancer

Data on the stage distribution of lung cancer at diagnosis in Portugal is limited to four publications (69, 90-92). Soares et al. (year 2020-2021) have published stage distribution at diagnosis for NSCLC[3] and SCLC, of which the former is illustrated here (by combining data from 2 publications) (90, 92). The data show that most patients were diagnosed at late stages III-IV (26% and 56% respectively). For SCLC, the results are similar but with an even larger proportion of patients diagnosed in stage IV (73%) (91).

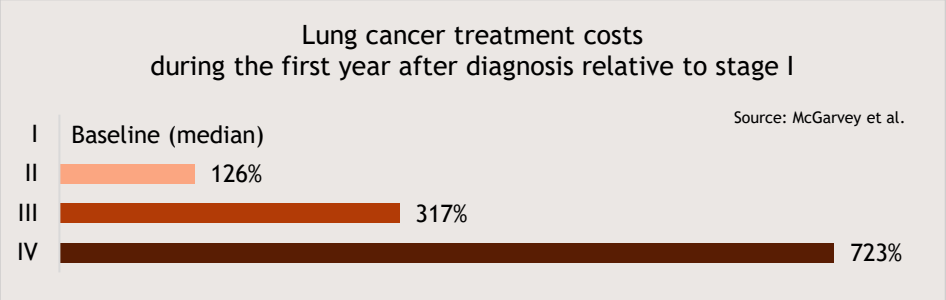




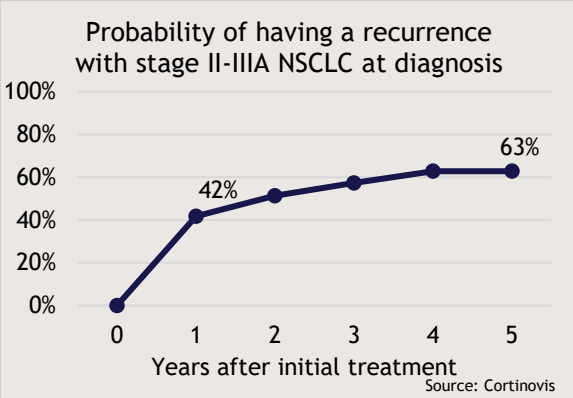
In terms of survival, a recent publication by Guerreiro et al. (2023) estimated 5-year survival by stage based on data from four population-based cancer registries covering the whole country of Portugal (year 2009-2011, n=11,523) (94). Survival is highly dependent on the disease stage at diagnosis (67% in stage I and only 2% in stage IV). This indicates a high unmet need for patients to be treated better in all stages of the disease, as even stage I is far from the 100% goal.

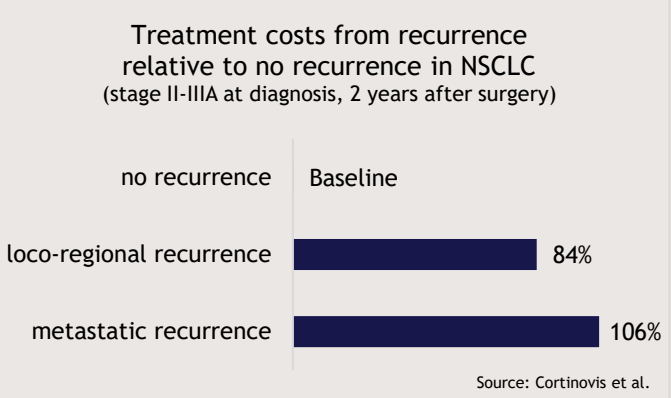
[3] Approximately 85% of all lung cancer cases are non-small cell lung cancer (NSCLC) and the remaining 15% are small cell lung cancer (SCLC) (93).

Data on treatment costs by disease stage for lung cancer in the Portuguese setting are scarce. Instead, cost estimates from the study by McGarvey et al. (2022) were used (same study as for cervical cancer above), which included patients diagnosed between 2016-2020 in the US (n = 3,459) (59). Median costs during the first year after diagnosis are lowest for stage I. Costs increase substantially for stages III and IV (3-fold and 7-fold, respectively), showing a similar trend as for cervical cancer. Other studies also found a similar cost pattern for lung cancer (95, 96).



No Portuguese study was found that reported recurrence rates or treatment costs due to the recurrence of lung cancer after initial treatment in the early-stage setting. One study from Italy by Cortinovis et al. (2023) reported recurrence rates and the economic burden for NSCLC diagnosed in stage II-IIIA (based on data from 2015-2021, n=458) (97). In this study, 42% of patients had a recurrence (with either loco-regional spread or metastatic spread) within one year after initial treatment, the median time to recurrence was 20.5 months, and after 5 years 63% of all patients had a recurrence, as shown in the left-hand graph below. This can be related to the 5-year net survival of 42% in stage II and 13% in stage III in Portugal (94). The results are similar to findings from a recent systematic literature review and meta-analysis of international NSCLC studies that found a recurrence-free survival[4] rate of 81% in stage I, 50% in stage II, and 34% in stage III after 5 years (81). The Italian study also investigated the resource use and treatment costs (from a healthcare perspective with mean costs over two years after surgery) associated with recurrence. Compared to NSCLC patients with no recurrence, patients with loco-regional and metastatic recurrence had almost twice as high treatment costs (84% and 106%, respectively), as shown in the right-hand graph below. Most of the cost differences were driven by an increased use of cancer medicines to treat the recurrence.





Another study by Andreas et al. (2018) evaluated the economic burden of stage IB-IIIA NSCLC patients who had surgery as initial treatment in France, Germany, and the UK based on data from 2009-2012 (n=831). Compared to patients who remained disease free after surgery and after adjuvant therapy, the healthcare costs of recurrent patients from all countries combined was 272% higher loco-regional recurrence and 354% higher for metastatic recurrence (98).

In summary, without a national screening program for lung cancer or improved earlier detection of symptoms in primary care in Portugal, a large proportion of patients will be diagnosed in later stages, where the survival prognosis is poor and treatment costs are high. First results from the national screening program for lung cancer in Croatia show that in the first round of 27,000 CT scans, 47% of the cases were diagnosed in stage I-II (72, 99). The proportion of patients diagnosed with stage I-II is expected to increase in the coming years, because the first round catches all pre-existing tumors in the population. Overall, this demonstrates the feasibility of a national lung cancer screening program to improve patient outcomes. Nevertheless, even if more cases can be detected early in stages I-II, there is still a need for more effective treatments to prevent recurrence, as the Portuguese survival rates in these stages are currently far from 100%.

[4] Time from end of treatment until there is evidence of cancer recurrence or until death.

Diagnosis and treatment
Comprehensive cancer centers

Background

- A comprehensive cancer center (CCC) is characterized by its organizational quality, multidisciplinarity, and integration of research into clinical care (translational research) (100). Patients diagnosed and treated in specialized cancer centers (including, but not limited to, CCC) generally have better access to advanced diagnostics and therapies as well as clinical trials, which results in better outcomes than of patients treated in general hospitals (101).
- There is no universal definition of a CCC. The Organisation of European Cancer Institutes (OECI) facilitates the development of accrediting CCCs around the world by means of quality standards which represent the European consensus for evaluating the performance of cancer centers (100). However, since the OECI accreditation system is voluntary and countries might also rely on other national accreditation systems, country comparisons of the number of CCCs are not possible to evaluate using the definition by the OECI.
- The EBCP states that by 2030, 90% of eligible patients should have access to national CCCs linked through a new EU Network of CCCs with the purpose of facilitating the uptake of quality-assured diagnosis and treatment. The EU Network of CCCs will be established by the year of 2025 with the aim of increasing cross-border collaboration in quality-assured diagnosis and treatment processes (2).
- According to the NCCS 2030, the implementation of a multidisciplinary team meeting prior to the first treatment for >85% of cancer patients by 2030 is a priority (4). The clinical management of >90% of cancer patients should be carried out in certified oncology units by 2030. In addition, the Oncology Reference Network (RRO) between NHS hospitals should be established to integrate cancer care and to ensure equal access by 2026.

Current status in Portugal

- Based on the voluntary OECI accreditation system, Portugal has one CCC, the Instituto Português de Oncologia do Porto Francisco Gentil, E.P.E. (IPO-Porto), and two cancer centers[5]: Instituto Português de Oncologia de Lisboa Francisco Gentil, E.P.E. (IPO-Lisboa) and Instituto Português de Oncologia de Coimbra Francisco Gentil, E.P.E. (IPO-Coimbra). This limits access of patients living in Southern Portugal and the Azores and Madeira.

- In the NCCS 2030, CCCs are referred to as specialized reference centers. Designated reference centers for seven cancer types exist (rectal cancer, pancreatic cancer, esophageal cancer, sarcomas, testicular cancer, eye cancer, pediatric cancer). Their purpose is to integrate skills, formalize and train multidisciplinary teams, and improve the hospital referral pathway. However, according to the NCCS 2030, the establishment of these designated reference centers did not lead to an improvement in compliance with the maximum legal response times for oncology surgery, and currently the referral pathways for cancer patients are far from optimal to ensure efficient and timely access to care (4).

Recommendations

- Improve the integration of different levels of care (primary care, secondary care, tertiary care) and referral pathways for newly diagnosed patients in accordance with the strategies and aims in the NCCS 2030.
- Ensure more equal geographical access to comprehensive cancer centers as well as specialized reference centers and try to reduce the access inequalities.
- Mandate the use of multidisciplinary team meetings prior to the first treatment of >85% of cancer patients by 2030, in line with the aims of the NCCS.

[5] According to the accreditation process by OECI, the criteria to be a certified a cancer center (CC) are lower than for a CCC. For instance, the annual budget for cancer care, number of inpatient hospitals beds, and clinical staff requirements are lower (100).

Diagnosis and treatment
Multi-biomarker testing

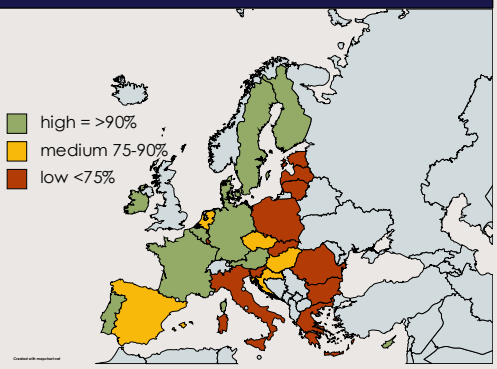
Background

- Biomarker testing is part of the diagnostic process of cancer care, which allows to identify the molecular characteristics of the tumor and helps to select appropriate treatments.
- Testing with single biomarkers has been done for decades in certain cancer types (e.g., breast cancer). With increasing knowledge of molecular targets, single-biomarker testing has become impractical in some cancer types (e.g., lung cancer). Multi-biomarker testing, specifically with next-generation sequencing (NGS) technology, tests for several biomarkers in parallel rather than sequentially. NGS testing is increasingly becoming standard of care in several cancer types, thereby replacing or complementing single-biomarker testing (102).
- The EBCP's flagship initiative "Cancer Diagnostic and Treatment for All" includes several action plans and advocates the use of NGS (2). The overall intention is to improve cancer diagnosis and treatment through personalized medicine and the use of the latest innovations in cancer care. The European Society for Medical Oncology (ESMO) issued its first recommendation to use NGS in the treatment of advanced non-small cell lung cancer (NSCLC), prostate cancer, ovarian cancer, and bile duct cancer in 2020 (103).
- The ENLLC 2030 has the objective to guarantee access to precision medicine, genomic medicine, predictive medicine and pharmacogenomics techniques and practices in the Oncology Reference Network (RRO) until 2026 (4). It aims to collaborate in the implementation of the national strategy for genomic medicine and with hospitals and academic laboratories involved in the GenomaPT consortium and the PT_MedGen project.

Current status in Portugal

- Multi-biomarker testing has already been introduced in Portugal. IPO Porto, Coimbra, and Lisbon have the capability to perform NGS testing in-house. In other hospitals treating cancer patients, biopsy samples may be sent to external, private laboratories for analysis. Outsourcing of the testing has been reported to lead to delays in the diagnostic process (25).
- There are no national guidelines for NGS testing. Recommendations from a Portuguese Expert Group published in 2022 state that an NGS panel should be used to test non-squamous NSCLC, and it should not only include genes with approved targeted therapies (ALK, BRAF, EGFR, MET, NTRK, RET, ROS1) but also genes with potentially actionable genomic alterations (HER2 and KRAS) (104).
- According to an international study conducted in 2020, Portugal had a high availability of multigene biomarker tests (above >90%), on par with the Nordic and Western European countries (105). However, in terms of actual use of NGS, the same study reported that approximately 30% of all biopsies in NSCLC were analyzed with NGS technology (105), indicating rather low use, which was explained by the perceived high costs of the tests (105).
- By contrast, a study conducted by ESMO in 2021 found that NGS was only "occasionally" available in Portugal, whereas single-biomarker testing, such as immunohistochemistry, was "always" available (106). In the same study, Portuguese pathologists and medical oncologists stated that access to biomarker testing is not equal across the country. Countries with a higher access to NGS technology (e.g., Finland, Sweden) had policy initiatives for the implementation of innovative molecular testing technologies, which was not the case in Portugal (106).

Estimated availability of multigene biomarker tests (NGS) in 2020



Recommendations

- Create a national strategy for precision medicine in oncology in line with the objectives in the NCCS 2030.
- Expand the diagnostic infrastructure in NHS hospitals or improve external partnerships with private laboratories to perform NGS tests, with the aim to accelerate the genomic testing and pathological assessment and consequently clinical decision on treatment.
- Ensure the use of NGS testing in cancer types as indicated by ESMO recommendations.

Diagnosis and treatment

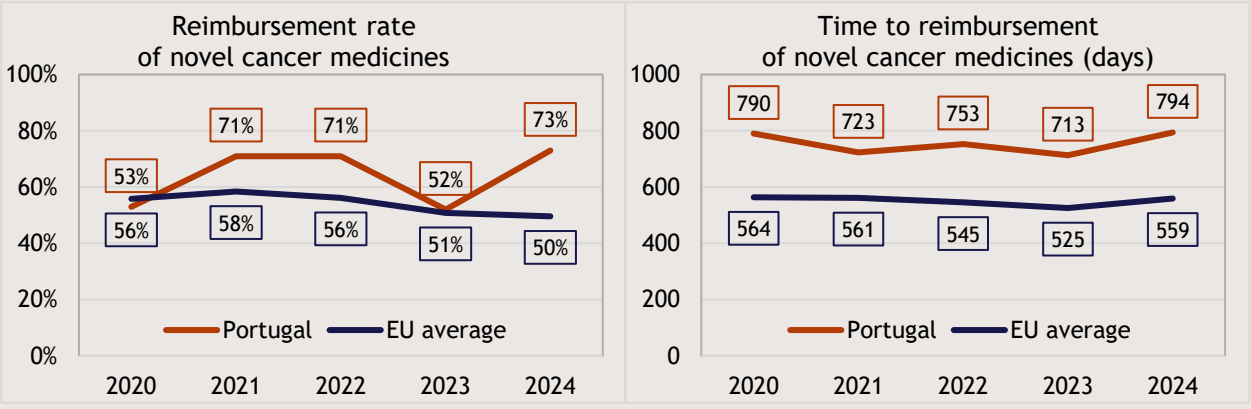
Availability of new cancer medicines

Background

- The local availability of new medicines is defined by the European Federation of Pharmaceutical Industries and Associations (EFPIA) as the inclusion of a centrally approved medicine by the European Medicines Agency (EMA) in the national/regional public reimbursement list (107). EFPIA publishes an annual report, the EFPIA WAIT Indicator Survey, which monitors the local availability of recently approved medicines.
- The local availability of new cancer medicines with approval by the EMA differs considerably between EU countries (107). Many causes for delays and unavailability of new medicines at the country level have been identified across the EU (108), such as (i) limited public budgets for medicines, (ii) late company submission or late start of the national pricing and reimbursement process, (iii) lack of clearly defined timelines for pricing and reimbursement, (iv) the complexity of the health technology assessment (HTA) process.
- At the EU level, a revision of the EU pharmaceutical legislation is underway. One objective is to reduce country differences in the availability of new medicines and to shorten the time from EMA approval until patient access (109). In addition, the new EU HTA regulation will apply for cancer medicines and advanced therapy medicinal products from January 12, 2025. This will entail a joint (cross-country) clinical assessment of the relative effectiveness of new medicines (110).
- The NCCS 2030 aims for greater transparency and wants to publish the time for deciding on the reimbursement of new cancer medicines until 2025 (4).

Current status in Portugal

- The reimbursement rate in Portugal for new cancer medicines (EMA approved in 2019-2022) was 73% at the beginning of 2024 (107). This is above the EU average of 50%. Yet less than half of the reimbursed medicines in Portugal had “full reimbursement” (43%), while the remaining ones had some limitations (57%). The time from EMA approval to local reimbursement in Portugal was on average 794 days for cancer medicines reimbursed until the beginning of 2024. This was 42% longer than the EU average (559 days) and the fifth longest delay among EU countries with available data. The reimbursement time has remained rather constant in recent years.
- Infarmed is conducting the HTA of new medicines. Various reports have highlighted challenges that Infarmed is facing in terms of resources and organization (111, 112), which might affect the assessment timelines. Shortages of human resources and challenging working conditions lead to high rates of absenteeism and turnover (112). Inefficiencies in the organization and weaknesses in information systems are delaying responses to applicants of new technologies (111). Patient associations are very marginally involved in the assessment processes (113).
- HTA agencies across the EU apply different evidence requirements. For instance, it has been reported that clinical endpoints, other than overall survival (OS) and progression free survival (PFS), are less often accepted in Portugal compared to Sweden (114). This could explain some of the reimbursement delays in Portugal.



Recommendations

- Leverage the imminent application of the EU HTA regulation in 2025 as an opportunity to review the national HTA process for cancer medicines. This could include a review of the evidence requirements (such as accepted clinical endpoints) and to what extent the national clinical assessment can be replaced by the joint EU clinical assessment of relative effectiveness.
- Ensure sufficient human resources at Infarmed to cope with the increasing number of assessments of new medicines and optimize organizational structures to identify opportunities to accelerate the HTA process.

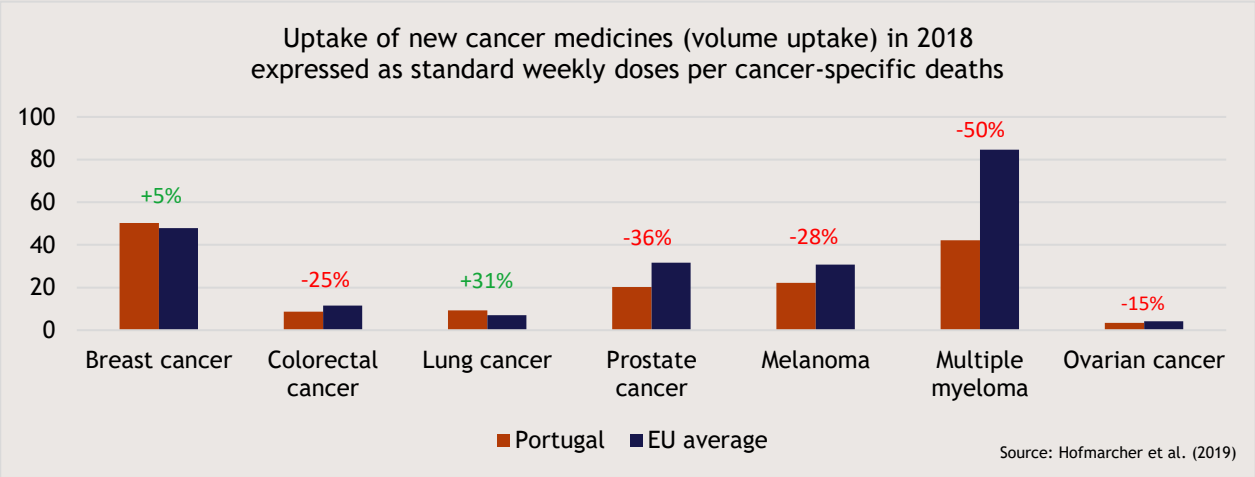
Diagnosis and treatment
Uptake of new cancer medicines

Background

- Around 100 new cancer medicines have been approved by the EMA over the last decade. However, there are considerable differences as to when and to what extent EU countries are able to ensure access to these new treatments to all eligible patients (108, 115).
- Although the local reimbursement rate of new cancer medicines is one way to measure patient access in a country (see the previous indicator), it is only an approximation and does not necessarily capture patient access in terms of uptake (actual use). Nonetheless, cross-country comparisons of medicine uptake are challenging to study, since most countries lack equivalent reporting of treatment use for different disease categories.
- The NCCS 2030 aims to identify and propose criteria for analyzing equity of access to cancer medicines by cancer type (4).

Current status in Portugal

- A study by Hofmarcher et al. (2019) compared the uptake of new medicines in seven cancer types in the EU using volume sales data in milligrams (116). Uptake of new cancer medicines (defined as a ratio between sales of standard weekly doses per cancer-specific deaths) in Portugal was below the EU average in most cancer types. For melanoma medicines, the uptake was 28% lower in comparison with the EU average, 36% lower for prostate cancer medicines, and 50% lower for multiple myeloma medicines. The uptake in Portugal was only slightly above the EU average in breast cancer (+5%) and lung cancer (+31%).
- Overall, wealthier EU countries (measured as GDP per capita) tend to have a higher uptake of new cancer medicines compared to countries with lower GDP per capita (including Portugal) across all cancer types (116). This can to some extent be related to the affordability of including new cancer treatments in the public reimbursement systems (117).
- Other general reasons for lower uptake of new cancer medicines relate to health system readiness and agility. Uptake may be lower in countries where national clinical guidelines are not frequently updated, routine clinical practices are only changed slowly, lack of reimbursement of the companion diagnostic (biomarker testing) of a newly reimbursed medicine, lack of comprehensive cancer centers that can administer innovative types of medicines (e.g., CAR T cell therapies). In Portugal, one additional issue hindering uptake in hospitals after a positive national reimbursement decisions is bureaucracy (administrative burden) involved in the process of acquiring the medicines (118), specifically the practice of additional assessment performed by each individual hospital (by the Pharmacy and Therapeutic's Commissions) after the national decision.
- The current financing model of hospitals via the state budget at average prices puts hospitals at a financial disadvantage if they are more differentiated and use more innovative medicines, because the average prices are below the prices of new medicines (119). This may slow down the uptake of new medicines.



Source: Hofmarcher et al. (2019)

Recommendations

- Ensure a solid framework and adequate funding for equitable access to new medicines in all oncology treatment units once a new medicine is reimbursed. More specifically, improve the current financing model of hospitals via the state budget, which is not adapted or correlated to the cost of medicines.
- Explore alternative funding models (such as value-based healthcare approaches / managed entry agreements) to ensure patient access to evidence-based, effective treatments.

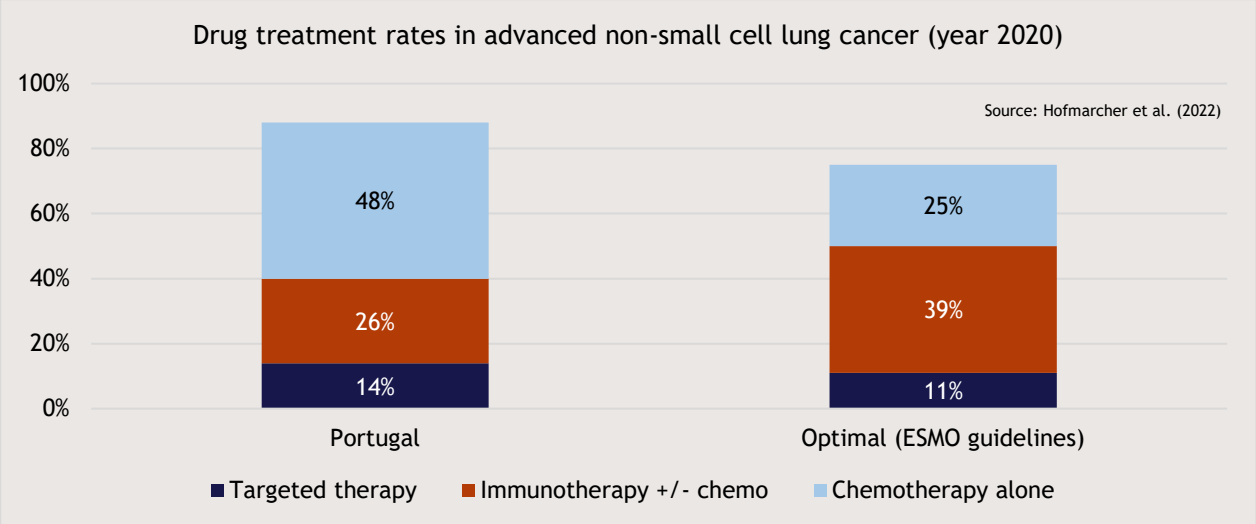
Diagnosis and treatment
Evidence-based treatment

Background

- Access to evidence-based, effective treatments is a key element of the EBCP (2). This is crucial to provide the best possible care to patients and raises the likelihood of better outcomes.
- The NCCS 2030 contains the objective to identify and propose criteria for monitoring the quality of access to innovative medical therapy in the planned Oncology Reference Network (RRO) (4). One possible way to measure the quality of care is to compare real-world treatment patterns in hospitals not only with each other but also against a common benchmark derived from clinical guidelines.

Current status in Portugal

- A study by Hofmarcher et al. (2022), evaluated patient access to cancer medicines and evidence-based care across Europe including Portugal (25). The study considered treatment patterns in advanced-stage NSCLC ("drug treatment rates"). National treatment patterns were compared to an "optimal", evidence-based treatment standard based on guidelines by ESMO.[6]
  - Drug treatment rates in advanced-stage NSCLC were estimated to be 88% in Portugal in 2020, up from 70% in 2018 and 62% in 2014 (25). This is above the approximate benchmark of 75% of what is recommended by ESMO guidelines (assuming that 25% of patients are in too poor health to receive cancer medicines).
  - Treatment patterns in Portugal deviated from ESMO guidelines. Most patients were estimated to have only received chemotherapy (48%), whereas the optimal use of chemotherapy was almost only half as much (25%) in 2020. The estimated use of targeted therapies was close to the benchmark. By contrast, the estimated use of immunotherapy in Portugal was below the optimal use. Delayed reimbursement of immunotherapies, lack of budget of hospitals for new medicines, and lack of biomarker testing to guide the appropriate use of immunotherapies might be reasons for the observed deviations (25).
- In a recent study in Portugal, 61 physicians specialized in lung cancer treatment estimated perceived lag times for diagnosis, staging and treatment. The majority of physicians (89%) stated they had started treatment before available biomarkers results, at least at some point of their clinical practice (75). This is not in line with clinical guidelines which mandate biomarker testing prior to treatment initiation.



Recommendations

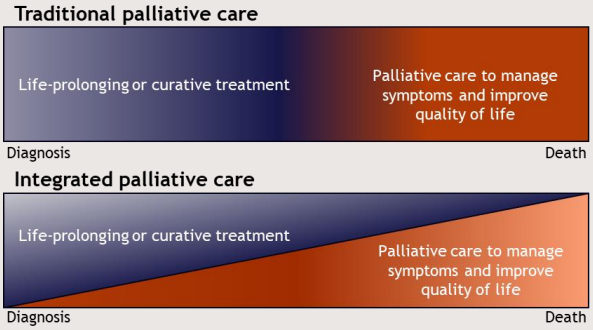
- Improve the up-to-datedness of local clinical guidelines.
- Ensure continuous training of medical staff to facilitate the inclusion of new medicines into routine clinical practice.
- Increase the capacity to perform biomarker tests to inform treatment decisions around the use of innovative cancer medicines.

[6] In comparison with the indicator "Uptake of new cancer medicines", this indicator measures access to all relevant – both old and new – cancer medicines for a specific cancer type. It also relates the use of the medicines to an estimation of the total eligible number patients, whereas the former only approximates patient numbers with the number of deaths.

Survivorship
Palliative care services

Background

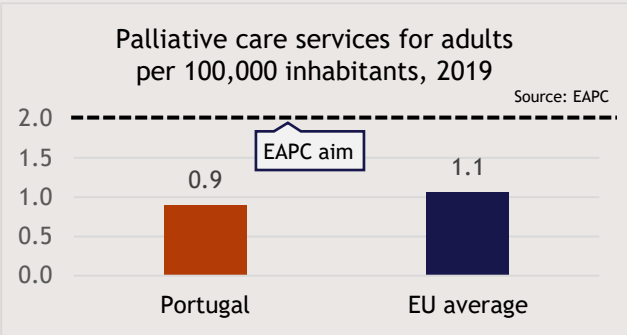
- Portugal has the third highest proportion of people aged 65 or older in the EU after Italy and Finland (120). This results in a high and increasing demand for palliative care (PC) services.
- Cancer is the most frequent cause of need for PC among life threatening or life-limiting health conditions (121). Within oncology, PC has traditionally had a strong focus on the end-of-life-stage but more recent definitions emphasize its relevance earlier in the disease pathway (122).

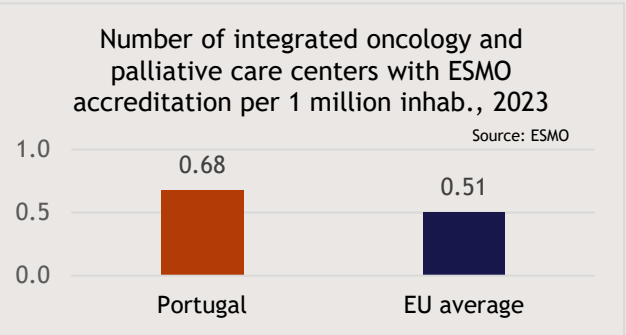


- The availability of PC services in a country is one metric to assess the capacity and potential access to PC. Another metric is the degree to which PC is integrated with the overall healthcare system (123). The European Association for Palliative Care (EAPC) recommends two specialized PC services for every 100,000 inhabitants (121).
- The NCCS 2030 includes the objective to provide PC team appointments to 50% of adult cancer patients who, at the time of diagnosis, have a 2-year survival probability of less than 50% by 2030. The appointment should be conducted within the first 6 months after the diagnosis (4).

Current status in Portugal

- Portugal's Strategic Plan for the Development of Palliative Care (2021-2022), as well as other literature, highlights that many people still do not have adequate access to PC despite improvements over the last decade (33, 124). Reasons for inadequate coverage of PC services include inadequate funding and political prioritization, lack of human resources and their adequate training and education, and geographical distance (33, 124).
- In 2019, the number of PC services (non-cancer specific) was 0.9 per 100,000 inhabitants in Portugal (121). This is lower than the EU average of 1.1 PC services per 100,000 and far off the recommendation of 2 PC services per 100,000 by the EAPC. However, there has been a positive development in Portugal with the availability having increased from 0.5 PC services per 100,000 in 2012 (125).
- Based on a voluntary ESMO accreditation system of cancer centers, a comparison of the integration of PC with oncology care can be made. Currently, there are 7 ESMO Designated Centers of Integrated Oncology and Palliative Care in Portugal (126). This translates to 0.68 centers per 100,000 inhabitants, which is above the EU average of 0.51 centers per 100,000 inhabitants. Since this accreditation system is voluntary, a comparison with other countries should be made with caution. Overall, it is unclear whether the need for PC for cancer patients in Portugal is met to a greater extent than in other EU countries.





Recommendations

- Expand and improve PC services in response to the growing elderly population, with a focus on accessible and integrated care with treatment services to provide comprehensive support for cancer patients.
- Invest in and recruit PC professionals and ensure adequate training.
- Improve the referral criteria for PC as foreseen in the Strategic Plan for the Development of Palliative Care.

References

1. OECD/European Union. Health at a Glance: Europe 2022: State of Health in the EU Cycle. Paris: OECD Publishing, 2022.
2. European Commission. Europe's Beating Cancer Plan: Communication from the Commission to the European Parliament and the Council. 2021.
3. European Commission. EU Mission: Cancer. 2023 [2023-08-16]. Available from: https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/eu-mission-cancer_en.
4. Gabinete da Secretária de Estado da Promoção da Saúde. Estratégia Nacional de Luta contra o Cancro, horizonte 2030. 2023.
5. Health Regulatory Authority (ERS). Informação de monitorização sobre tempos de espera no sns no 2.º semestre de 2022. 2022.
6. Meunier F. Ending discrimination against cancer survivors. 2022 [2023-07-07]. Available from: https://endingdiscrimination-cancersurvivors.eu/.
7. Andersson TM, Myklebust TA, Rutherford MJ, Moller B, Arnold M, Soerjomataram I, et al. Five ways to improve international comparisons of cancer survival: lessons learned from ICBP SURVMARK-2. Br J Cancer. 2022;126(8):1224-8.
8. International Agency for Research on Cancer (IARC). Survival. [2024-05-24]. Available from: https://survival.iarc.fr/.
9. National Oncology Registry (RON). 2018 - An overview. 2018. Available from: https://ron.min-saude.pt/en/news/news/2018-an-overview/.
10. OECD. EU Country Cancer Profile: Portugal 2023. Paris: OECD Publishing, 2023.
11. Tribunal De Contas. Auditoria ao Acesso a Cuidados de Saúde Oncológicos no SNS,. 2022.
12. Regionala Cancercentrum i Samverkan. Interaktiva rapporter. 2023. Available from: https://cancercentrum.se/samverkan/vara-uppdrag/statistik/kvalitetsregisterstatistik/interaktiva-rapporter/.
13. Katalinic A, Halber M, Meyer M, Pflüger M, Eberle A, Nennecke A, et al. Population-Based Clinical Cancer Registration in Germany. Cancers (Basel). 2023;15(15).
14. National Oncology Registry (RON). Publicação RON 2020. [2024-02-05]. Available from: https://ron.min-saude.pt/pt/noticias/noticias/publicacao-ron-2020/.
15. Danish Health Data Authority. The Cancer Registry. 2023. Available from: https://sundhedsdatastyrelsen.dk/da/registre-og-services/om-de-nationale-sundhedsregistre/sygdomme-laegemidler-og-behandlinger/cancerregisteret.
16. Finnish Cancer Registry. Statistics and research. 2023. Available from: https://cancerregister.fi/information-om-cancerregistret/uppgifter/.
17. National Board of Health and Welfare. National Cancer Register. 2023. Available from: https://www.socialstyrelsen.se/en/statistics-and-data/registers/national-cancer-register/.
18. OECD/European Observatory on Health Systems and Policies. Portugal: Country Health Profile 2023 - State of Health in the EU. OECD Publishing, Paris/European Observatory on Health Systems and Policies, Brussels, 2023.
19. Direção Executiva do SNS. DE-SNS 212/2023 - Criacao Nucleo Coordenador dos Rastreios. 2023.
20. European Cancer Information System (ECIS). Estimates of cancer incidence and mortality in 2022, for all countries. [2023-11-15]. Available from: https://ecis.jrc.ec.europa.eu/.
21. Eurostat. Causes of death statistics. [2023-10-18]. Available from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Causes_of_death_statistics.
22. Allemani C, Matsuda T, Di Carlo V, Harewood R, Matz M, Nikšić M, et al. Global surveillance of trends in cancer survival 2000-14 (CONCORD-3): analysis of individual records for 37 513 025 patients diagnosed with one of 18 cancers from 322 population-based registries in 71 countries. Lancet. 2018;391(10125):1023-75.
23. Hofmarcher T, Lindgren P, Wilking N, Jonsson B. The cost of cancer in Europe 2018. Eur J Cancer. 2020;129:41-9.
24. Lopes JM, Gonçalves FR, Borges M, Redondo P, Laranja-Pontes J. The cost of cancer treatment in Portugal. Ecancermedicalscience. 2017;11:765.
25. Hofmarcher T, Lindgren P, Wilking N. Diagnosed but not treated: How to improve patient access to advanced NSCLC treatment in Europe. Lund: IHE, 2022.
26. Organisation for Economic Co-operation and Development (OECD). Unmet need for health care: Comparing approaches and results from international surveys. 2020.
27. Eurostat. Self-reported unmet needs for health care by sex, age, specific reasons and degree of urbanisation [hlth_ehis_un1u__custom_8127239]. 2019 [2023-10-26]. Available from: https://ec.europa.eu/eurostat/databrowser/view/hlth_ehis_un1u__custom_8127239/default/table.
28. Organisation for Economic Co-operation and Development (OECD.stat). Dataset: Health expenditure and financing. [2023-11-22]. Available from: https://stats.oecd.org/Index.aspx?ThemeTreeId=9.
29. Eurostat. Health care expenditure by financing scheme [hlth_sha11]. [2023-12-18]. Available from: https://ec.europa.eu/eurostat/databrowser/product/view/HLTH_SHA11_HF.
30. Organisation for Economic Co-operation and Development (OECD.stat). Dataset: Healthcare utilisation. [2023-11-20]. Available from: https://stats.oecd.org/index.aspx?DataSetCode=SHA.
31. Ministério da Saúde. Recursos do SNS em Oncologia - Relatório de Inquérito 2021. 2022.
32. National Health Service (SNS). Acesso a Cuidados de Saúde nos Estabelecimentos do SNS e Entidades Convencionadas de 2021. 2021:307.
33. Marques P, Rêgo F, Nunes R. Palliative Care in Portugal-From Intention to Reality, What Is Yet to Be Accomplished. Nurs Rep. 2023;13(4):1477-85.

34. World Health Organization (WHO). Cervical cancer: key facts. 2020 [2023-05-31]. Available from: https://www.who.int/news-room/fact-sheets/detail/cervical-cancer.
35. Schüz J, Espina C, Villain P, Herrero R, Leon ME, Minozzi S, et al. European Code against Cancer 4th Edition: 12 ways to reduce your cancer risk. Cancer Epidemiol. 2015;39 Suppl 1:S1-10.
36. Sorensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: a systematic review and integration of definitions and models. BMC Public Health. 2012;12:80.
37. World Health Organization (WHO). Health Promotion. WHO; [2024-02-06]. Available from: https://www.who.int/teams/health-promotion/enhanced-wellbeing/ninth-global-conference/health-literacy.
38. Aaby A, Friis K, Christensen B, Rowlands G, Maindal HT. Health literacy is associated with health behaviour and self-reported health: A large population-based study in individuals with cardiovascular disease. Eur J Prev Cardiol. 2017;24(17):1880-8.
39. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. Ann Intern Med. 2011;155(2):97-107.
40. The Action Network on Measuring Population and Organizational Health Literacy (M-POHL). International Report on the Methodology, Results, and Recommendations of the European Health Literacy Population Survey 2019-2021 (HLS19) of M-POHL. Vienna: 2021.
41. Brega AG, Hamer MK, Albright K, Brach C, Saliba D, Abbey D, et al. Organizational Health Literacy: Quality Improvement Measures with Expert Consensus. Health Lit Res Pract. 2019;3(2):e127-e46.
42. Directorate-General of Health (SNS). Health literacy survey 2019 (HLS19) Portugal. 2021.
43. Costa A, Feteira-Santos R, Alarcão V, Henriques A, Madeira T, Virgolino A, et al. Health Literacy among Older Adults in Portugal and Associated Sociodemographic, Health and Healthcare-Related Factors. Int J Environ Res Public Health. 2023;20(5).
44. European Cancer Organisation. A Four Step Plan for Eliminating HPV Cancers in Europe. 2020.
45. World Health Organization (WHO). Cervical cancer. [2023-04-24]. Available from: https://www.who.int/news-room/fact-sheets/detail/cervical-cancer.
46. European Center for Disease Control and Prevention (ECDC). Guidance on HPV vaccination in EU countries: focus on boys, people living with HIV and 9-valent HPV vaccine introduction. 2020.
47. Portuguese Society of Gynecology (Sociedade Portuguesa de Ginecologia). Consenso nacional sobre vacinas contra HPV [National consensus on HPV vaccines]. 2017.
48. European Commission. Proposal for a Council Recommendation on vaccine-preventable cancers. 2024.
49. World Health Organization (WHO). Human Papillomavirus (HPV) vaccination coverage. [2023-10-09]. Available from: https://immunizationdata.who.int/pages/coverage/hpv.html?CODE=ROU&ANTIGEN=15HPVC_F&YEAR=.
50. European Commission. State of Vaccine Confidence in the EU. 2022.
51. World Health Organization (WHO). A short guide to cancer screening: increase effectiveness, maximize benefits and minimize harm. WHO, 2022 2022. Report No.
52. Manzano A, Hofmarcher T. Improving the care of women with triple-negative breast cancer. Lund: IHE, 2023.
53. Council of the European Union. Council Recommendation of 9 December 2022 on strengthening prevention through early detection: A new EU approach on cancer screening replacing Council Recommendation 2003/878/EC 2022/C 473/01. 2022.
54. European Commission. Screening ages and frequencies. [Apr 17, 2022]. Available from: https://healthcare-quality.jrc.ec.europa.eu/european-breast-cancer-guidelines/screening-ages-and-frequencies.
55. Quintal C, Antunes M. Picturing Prevalence and Inequalities in Cancer Screening Attendance to Population-Based Programs in Portugal. Acta Med Port. 2023;36(9):577-87.
56. Ministério da Saúde - Direção-Geral da Saúde. Avaliação e monitorização dos rastreios oncológicos organizados de base populacional 2022 - Portugal. Lisboa: Direção-Geral da Saúde, 2023.
57. Eurostat. Self-reported last breast examination by X-ray among women by age and educational attainment level. Available from: https://ec.europa.eu/eurostat/databrowser/view/hlth_ehis_pa7e__custom_8425663/default/table.
58. Cancer Research UK. Survival for cervical cancer. [Dec 2, 2023]. Available from: https://www.cancerresearchuk.org/about-cancer/cervical-cancer/survival.
59. McGarvey N, Gitlin M, Fadli E, Chung KC. Increased healthcare costs by later stage cancer diagnosis. BMC Health Serv Res. 2022;22(1):1155.
60. Portal da Transparência SNS. Utentes Inscritos em Cuidados de Saúde Primários. [2024-02-06]. Available from: https://www.sns.gov.pt/transparencia/.
61. Teixeira C, Antão C, Anes E, Gomes MJ, Versos A, Tomé C. Use of Cervical Cancer Screening among Patients of Primary Healthcare Services: Northeast Portugal. Portuguese Journal of Public Health. 2022;40(2):61-8.
62. Eurostat. Self-reported last cervical smear test among women by age and educational attainment level. Available from: https://ec.europa.eu/eurostat/databrowser/view/hlth_ehis_pa8e__custom_8054263/default/table.
63. Digestive Cancers Europe. Roadmap for the Prevention and Treatment of Colorectal Cancer in Europe. 2020.
64. Cancer Research UK. Survival for bowel cancer. [Dec 3, 2023]. Available from: https://www.cancerresearchuk.org/about-cancer/bowel-cancer/survival.
65. Shaukat A, Levin TR. Current and future colorectal cancer screening strategies. Nat Rev Gastroenterol Hepatol. 2022;19(8):521-31.
66. Segnan N, Patnick J, von Karsa L. European guidelines for quality assurance in colorectal cancer screening and diagnosis. Luxembourg: Publications Office of the European Union, 2012.
67. Eurostat. Self-reported last colorectal cancer screening test by sex, age and educational attainment level. Available from: https://ec.europa.eu/eurostat/databrowser/view/hlth_ehis_pa5e__custom_8520254/default/table.

68. Cancer Research UK. Survival for lung cancer. [Dec 3, 2023]. Available from: https://www.cancerresearchuk.org/about-cancer/lung-cancer/survival.
69. Hespanhol V, Parente B, Araújo A, Cunha J, Fernandes A, Figueiredo MM, et al. Lung cancer in Northern Portugal: A hospital-based study. Rev Port Pneumol. 2013;19(6):245-51.
70. Soares M, Antunes L, Redondo P, Borges M, Hermans R, Patel D, et al. Real-world treatment patterns and survival outcomes for advanced non-small cell lung cancer in the pre-immunotherapy era in Portugal: a retrospective analysis from the I-O Optimise initiative. BMC Pulm Med. 2020;20(1):240.
71. Wait S, Alvarez-Rosete A, Osama T, Bancroft D, Cornelissen R, Marušić A, et al. Implementing Lung Cancer Screening in Europe: Taking a Systems Approach. JTO Clin Res Rep. 2022;3(5):100329.
72. European Commission. SOLACE - Strengthening the screening of Lung Cancer in Europe. 2023 [2023-11-22]. Available from: https://health.ec.europa.eu/non-communicable-diseases/cancer/europes-beating-cancer-plan-eu4health-financed-projects/projects/solace_en.
73. Ward B, Koziar Vašáková M, Robalo Cordeiro C, Yorgancioğlu A, Chorostowska-Wynimko J, Blum TG, et al. Important steps towards a big change for lung health: a joint approach by the European Respiratory Society, the European Society of Radiology and their partners to facilitate implementation of the European Union's new recommendations on lung cancer screening. ERJ Open Res. 2023;9(3).
74. Van Meerbeeck JP, O'Dowd E, Ward B, Van Schil P, Snoeckx A. Lung Cancer Screening: New Perspective and Challenges in Europe. Cancers (Basel). 2022;14(9).
75. Barata F, Fidalgo P, Figueiredo S, Tonin FS, Duarte-Ramos F. Limitations and perceived delays for diagnosis and staging of lung cancer in Portugal: A nationwide survey analysis. PLoS One. 2021;16(6):e0252529.
76. Assembleia da República. Orçamento do Estado para 2024 (Lei n.º 82/2023). 2023.
77. Sicnoticas. Liga Contra o Cancro pede avanço nos rastreios: "Decisores políticos não devem esperar". 2023 [2023-11-22]. Available from: https://sicnoticias.pt/pais/2023-11-16-Liga-Contra-o-Cancro-pede-avanco-nos-rastreios-Decisores-politicos-nao-devem-esperar-01ff9342.
78. Pulmonale. Antes que o cancro do pulmão seja sentido, o que faz sentido é agir. 2023 [2023-11-22]. Available from: https://www.agirantesdesentir.pt/.
79. Andersson E, Hofmarcher T. Värdet av tidig behandling av cancer med immunoterapi i Sverige - en genomgång av literaturen [The value of early treatment of cancer with immunotherapy in Sweden - a review of the literature]. Lund: IHE, 2023.
80. Cong Z, Tran O, Nelson J, Silver M, Chung K. Productivity Loss and Indirect Costs for Patients Newly Diagnosed with Early- versus Late-Stage Cancer in the USA: A Large-Scale Observational Research Study. Appl Health Econ Health Policy. 2022;20(6):845-56.
81. Rajaram R, Huang Q, Li RZ, Chandran U, Zhang Y, Amos TB, et al. Recurrence-Free Survival in Patients With Surgically Resected Non-Small Cell Lung Cancer: A Systematic Literature Review and Meta-Analysis. Chest. 2024;165(5):1260-70.
82. Regionala Cancercentrum i Samverkan (RCC). Årsrapport Svenska Kvalitetsregistret för Gynekologisk Cancer (SQRGC). 2023.
83. Cancer Research UK. Survival for cervical cancer. 2023. Available from: https://www.cancerresearchuk.org/about-cancer/cervical-cancer/survival.
84. Gennigens C, Jerusalem G, Lapaille L, De Cuypere M, Streel S, Kridelka F, et al. Recurrent or primary metastatic cervical cancer: current and future treatments. ESMO Open. 2022;7(5):100579.
85. Taarnhoj GA, Christensen IJ, Lajer H, Fuglsang K, Jeppesen MM, Kahr HS, et al. Risk of recurrence, prognosis, and follow-up for Danish women with cervical cancer in 2005-2013: A national cohort study. Cancer. 2018;124(5):943-51.
86. Serouart B, Cordoba A, Martinez-Gomez C, Bogart E, Le Deley MC, Leblanc É, et al. Results of a 20 Year Retrospective Analysis of Early-Stage Cervical Cancer: Should 3 cm Be Considered the New Ariadne's Thread in Early Cervical Cancer Treatment? Cancers (Basel). 2023;15(5).
87. Moreira ASL, Cunha TM, Esteves S. Cervical cancer recurrence - can we predict the type of recurrence? Diagn Interv Radiol. 2020;26(5):403-10.
88. Leath CA, 3rd, Nysenbaum J, Ting J, Zhang YJ, Fiori A, Pauly N. Patterns of care and health care resource use among Medicaid-enrolled women with recurrent or metastatic cervical cancer. J Manag Care Spec Pharm. 2023;29(5):490-8.
89. Barrington DA, Riedinger C, Haight PJ, Tubbs C, Cohn DE. Pembrolizumab with or without bevacizumab for recurrent or metastatic cervical cancer: A cost-effectiveness analysis. Gynecol Oncol. 2022;165(3):500-5.
90. Soares M, Antunes L, Redondo P, Borges M, Hermans R, Patel D, et al. Real-world treatment patterns and survival outcomes for advanced non-small cell lung cancer in the pre-immunotherapy era in Portugal: a retrospective analysis from the I-O Optimise initiative. BMC Pulm Med. 2020;20(1):240.
91. Soares M, Antunes L, Redondo P, Borges M, Grimson F, Hermans R, et al. Small cell lung cancer treatment and survival in Portugal: A retrospective analysis from the I-O Optimise initiative. Eur J Cancer Care (Engl). 2021;30(6):e13496.
92. Soares M, Antunes L, Redondo P, Borges M, Hermans R, Patel D, et al. Treatment and outcomes for early non-small-cell lung cancer: a retrospective analysis of a Portuguese hospital database. Lung Cancer Manag. 2021;10(2):Lmt46.
93. Nur U, Quaresma M, De Stavola B, Peake M, Rachet B. Inequalities in non-small cell lung cancer treatment and mortality. J Epidemiol Community Health. 2015;69(10):985-92.
94. Guerreiro T, Forjaz G, Antunes L, Bastos J, Mayer A, Aguiar P, et al. Lung cancer survival and sex-specific patterns in Portugal: A population-based analysis. Pulmonology. 2023;29 Suppl 4:S70-s9.
95. Andersson E, Wilking N, Fridhammar A, Steen Charlsson K, P. L. Lung cancer in Sweden - An analysis of the burden of disease and the value of earlier detection. The Swedish Institute for Health Economics (IHE),: 2021.

96. Buja A, Rivera M, De Polo A, Brino ED, Marchetti M, Scioni M, et al. Estimated direct costs of non-small cell lung cancer by stage at diagnosis and disease management phase: A whole-disease model. Thorac Cancer. 2021;12(1):13-20.
97. Cortinovis DL, Perrone V, Giacomini E, Sangiorgi D, Andretta M, Bartolini F, et al. Epidemiology, Patients' Journey and Healthcare Costs in Early-Stage Non-Small-Cell Lung Carcinoma: A Real-World Evidence Analysis in Italy. Pharmaceuticals (Basel). 2023;16(3).
98. Andreas S, Chouaid C, Danson S, Siakpere O, Benjamin L, Ehness R, et al. Economic burden of resected (stage IB-IIIA) non-small cell lung cancer in France, Germany and the United Kingdom: A retrospective observational study (LuCaBIS). Lung Cancer. 2018;124:298-309.
99. Onco Daily. Sebastian Schmidt: Lung cancer screening – results from Croatia. 2024 [2024-05-24]. Available from: https://oncodaily.com/blog/38363.html.
100. Organisation of European Cancer Institutes (OECI). Accreditation and Designation User Manual V. 3.2. 2019.
101. European Cancer Organisation, Organisation of European Cancer Institutes (OECI). Comprehensive Cancer Care Across the EU: Advancing the Vision. 2021.
102. Malone ER, Oliva M, Sabatini PJB, Stockley TL, Siu LL. Molecular profiling for precision cancer therapies. Genome Med. 2020;12(1):8.
103. Mosele F, Remon J, Mateo J, Westphalen CB, Barlesi F, Lolkema MP, et al. Recommendations for the use of next-generation sequencing (NGS) for patients with metastatic cancers: a report from the ESMO Precision Medicine Working Group. Ann Oncol. 2020;31(11):1491-505.
104. Teixeira MR, Oliveira J, Borralho P, MG OF, Almodovar T, Fernandes I, et al. Portuguese Consensus Recommendations for Next-Generation Sequencing of Lung Cancer, Rare Tumors, and Cancers of Unknown Primary Origin in Clinical Practice. Acta Med Port. 2022;35(9):677-90.
105. IQN Path & European Cancer Patient Coalition (ECPC) & European Federation of Pharmaceutical Industries and Associations (EFPIA). Unlocking the potential of precision medicine in Europe. 2021.
106. Bayle A, Bonastre J, Chaltiel D, Latino N, Rouleau E, Peters S, et al. ESMO study on the availability and accessibility of biomolecular technologies in oncology in Europe. Ann Oncol. 2023.
107. European Federation of Pharmaceutical Industries and Associations (EFPIA). EFPIA Patients W.A.I.T. Indicator 2023 Survey. 2024.
108. European Federation of Pharmaceutical Industries and Associations (EFPIA). The root cause of unavailability and delay to innovative medicines: Reducing the time before patients have access to innovative medicines. 2023.
109. European Commission. Reform of the EU pharmaceutical legislation. [2023-05-02]. Available from: https://health.ec.europa.eu/medicinal-products/pharmaceutical-strategy-europe/reform-eu-pharmaceutical-legislation_en.
110. European Commission. Regulation on Health Technology Assessment. [2024-02-06]. Available from: https://health.ec.europa.eu/health-technology-assessment/regulation-health-technology-assessment_en.
111. Jornal de Notícias. Falhas na organização do Infarmed atrasam avaliação de medicamentos. [204-02-06]. Available from: https://www.inesctec.pt/download/805/ab382a05f816bdcd81b7fb16533090e2/27_06_2018_falhas_na_organizacao_do_infarmed_atrasam_avaliacao_de_medicamentos.pdf.
112. Rádio e Televisão de Portugal. Autoridade do Medicamento precisa "com urgência" de mais meios, alerta INFARMED. [2024-02-06]. Available from: https://www.rtp.pt/noticias/pais/autoridade-do-medicamento-precisa-com-urgencia-de-mais-meios-alerta-infarmed_n1139064.
113. Apifarma. Mais organização e celeridade para melhorar o acesso à inovação. [2024-02-06]. Available from: https://apifarma.pt/news/mais-organizacao-e-celeridade-para-melhorar-o-acesso-a-inovacao/.
114. Vintura. Every day counts- Improving time to patient access to innovative oncology therapies in Europe 2020.
115. Hofmarcher T, Szilagyiova P, Gustafsson A, Dolezal T, Rutkowski P, Baxter C, et al. Access to novel cancer medicines in four countries in Central and Eastern Europe in relation to clinical benefit. ESMO Open. 2023;8(4):101593.
116. Hofmarcher T, Brådvik G, Svedman C, Lindgren P, Jönsson B, Wilking N. Comparator Report on Cancer in Europe 2019 – Disease Burden, Costs and Access to Medicines. Lund: IHE, 2019.
117. Kamphuis B, Fontrier A-M, Gill J, Efthymiadou O, Salyga H, Kanavos P. Access to medicines in Europe: Delays and challenges for access. London School of Economics, 2021.
118. de Oliveira Martins S, Advinha AM. Índex Nacional de Acesso ao Medicamento Hospitalar 2022 - Estudo intercalar. APAH & FFUL & OF & APFH, 2022.
119. Rádio Renascença. Hospitais querem medicamentos inovadores financiados por fundo próprio. 2023 [2024-04-10]. Available from: https://rr.sapo.pt/noticia/pais/2023/07/23/hospitais-querem-medicamentos-inovadores-financiados-por-fundo-proprio/340089/.
120. The World Bank. Population ages 65 and above (% of total population) 2022. Available from: https://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS?locations=PT.
121. European Association for Palliative Care (EAPC). EAPC Atlas of Palliative Care in Europe 2019. 2019.
122. Kaasa S, Loge JH, Aapro M, Albreht T, Anderson R, Bruera E, et al. Integration of oncology and palliative care: a Lancet Oncology Commission. Lancet Oncol. 2018;19(11):e588-e653.
123. Arias-Casais N, Garralda E, Sánchez-Cárdenas MA, Rhee JY, Centeno C. Evaluating the integration of palliative care in national health systems: an indicator rating process with EAPC task force members to measure advanced palliative care development. BMC Palliat Care. 2021;20(1):36.
124. National Palliative Care Commission 2021-2022. Plano Estratégico para o Desenvolvimento dos Cuidados Paliativos. 2021.
125. Arias-Casais N, López-Fidalgo J, Garralda E, Pons JJ, Rhee JY, Lukas R, et al. Trends analysis of specialized palliative care services in 51 countries of the WHO European region in the last 14 years. Palliat Med. 2020;34(8):1044-56.

126. European Society for Medical Oncology (ESMO). ESMO Accredited Designated Centres. 2023 [2023-11-22]. Available from: https://www.esmo.org/for-patients/esmo-designated-centres-of-integrated-oncology-palliative-care/esmo-accredited-designated-centres.

Appendix: Methodology and sources for indicators

Prevention	
Health literacy level	Data on HL for Portugal and EU member states were sources from the European Health Literacy Population Survey 2019-2021 (HLS19) of M-POHL was used. The average was calculated by excluding non-EU member states. 13 EU countries were used to calculate the EU average.
HPV vaccination rate	Data for both graphs were sourced from the WHO's immunization database for Portugal and EU countries (49). 1st graph. Data not available for Croatia, Czechia, Greece, Poland, Romania, and Slovakia. i) HPV vaccination program performance coverage: describes the vaccination coverage according to the national schedule and the program's eligibility criteria for each calendar year. It represents the number of doses of HPV vaccines provided in the calendar year as a fraction of the program's target population up to 14 years of age. Note that most countries vaccinate a single cohort and current estimate excludes the population aged 15 and above even if they were vaccinated in the given calendar year. ii) HPV vaccination coverage by age 15: represents the proportion of population turning 15 in the reporting year that have been vaccinated against HPV at any time between ages 9 to 14, at any time up to the calendar year in question. This indicator is highly dependent on the consistency and quality of reporting from the previous 5 years, as they accumulate the number of doses administered to a specific birth cohort over time. This indicator allows to assess the population protection level by age 15 through a standardized cohort-based measure, independent of vaccination strategy, and in theory may allow for a better comparison of vaccine coverage trends over time and across countries.
Early detection	
Breast cancer screening	1st graph: Data sourced from Eurostat. Specification: Self-reported last breast examination by X-ray among women; age 50-69 years; X-ray within "less than 2 years" (year 2019) for all EU member states (n=27) 2nd graph: Data sourced from Eurostat. Specification: Devices for medical imaging: Mammographs per 100,000 inhabitants (year 2020) for all EU member states (data not available for Ireland, Hungary, Netherlands, and Finland)
Cervical cancer screening	1st graph: Data sourced from Eurostat. Specification: Self-reported last cervical smear test within 3 years among women aged 20-69 years (year 2019) for all EU member states (n=27) 2nd graph: Data sourced from a publication by Quintal et al. (2023) in table 1 by summarizing category "<1 year" and >1 year".
Colorectal cancer screening	1st graph: Data sourced from Eurostat. Specification: Self-reported screening rate within 2 years by age 50-74 years (year 2019) 2nd graph: Data sourced from a publication by Quintal et al. (2023) in table 1 by summarizing category "<1 year" and >1 year".
Lung cancer screening	NA
Diagnosis and treatment	
Comprehensive cancer centers	NA
Multi-biomarker testing	In the publication by the International Quality Network for Pathology, the European Cancer Patient Coalition, and European Federation of Pharmaceutical Industries and Associations EFPIA, availability of multigene biomarker tests was estimated based on a composite score of different NGS test technologies (i.e., hotspot / panel / comprehensive) within a given country and proportion of laboratories offering any NGS modality in-house or through referral.
Availability of new cancer medicines	1st and 2nd graph: EFPIA Patients W.A.I.T. Indicator Surveys. Data refers to rate of availability and time to availability of new cancer medicines. For most countries, availability is the point at which products gain access to the reimbursement list. The EFPIA data only refer to new medicines and not new indications of already approved medicines. Data in 2020-2021 do not include Malta, Cyprus, Luxembourg. Unweighted EU-average. The year 2020 refers to EMA medicine approvals in 2015-2018. The year 2021 refers to EMA medicine approvals in 2016-2019. The year 2022 refers to EMA medicine approvals in 2017-2020. The year 2023 refers to EMA medicine approvals in 2018-2021. The year 2024 refers to EMA medicine approvals in 2019-2022.
Uptake of new cancer medicines	Data sourced from a study by Hofmarcher et al. (2019) (116).
Evidence-based treatment	Data sourced from a study by Hofmarcher et al. (2022) (25). The aim of the study was to estimate country specific treatment rates and optimal treatment rates for non-small cell lung cancer (NSCLC).
Survivorship	
Palliative care services	1st graph: Report by the European Association for Palliative Care (EAPC) (121). 2nd graph: Data sourced from ESMO's website (126).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