Tackling inequalities in cancer care in the European Union

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Foreword

Already before the COVID-19 pandemic, public health and health care started to become mainstream politics at the European level. The “Health at a Glance: Europe” report series by the OECD in collaboration with the European Commission has compared EU countries since 2010. This series revealed and continues to reveal considerable inequalities between countries in terms of health status, such as life expectancy, health determinants, such as smoking habits, health resources, such as hospital beds, and health expenditure. This partly informs health system-related recommendations in the annual Country-Specific Recommendations as part of the European Semester.

The topic of between-country inequalities in cancer care in Europe, with a focus on cancer medicines, has been covered extensively by IHE and its frequent collaborators in the “Comparator Report” series since 2005. This report looks beyond between-country inequalities in the EU, focusing on various dimensions of inequalities such as differences by sex, age, socioeconomic status, and place of residence. It also takes a comprehensive view on cancer care, focusing on the entire cancer disease pathway from prevention to survivorship. The report includes a descriptive analysis of inequalities and explores possible reasons for the observed inequalities as well as provides evidence-based strategies to address the inequalities.

This report could not have been completed without input from various stakeholders. IHE held a series of expert interviews to inform the analysis from June to July 2023. IHE wants to thank all experts for sharing their expertise and contribution.

Lund, January 2024

Peter Lindgren
Managing Director, IHE

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- **Ms. Ewelina Szmytke**, Vice-President of Lung Cancer Europe
- **Dr. Françoise Meunier**, Founder of the European Initiative on Ending Discrimination Against Cancer Survivors
- **Dr. Nicola Normanno**, President of the International Quality Network for Pathology (IQN Path)
- **Ms. Zorana Maravic**, CEO of Digestive Cancers Europe

Endorsements

This report is explicitly endorsed by the following organisations:

Chapter 3.5 of this report and the recommendations from this chapter are endorsed by Dr. Françoise Meunier.

Table of Contents

Summary

The number of cancer cases is projected to rise considerably in the European Union (EU) in the coming decades. However, the chances of patients overcoming their disease vary depending on one's place of residence. Survival rates exhibit substantial disparities between EU countries. For instance, in the case of colon cancer, the five-year survival rate ranges from 50% in the worst-performing country to nearly 70% in the best-performing country.

Political commitment at the EU level to tackle cancer has received a significant boost with the publication of the Europe's Beating Cancer Plan (EBCP) in 2021 and the EU Cancer Mission under Horizon Europe 2021–2027. The EBCP is an ambitious policy framework that targets existing inequalities and aims to address the entire disease pathway. It includes concrete initiatives for cross-country collaborations, measures to adopt innovation in health care, and funding. To reach the aims defined in the EBCP, member states need to increase their efforts to improve equal access to high-quality cancer care for everyone.

This report primarily seeks to assist policymakers at the national level in comprehending and mitigating disparities both between and within EU member states. It adopts an input-process-outcomes perspective of health care as a basic framework to analyse existing inequalities. Beginning with the noted discrepancies in survival rates (representing 'the outcomes' of cancer care) between member states, differences in inputs to cancer care were considered. It is evident that one underlying factor contributing to between-country inequalities in outcomes may be the level of per-capita spending on cancer care, which ranges from €50–100 in Bulgaria, Croatia, Estonia, Latvia, Poland, and Romania to €250–300 in Austria, the Benelux countries, France, and Germany (adjusted for purchasing power parities). However, spending on cancer care only partially seems to explain between-country inequalities. Even though higher-spending countries in Northwestern Europe generally tend to achieve better outcomes than lower-spending countries in Eastern Europe, there are wide differences in outcomes even between countries with similar spending levels.

Therefore, this report focuses mainly on the processes of cancer care provision. The processes transform inputs (resources) into outcomes (survival, quality of life). The following five case studies along the disease pathway, covering the four pillars of the EBCP, were selected:

1. **Prevention**: Human papillomavirus (HPV) vaccination
2. **Early detection**: Colorectal cancer screening
3. **Diagnosis and treatment**: Biomarker testing
4. **Diagnosis and treatment**: Cancer medicines and evidence-based care
5. **Survivorship**: Access to financial products ("the right to be forgotten")

The six-dimensional framework of between-country and within-country inequalities of the European Cancer Inequalities Registry (ECIR) was applied for each case study to examine disparities.

Existing inequalities

The findings from the five case studies revealed large between-country inequalities in the EU along the entire disease pathway, as indicated in the table below. Only a minority of EU member states reaches aims defined in the EBCP or other relevant benchmarks. Examples of between-country inequalities are:

- Two member states still have not included boys in their HPV vaccination programme, and vaccination rates for girls range from 9% in Bulgaria to 94% in Portugal.
- Bulgaria and Romania have no screening programme for colorectal cancer, and in countries with a programme, the screening rates range from 4% in Cyprus to 76% in Denmark.
- Denmark and the Netherlands are the only countries where more than half of biopsies are analysed with next-generation sequencing (NGS) testing methods, whereas no biopsy samples are analysed with NGS in Czechia and Slovakia.
- Only Belgium and Portugal seem to treat at least 75% of advanced-stage non-small cell lung cancer (NSCLC) patients with cancer medicines, whereas Romania only treats 46%. No countries provide adequate access to immunotherapies and targeted therapies, relying on less effective chemotherapy instead.
- Eight member states have so far adopted legislation on the “Right to be forgotten” to ensure fair access to financial products for cancer survivors.

Additionally, notable within-country inequalities were found as indicated in the table below. Factors such as age, socioeconomic status, and urbanisation level (rural/urban place of residence) demonstrated high levels of inequalities. While disparities in access to cancer care based on individuals' formal education level were relatively modest, other individual aspects relating to health literacy, including general awareness and knowledge, perception of risks associated with a disease, and the means to acquire information, were identified as significant factors influencing access to cancer care.

	HPV vaccination	CRC screening	Biomarker testing	Cancer medicines and evidence-based care	Access to financial products
Country					
Sex					
Age					
Education level					
Socioeconomic status					
Urbanisation level					

Notes: Scoring of the level of inequalities observed according to the following categories: “inconclusive or lack of evidence” (grey), “noticeable” (light brown), “important” (medium brown), “very important” (dark brown).

Reasons for inequalities

Across all case studies, several common reasons for the observed inequalities were discerned. On a national level, the following aspects might help to explain between-country inequalities in cancer care:

- Political prioritisation of cancer care
- Health expenditure on cancer care (funding)
- Availability of supporting infrastructure
- Availability of medical professionals
- Up-to-dateness of clinical guidelines

In terms of reasons for inequalities within countries, the following common reasons were identified:

- Level of health literacy
- Geographic distance to university hospitals and comprehensive cancer centres

Recommendations to overcome inequalities

Based on our findings we propose the following recommendations to national policymakers to enhance and ensure more equal access to cancer care for everyone.

Long-term recommendations (based on broad themes identified):

- Improve personal and organisational health literacy of cancer patients and the public
- Ensure education and continuous training of medical staff
- Adopt innovations in early detection, diagnosis, and treatment of cancer
- Take a societal perspective in national cancer control planning
- Collect relevant data and continuously evaluate the quality of cancer care services

Short-term recommendations (case study-specific minimum requirements):

- Introduce a free-of-charge gender-neutral HPV vaccination programme and consider a school-based system for its implementation
- Improve participation in CRC screening programmes by making participation as easy as possible, e.g., by sending and collecting test kits by post
- Prioritise reimbursement of NGS testing methods for all cancer types with a clear clinical recommendation
- Prioritise reimbursement of medicines with a high clinical benefit
- Adopt legislation on the “right to be forgotten” for cancer survivors

List of abbreviations

CRC	Colorectal cancer
EBCP	Europe's Beating Cancer Plan
ECDC	European Centre for Disease Prevention and Control
ECIR	European Cancer Inequalities Registry
ECIS	European Cancer Information System
EFPIA	European Federation of Pharmaceutical Industries and Associations
EHIS	European Health Interview Survey
EMA	European Medicines Agency
ESCAT	ESMO Scale for Clinical Actionability of molecular Targets
ESMO	European Society for Medical Oncology
EU	European Union
FIT	Faecal immunochemical test
FOBT	Faecal occult blood test
GCO	Global Cancer Observatory
GP	General practitioner
HPV	Human papillomavirus
HTA	Health technology assessment
L.E.K. report	International Quality Network for Pathology (IQN Path), the European Cancer Patient Coalition (ECPC), and EFPIA
MCBS	Magnitude of Clinical Benefit Scale
NGS	Next-generation sequencing
NSCLC	Non-small cell lung cancer
OECD	Organisation for Economic Co-operation and Development
PO	Precision oncology
pp	Percentage point
PPP	Purchasing power parity
RTBF	Right to be forgotten
SACT	Systemic anti-cancer therapy
SLR	Systematic literature review
VCR	Vaccination coverage rate
WHO	World Health Organization

1. Introduction

Oncology has been one of the most dynamic areas of clinical research in recent decades. A better biological understanding of why cancer develops and how tumours grow has led to the development of innovative options to prevent, diagnose, and treat cancer. Unfortunately, the number of new cancer cases and deaths remains high in the European Union (EU). 2.7 million new cases were detected and 1.3 million people died from cancer in 2022 (1). Until 2040, shifting demographic developments and population aging are expected to increase the number of new cases by 18% and the number of deaths by 29% in the EU (1); see Figure 1. Deaths from cancer are also predicted to surpass deaths from cardiovascular diseases by 2035, making cancer the leading cause of death in the EU (2). Political commitment and resolute actions are required to avert at least some of the anticipated increases.

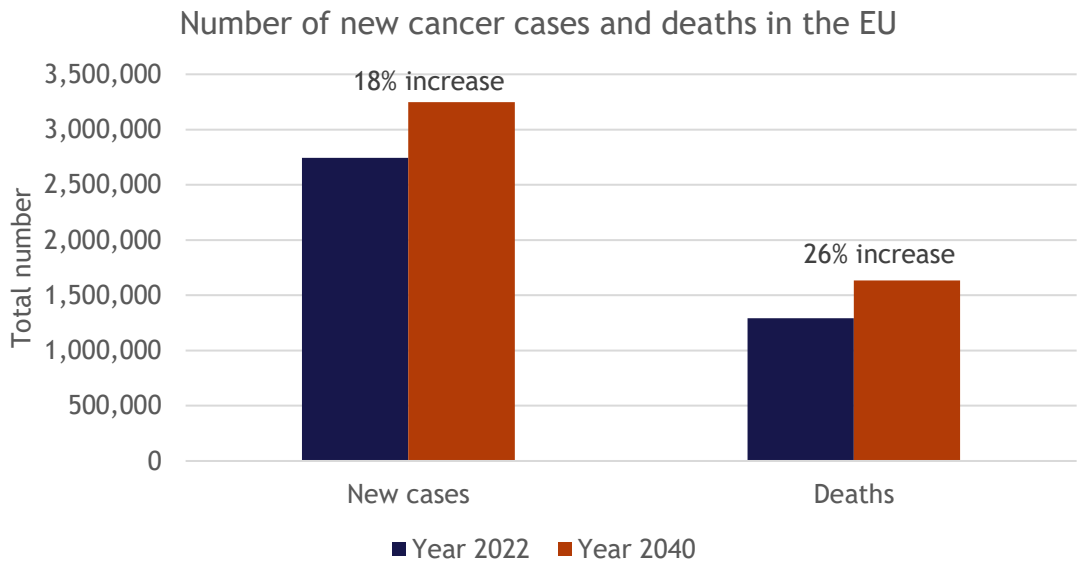

Figure 1: Estimated number of new cancer cases and deaths in the EU-27 in years 2022 and 2040.

Notes: Future numbers are only based on anticipated demographic changes and not on changes in the individual risk of getting and surviving cancer. Source: European Cancer Information System (ECIS) (1).

The rising number of cancer cases and deaths has helped draw the attention of policy makers. At the EU political level, this culminated in the launch of Europe's Beating Cancer Plan (EBCP) in February 2021 as well as the EU Cancer Mission as part of the Horizon Europe research and innovation programme for the years 2021–2027 (2, 3).

One ambition of the EBCP is to measure and reduce inequalities in cancer care both between and within member states. For this purpose, the European Cancer Inequalities Registry (ECIR) was launched in February 2022 (4). In addition, the European Cancer Pulse, co-developed by the European Cancer Organisation, the EFPIA Oncology Platform, and the Swedish Institute for Health Economics (IHE) and launched in November 2022, provides a more comprehensive overview of between-country inequalities in all areas of cancer care (5). Using data from the ECIR, Country Cancer Profiles for all EU countries were developed and published by the Organisation for Economic Co-operation and Development (OECD) on behalf of the European Commission in February 2023 (4). These profiles also highlighted selected between-country and within-country inequalities.

1.1 Europe's Beating Cancer Plan

The aim of the EBCP is to tackle the entire cancer disease pathway. It is structured around four pillars: (1) prevention; (2) early detection; (3) diagnosis and treatment; and (4) quality of life of cancer patients and survivors; see Figure 2.

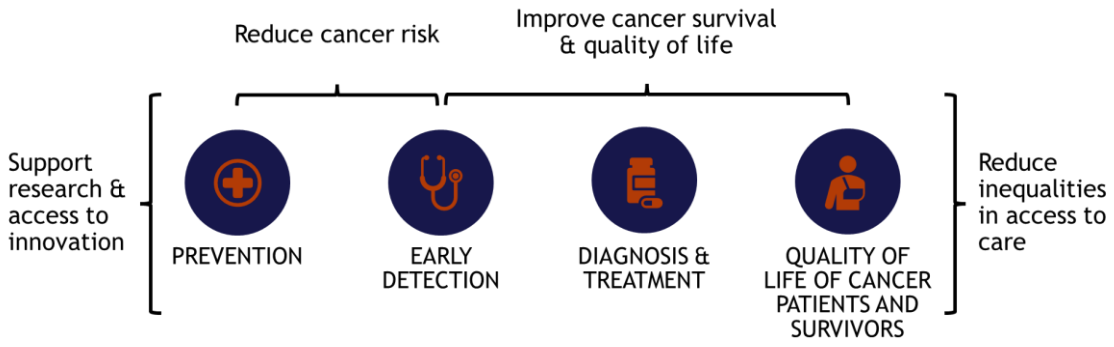

Figure 2: Key pillars and aims of the EBCP.

Source: European Commission (2).

Over the coming years, the EBCP will focus on research and innovation, utilising the potential of digitalisation and new technologies, and mobilising financial instruments to support member states. With its policy objectives, supported by ten flagship initiatives and multiple supporting actions, the EBCP hopes to aid member states to turn the tide against cancer.

Table 1: 10 flagship initiatives of the EBCP.

1.	'Knowledge Centre on Cancer' to facilitate the coordination of scientific and technical cancer-related initiatives at EU level
2.	'European Cancer Imaging Initiative' to develop an EU 'atlas' of cancer-related images to support the development of computer-aided tools to improve personalised medicines and innovative solutions
3.	Eliminate cervical cancer and other cancers caused by human papillomaviruses (HPV) by achieving an HPV vaccination rate of at least 90% of the EU target population of girls and to significantly increase the vaccination of boys by 2030
4.	A new 'EU-supported Cancer Screening Scheme' to ensure that 90% of the EU population who qualify for breast, cervical and colorectal cancer screenings are offered screening by 2025
5.	EU Network linking recognised national Comprehensive Cancer Centres to improve access to high-quality diagnosis and care with 90% of eligible patients having access to such centres by 2030
6.	'Cancer Diagnostic and Treatment for All Initiative' to improve access to innovative cancer diagnosis and treatments
7.	European Initiative to Understand Cancer (UNCAN.eu) to increase the understanding of how cancers and help identify individuals at high risk from common cancers
8.	'Better Life for Cancer Patients Initiative' to create a 'Cancer Survivor Smart-Card' and a virtual 'European Cancer Patient Digital Centre'
9.	Cancer Inequalities Registry to identify trends, disparities and inequalities between Member States and regions
10.	'Helping Children with Cancer Initiative' to ensure access to rapid and optimal detection, diagnosis, treatment and care

Source: European Commission (2).

1.2 Purpose and outline of the report

A critical step for policy makers, both at the EU level and the national level, is to turn the ambitious initiatives and aims outlined in the EBCP into real-life actions. The objective of this report is to support these initiatives and aims by providing an in-depth understanding of current between-country and within-country inequalities in cancer care. This is done in four steps:

1. Illustrate inequalities in spending and outcomes in cancer care between EU member states
2. Illustrate between-country and within-country inequalities throughout the cancer disease pathway (prevention, early detection, diagnosis and treatment, quality of life among cancer survivors) based on five case studies
3. Identify possible reasons for the observed inequalities
4. Propose evidence-based strategies and recommendations to reduce between-country and within-country inequalities

1.3 Methodology

The geographic scope of this report are the 27 member states of the EU.

1.3.1 Analytical framework

The analysis in the report takes its starting point from an input-process-outcome perspective of the cancer care system. This follows the basic structure of the Donabedian model of quality of care with its three components: structure (inputs), processes (outputs), and outcomes (6, 7), see Figure 3. The inputs – financial resources, physical resources such as treatment facilities, medical equipment, medical staff, and non-physical resources such as clinical guidelines – constitute the foundation based on which care provision takes place. The processes transform the inputs through specific actions such as vaccinations, diagnosis, treatments to address the patient's care needs. The result of these actions are the outcomes experienced by the patient in terms of health status, quality of life, and patient satisfaction.

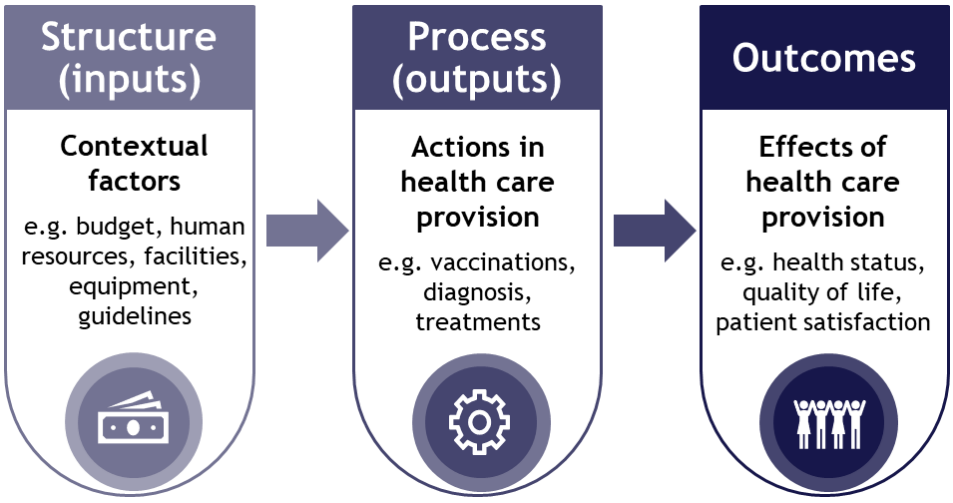

Figure 3: Donabedian model of quality of health care.
Source: Adapted from Donabedian (1988) (7).

Based on the Donabedian model of quality of care, this report considers inequalities in cancer care in the "input dimension" and the "outcomes dimension" in section 2. The "process dimension" covers all actions in health care provision and the exchange/transactions between patients and providers along the cancer disease pathway. This is examined based on selected case studies in section 3.

Definition of inequalities

There are various dimensions of inequalities in cancer care. The main focus for the description of inequalities in section 2 are between-country differences among the EU-27 member states. The case studies in section 3 explore five additional dimensions. These dimensions reflect the framework used by the ECIR to study disparities in cancer control between and within countries (4). Figure 4 illustrates the six dimensions considered by the ECIR, which in addition to between-country differences include differences by sex, formal education level, income level, urbanisation (place of residence in rural/urban areas), and age.

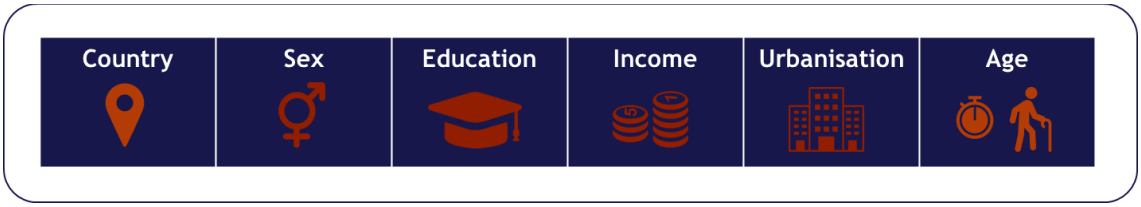

Figure 4: Framework to illustrate inequality dimensions across selected case studies.
Source: Adapted from the ECIR (4).

It should be noted that there might be important additional dimensions of inequalities depending on the setting. This may include inequalities between different regions in countries with regional health care systems (e.g., Germany, Spain, and Sweden) or inequalities between the majority population and, e.g., ethnic minority populations (Romani people), sexual minorities (LGBT+ people), religious groups (e.g., Jehovah's Witnesses, Muslims), or foreign residents (e.g., third-country citizens, refugees).

1.3.2 Case studies

Five case studies were selected to cover the entire cancer disease pathway; see Table 2. The selection criteria for the case studies included:

- One case study for each pillar of the EBCP but two case studies for the pillar on diagnosis and treatment
- Topic covered by a flagship initiative(s) of the EBCP
- Topic where (mostly) the member states are required to take concrete actions rather than the European Commission, because the actions relate to the provision of health care

Table 2: Selected case studies.

Case study	Topic	Relation to EBCP
#1 – Prevention	HPV vaccination	Flagship 3
#2 – Early detection	Colorectal cancer screening	Flagship 4
#3 – Diagnosis	Biomarker testing	Flagship 5-6 and 10
#4 – Treatment	Cancer medicines and evidence-based care	Flagship 5-6 and 10
#5 – Survivorship	Access to financial products ("The right to be forgotten")	Flagship 8

1.3.3 Sources

We applied a dual approach to obtain evidence and inform the analysis of the report:

Desk research: To describe inequalities, we relied mainly on data from the ECIR and the European Cancer Pulse as well as complimentary sources. To identify causes of the observed inequalities, we focused mainly on results from systematic literature reviews (SLR) that include results from EU countries, single-country studies from Europe not covered in published SLRs as well as published reports from various international organisations and institutions such as the European Commission, the OECD, Lung Cancer Europe, Digestive Cancers Europe, and the European Cancer Organisation.

Expert interviews: We conducted one expert interview per case study to identify potential reasons behind the observed inequalities. The experts were also asked about best practice examples and recommendations to overcome the inequalities.

2. Inequalities in spending on cancer care and patient outcomes

This section provides an overview of between-country differences in spending on cancer care (a single proxy measure for the input dimension of the analytical framework) and survival of cancer patients (a single proxy measure for the outcomes dimension of the analytical framework). The transformation of inputs to outcomes is the core of the care process and considered in section 3. Notably, inequalities in inputs might have implications for subsequent inequalities that can be observed in the process dimension and ultimately also in the outcomes dimension.

2.1 Inequalities in spending on cancer care

Health care resources used along the cancer disease pathway are manyfold. They include physical resources such as treatment facilities, medical staff, medical equipment, medicines, vaccines, and non-physical resources such as clinical guidelines. A single measure of the physical resources are the joint expenditures for these resources.[1]

Spending on cancer care per capita[2] in EU countries in 2018 is illustrated in Figure 5. It is evident that there were large between-country variations in spending (8). The Benelux countries, Austria, Germany, and France spent the most on cancer care – between €250 and €300 (PPP-adjusted). The Nordic countries, Ireland, Malta, Italy, Spain, Czechia, and Slovenia spent between €125 and €200 (PPP-adjusted). Countries on the Eastern border of the EU spent the least. The lowest spending country, Romania (€70), spent only a fourth of the highest spending country, Luxembourg (€294). If price differentials are not taken into account, the amount spent on cancer care in the highest spending country, Luxembourg (€363), was ten times higher than in the lowest spending country, Romania (€36).

It is important to note that most of the huge differences in per-capita spending on cancer care do not stem from vastly different proportions of the health care budget spent on cancer care. All EU countries were estimated to have spent around 4–7% of their total health expenditure on cancer care in 2018 (8). Interestingly, there was no discernible association between the overall wealth of a country and the proportion of health expenditure spent on cancer care (8). The vast differences in absolute spending on cancer care per capita stem from equally vast differences in total health care spending per capita (8). Therefore, to reduce between-country inequalities, lower-spending countries would need to prioritise increasing overall spending on health care in tandem with increasing spending on cancer care.

[1] Data on cancer care expenditure are generally not available by cancer control area (such as prevention, screening, diagnosis, treatment, survivorship). Existing data from published studies or reports for specific countries are difficult to compare due to different methods of reporting.
[2] Expenditure data only cover expenditures within the health care system. Social care services which may be important for cancer survivors are usually not fully covered by these data.

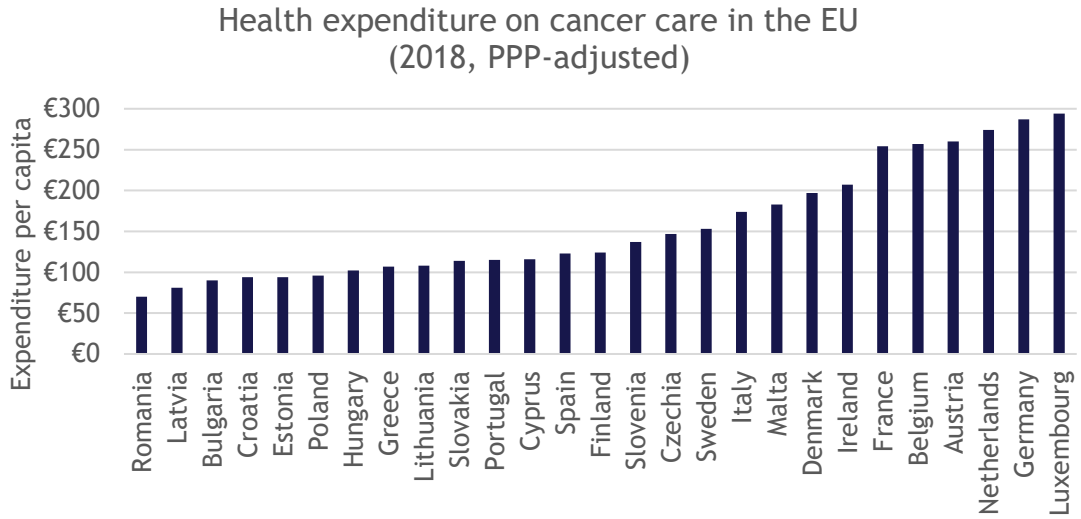

Figure 5: Per-capita health expenditure on cancer care (PPP adjusted) in EU member states in 2018.

Notes: PPP = purchasing power parity. Source: (8).

2.2 Inequalities in patient outcomes

The primary measure of outcomes of cancer patients is survival, as there is no definite "cure" for any cancer type. Health-related quality of life is an outcome measure that is becoming increasingly important as several cancer types start to resemble a chronic disease rather than a strictly lethal disease. Patient satisfaction is another outcome measure that is important. Due to limited and comparable data on health-related quality of life and patient satisfaction across EU countries, survival rates are considered below as a single measure for patient outcomes.

Survival, usually measured as 5-year survival rates, is an integral measure to evaluate the quality of cancer care and allows for between-country comparisons (9, 10). The latest comparable data on survival rates across countries come from the CONCORD-3 programme (11). They report survival rates of patients diagnosed in 2010–2014. Survival rates for the four most common cancer types in the EU are shown in Figure 6. Sizeable differences between countries are observable. For lung cancer, 5-year survival rates ranged from less than 10% to 20%, for colon cancer from 50% to almost 70%, for breast cancer in women from just above 70% to 90%, and for prostate cancer from less than 70% to over 90%. Overall, Cyprus (with less reliable date), Sweden, Finland, Belgium, and France ranked quite consistently among the countries with the highest survival rates for all four cancer types. Eastern European countries (especially Bulgaria, Croatia, Poland, Romania, and Slovakia) mostly reported the lowest survival rates.

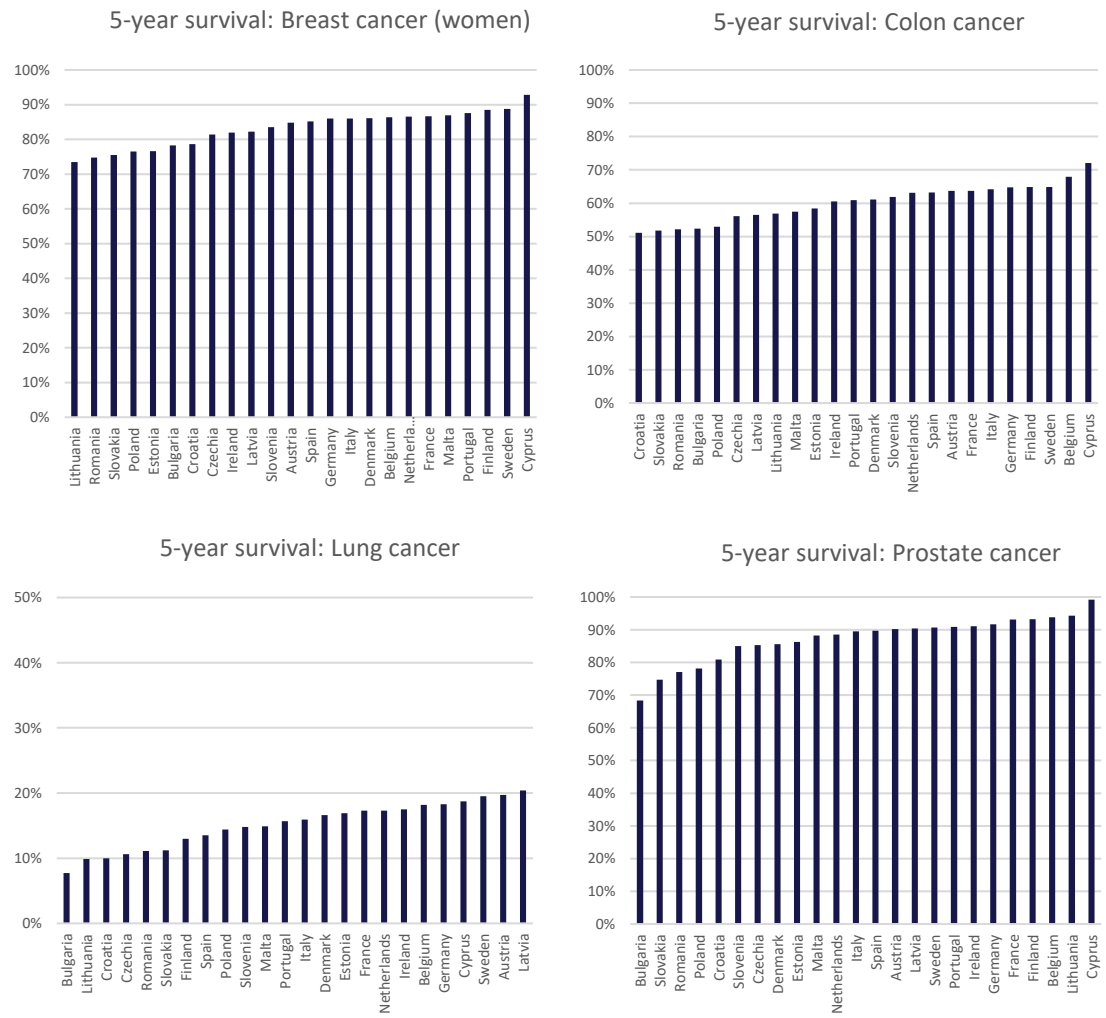

Figure 6: 5-year survival rates for the four most common cancer types of patients diagnosed in 2010-2014 in the EU.

Notes: Data not available for Greece, Hungary, and Luxembourg. Source: CONCORD-3 (11).

2.3 Relation between spending and patient outcomes

To inform policy decisions, it is crucial to understand to what extent inequalities in inputs translate into inequalities in outcomes. Access to better and relevant data – on resource use, processes, and patient outcomes – is vital to identify current inefficiencies and shortcomings in the care process along the entire patient pathway. This would also help health systems to weigh the opportunity costs of investing in different areas of cancer care against potential improvements in patient outcomes.

The association between inputs (defined as per-capita health expenditure on cancer care) and patient outcomes (defined as 5-year survival rates) at the country level is illustrated in Figure 7. This is a crude way of exploring whether there is a link between inputs and outcomes. Two important observations can be made from Figure 7.

Observation 1: Adequate spending on cancer care seems to be a prerequisite for achieving high survival rates.[3] The upward sloping trend lines in all four graphs, representing the four largest cancer types, indicate that countries with higher spending tend to record higher survival rates (mostly in Northwestern Europe) and countries with lower spending tend to record lower survival rates (mostly in Eastern Europe). In addition, the relationship between spending on cancer care and survival rates might be non-linear (concave shape of the trend lines). This indicates that each additional euro spent on cancer care improves survival rates, but the improvements for every additional euro spent might become smaller the more euros that have already been spent. An additional euro spent on cancer care in Eastern Europe might achieve greater gains in outcomes than spending the same euro in Northwestern Europe. To remedy at least some of the observed inequalities in outcomes between Northwestern and Eastern European countries, additional investment in the latter countries seems to be required.

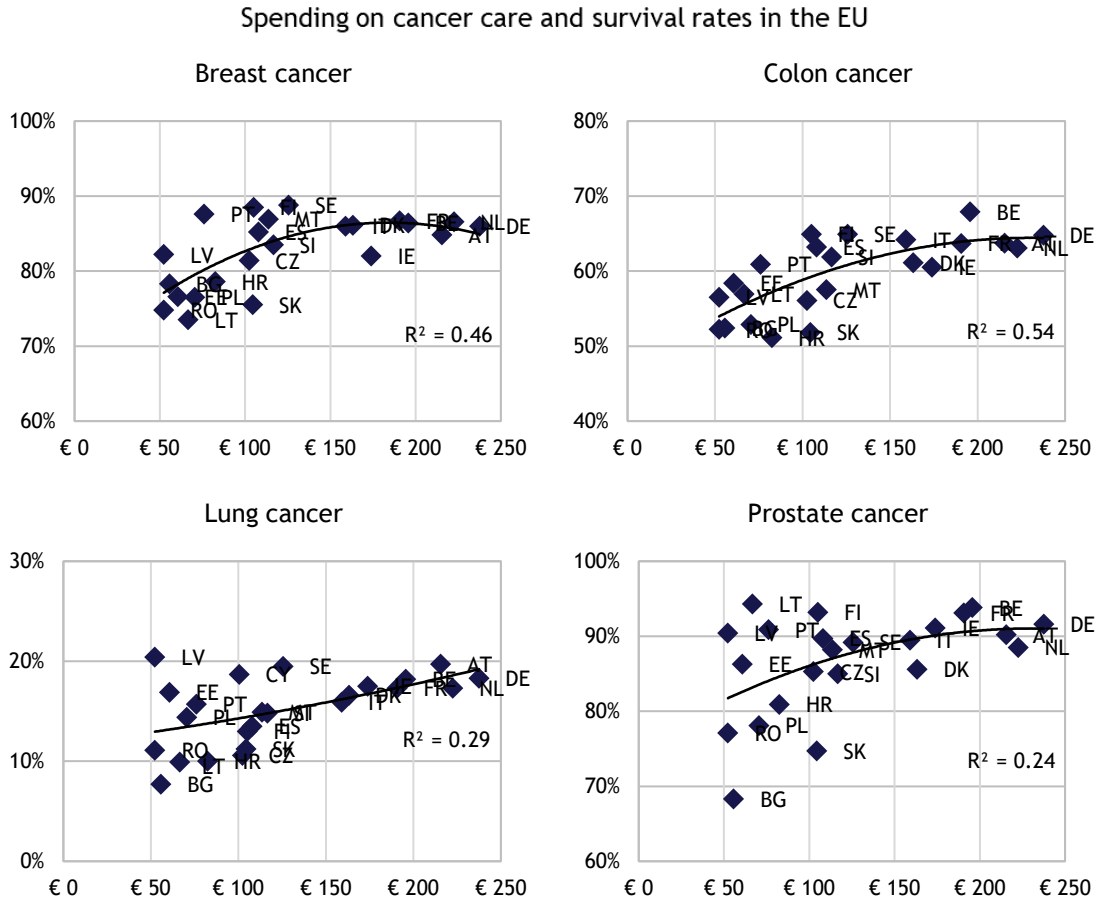

Figure 7: Cancer expenditure per capita in year 2010 (horizontal axis) and 5-year survival rates in year 2010-2014 (vertical axis) in the EU.

Notes: Data not available for Greece, Hungary, and Luxembourg. Source: Adapted from Hofmarcher et al. (8). Country abbreviations: AT- Austria, BE- Belgium, BG- Bulgaria, CY- Cyprus, CZ-Czechia, DK- Denmark, EE- Estonia, ES- Spain, FI- Finland, FR- France, DE- Germany, HR- Croatia, IE- Ireland, IT- Italy, LT- Lithuania, LV- Latvia, MT- Malta, NL- Netherlands, PL- Poland, PT- Portugal, RO- Romania, SE- Sweden, SK- Slovakia.

[3] Note that this positive association does not to be fully causal. The positive relationship could potentially also be driven by some third factor (e.g., the level of education in a country) that is related to both the amount of cancer-specific health expenditure and survival.

Observation 2: There seem to be considerable inefficiencies in cancer care. This is indicated by the great variation in spending on cancer care between countries that achieve similar survival rates. For instance, the Netherlands and Spain both recorded a survival rate of 63% in colon cancer, but per-capita spending on cancer in the Netherlands (€223) was twice as high as in Spain (€108). Although this is a crude way of inferring inefficiencies, this observation points to the importance of the processes of delivering cancer care (see section 3) and their role to explain existing between-country inequalities in outcomes. Inefficiencies motivate a reconsideration of the current allocation of cancer care expenditure into areas with evidence-based added clinical benefits. For countries below the trend lines, there seems to be room to improve patient outcomes through optimising the current processes of using existing resources and thereby increasing the added value for each additional euro spent.

3. Case studies on inequalities in cancer care

The previous section considered inputs and outcomes in cancer care. Inputs are required to achieve outcomes, but the processes through which this happens are crucial. The processes cover all actions along the cancer disease pathway. As the inputs to health care and cancer care are constrained, this calls for an evidence-based use of available inputs to achieve the best possible outcomes for patients.

This section considers five case studies of impactful measures to improve cancer care and the lives of patients and the public. For each case study, a description of current inequalities is provided based on the analytical framework. Possible reasons for the observed inequalities are explored and strategies to reduce inequalities are advised.

3.1 HPV vaccination

3.1.1 Background and aims defined in the EBCP

HPV infection is one of the major causes of infection-related cancer in both women and men (12, 13). HPV is also the most common sexually transmitted infection globally (12, 13). It is estimated that around 95% of all cases of cervical cancer are caused by HPV globally (14). In addition, HPV is responsible for a major proportion of cancers of the vulva, vagina, penis, anus, and oropharynx (12). In Europe, around 2.5% of all new cancer cases are estimated to be caused by HPV (15). Around 70-80% of all HPV-related cancers occur in women and 20-30% occur in men (15). Cervical cancer alone was estimated to account for 2.4% of all cancer-related deaths in women in the EU in 2022 (1).

In year 2022, cervical cancer ranked as the 13th most frequent cancer among women in the EU with over 28,000 diagnosed cases, but among younger women aged 15-49 it was the 4th most common cancer type (1). According to estimates from the ECIS, the age-standardised incidence rate of cervical cancer varied considerably across EU countries in 2022, ranging from 5.2 cases per 100,000 inhabitants in Malta to 32.6 cases per 100,000 inhabitants in Romania (1); see Figure 8.

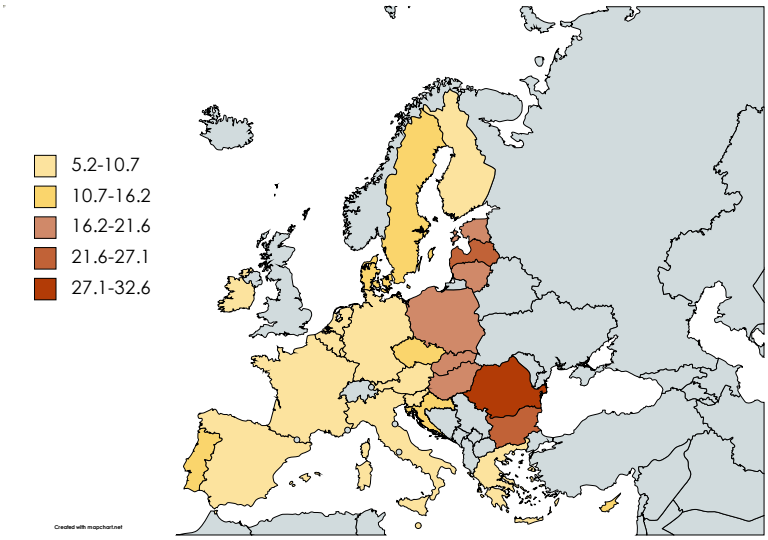

Figure 8: Age-standardised incidence rates of cervical cancer per 100,000 female inhabitants in the EU (estimates for 2022).

Source: ECIS (1).

The first two vaccines against HPV were approved by the European Medicines Agency (EMA) in 2006-2007. Vaccination against HPV has been shown to be an effective and cost-effective way to prevent cervical and other types of HPV-related cancers (15). A recent study in the Nordic countries demonstrated a vaccine effectiveness of 100% in young women over a 14-year follow-up period (16).

As part of the EBCP, the European Commission proposed to step up HPV vaccination activities in the member states. It aims to "*vaccinate 90% of the target population for girls by year 2030 and to significantly increase the vaccination for boys*". The goal is to eliminate cervical cancer and other cancers caused by HPV through an increase in immunisation, screening, and improvement in treatment (2). This is in line with the Cervical Cancer Elimination Initiative of the World Health Organization (WHO), which states that 90% of girls by age 15 should be vaccinated against HPV by year 2030 and that HPV vaccinations should be included in all vaccinations programmes (17).

3.1.2 Current inequalities

As of June 2023, all EU countries had HPV vaccination for girls included in their national vaccination programmes with full public funding (18). The last country to do so was Poland in June 2023 (19). Even before the EBCP set out clear aims to prioritise HPV vaccination for boys, several countries had already included boys in the national vaccination programmes, with the first country being Austria in 2014 (20). In recent years, almost all EU countries implemented a gender-neutral vaccination programme which is fully reimbursed, and at the end of year 2023, only 2 countries – Bulgaria and Estonia – only include girls; see Figure 9.

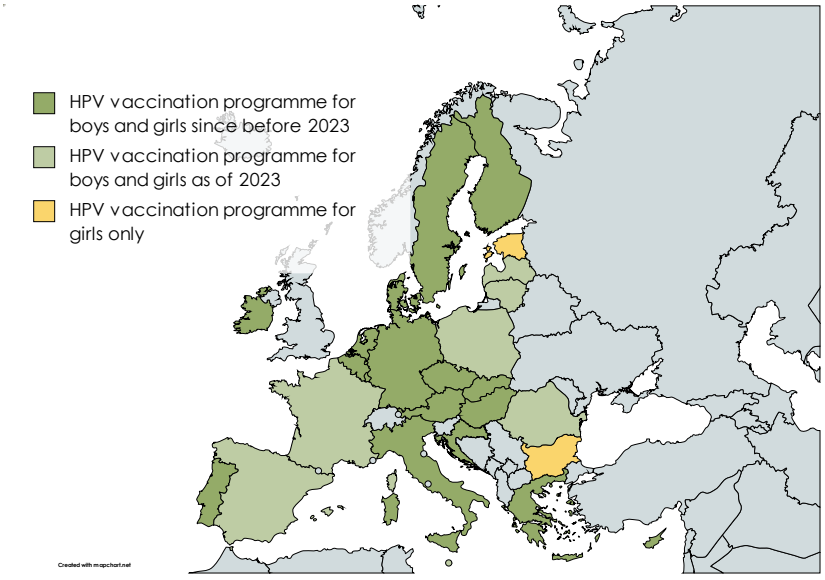

Figure 9: Implementation status of gender-neutral HPV vaccination programmes in the EU.

Source: Vaccine Scheduler database of the European Centre for Disease Prevention and Control (ECDC) (18), immunisation data from the WHO (21), and complementary country specific sources (Table A2 in Appendix). Note: Romania will introduce a gender-neutral vaccination programme by 1st December 2023.

HPV vaccination programmes in EU member states have been rolled out since the 2007, and resulted in an increasing coverage rate in most EU member states over the last decade (15, 22, 23). Based on the latest immunisation data from the WHO, the average HPV vaccination coverage rate (VCR) among EU countries with available data was 64% in 2022 for girls at age

15; see **Figure 10**. Over the last decade, the EU average HPV VCR has only increased by 6 percentage points, from ~58% to 64% (see Table A1 in Appendix).

Large country differences exist in the HPV VCR. As illustrated in **Figure 10**, only Portugal reaches the EBCP aim of a VCR of 90% for girls. Spain and Sweden are close to the target. Five countries have a VCR of below 50%. In Bulgaria, the VCR has been below 10% during the last decade, even though HPV vaccination has been recommended and fully reimbursed in the country since 2012 (24). Data on the VCR for girls up to age 15 were not available from the WHO for Croatia, Czechia, Greece, Poland, Romania, and Slovakia. In Czechia, the Ministry of Health reported an HPV VCR of around 63-65% for the years 2016-2020 (25), and in Romania, a government report stated an HPV VCR of below 10% in year 2019 (26). The lack of official registry-based records for HPV VCR renders it difficult to monitor progress towards the aims defined in the EBCP and by the WHO.

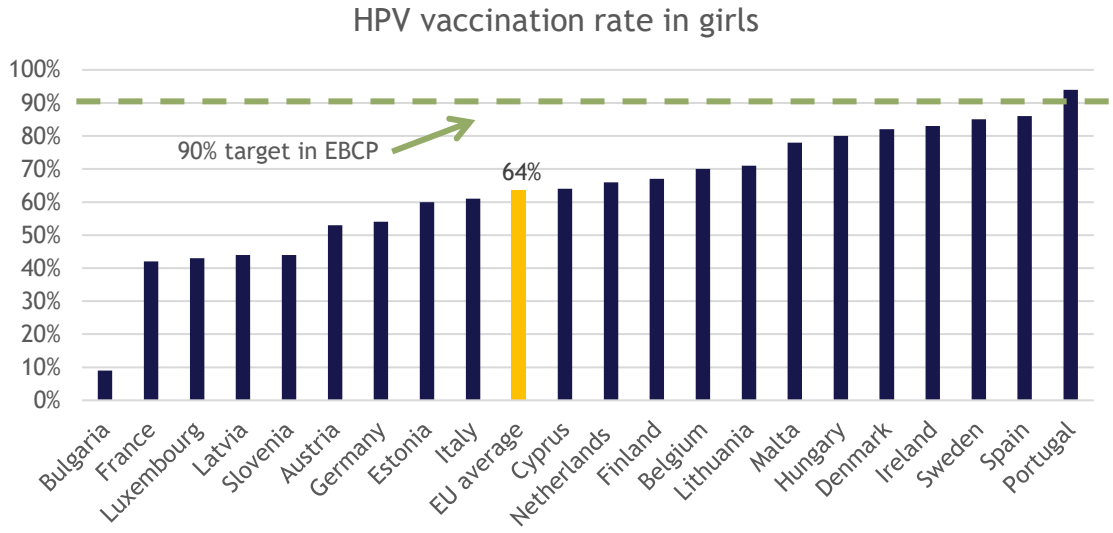

Figure 10: HPV vaccination coverage of girls by age 15 (last dose) in 2022.
Notes: Data not available for Croatia, Czechia, Greece, Poland, Romania, and Slovakia. Source: WHO immunisation database (21).

The target age for vaccinating girls varies from 10 to 14 years across countries. Most countries have an age interval, e.g., 10-13 years, while other countries such as Portugal and Slovakia only focus on a specific cohort (18). Moreover, a total of nine countries have catch-up vaccination programmes for girls and young women older than 15 years who missed out on the vaccination before age 15 (18).

Data on the HPV VCR for boys is lacking for most member states, partly because of the recent inclusion in national vaccination programmes. The immunisation database from the WHO only includes data for eight countries on the VCR for boys at age 15 in year 2022, see Figure 11. The same database also contains another metric for the VCR based on the vaccination coverage according to the national schedule and the programme's eligibility criteria for each calendar year. Based on this metric, the HPV VCR (last dose) was reported for additional countries: Portugal (80%), Sweden (78%), Hungary (61%), Cyprus (53%), Slovenia (23%), and Latvia and Slovakia (both 4%). In Czechia, the Ministry of Health reported an HPV VCR of 40% in 2020 (25).

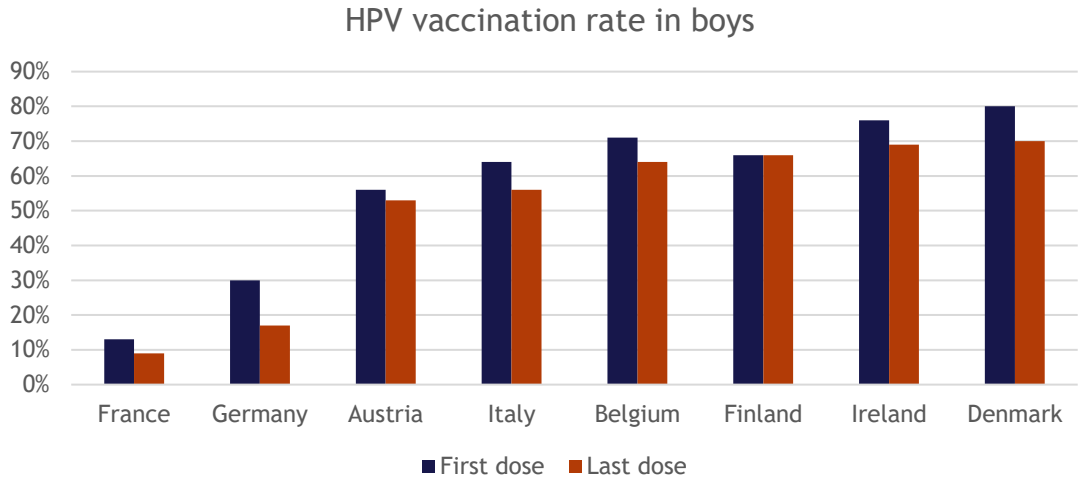

Figure 11: HPV vaccination coverage of boys by age 15 in 2022.
Source: WHO immunisation database (21).

Social determinants of getting vaccinated against HPV have been widely studied in Europe. One SLR from 2015 found that girls from families with low socioeconomic status and girls belonging to ethnic minority groups had lower HPV vaccination uptake, whereas there was limited evidence of rural-urban differences (27). Evidence regarding the association between the income level of parents an vaccination uptake is more mixed (28, 29). A study in Ireland found that HPV vaccination programmes were less successful in disadvantaged schools (30), whereas a study in England found that local authorities where there are more high-income families had lower vaccination uptake than local authorities with more low-income families (31).

Regarding the education level of parents, one study in Germany indicated that girls having a mother with a medium to high education level were significantly more likely to be vaccinated compared to girls with mothers with a low education level (32). Results from two studies in Sweden also indicated that a lower educational level was associated with a lower HPV vaccination uptake (28, 33). However, in a large study in Norway (data from ~84 000 girls), maternal education was associated with lower uptake, yet higher maternal income was associated with higher income, and paternal education and income showed similar, but weaker, associations (29).

Table 3: Level of inequalities in HPV vaccination between and within EU countries by dimension.

Country	Sex	Age	Education level	Socioeconomic status	Urbanisation level
			(of parents)	(of the family)	(of the family)

Notes: Scoring of the level of inequalities observed according to the following categories: “inconclusive or lack of evidence” (grey), “noticeable” (light brown), “important” (medium brown), “very important” (dark brown).

3.1.3 Reasons for inequalities

From a health system perspective, a wide range of factors that contribute to a low HPV VCR have been identified. This includes high costs of vaccines for the public payer, costs of monitoring programmes, lack of overall strategies for cancer prevention, restricted access to

health services, and deficiency of service coordination (15, 34). In Bulgaria, which ranks the lowest in HPV vaccination uptake for girls, a national cancer control plan had not been established until 2023 (35). This could possibly indicate a link between a suboptimal national strategy for cancer prevention and HPV vaccination uptake. Another aspect that has been found to be prevalent in countries with a very low HPV VCR is that a prescription is mandatory for dispensing the vaccine (23). In addition, the WHO has noted that there is currently a global shortage in HPV vaccines that is expected to continue until 2024 which might impact the VCR even in EU countries (36).

Most HPV vaccination programmes are either delivered through organised school-based vaccination programmes or at health facilities. The European Cancer Organisation as well as preceding studies state that school-based HPV vaccination programmes generally result in higher vaccine uptake (12, 23, 37). Among the best performing countries, Sweden, Denmark, Ireland, and parts of Spain deliver HPV vaccination through health services in schools (20). Latvia, France, and Bulgaria are examples of countries where HPV vaccination programmes are based on a different vaccination model that takes place outside the school health services. According to Prof. Charalambous, one possible reason why school-based vaccination programmes are more effective is that girls and boys are not dependent on their parents' motivation to go to a health centre to receive the vaccine, and furthermore, these school-based vaccination programmes cover school-age children better than community-based immunisation programmes (38). Nonetheless, in Portugal, community health clinics have been highlighted as a successful strategy, although no studies exist to pinpoint if there are any particular factors in the structure of the vaccination programme or individuals factors that explain the country's high VCR (15). In the Netherlands, there is currently an ongoing study that aims to provide guidance on methodologies to assess the performance of vaccination programmes (39).

On an individual level, factors such as lack of awareness and knowledge of HPV vaccination and cancer risks, vaccine hesitancy related to its safety, and overall mistrust are all aspects that influence vaccine uptake and that have been studied and monitored in Europe (34, 40, 41). These individual factors are related to a low level of health literacy.[4] A recent SLR highlighted the importance of health literacy for improving cancer care (45), and the significance of improving health literacy is also recognised in the EBCP and in the implementation plan of the EU Mission on Cancer (2, 46).

According to an SLR, insufficient knowledge or information, and beliefs that the available information is unclear, biased, and/or inadequate were common determinants of HPV vaccine hesitancy in Europe (34). Other studies have highlighted that individuals have concerns about potential side effects of the vaccine and hold mistrust against health authorities, healthcare workers, and new vaccines in general (34, 47). A recent study conducted by the European Commission investigating trends in vaccine "confidence" [5] in the EU and specifically for HPV vaccination found that HPV vaccination confidence in the EU declined from 2020 to 2022 (48).

[4] Health literacy is a concept defined by the WHO as the cognitive and social skills that allow individuals to gain access to, understand and use information to promote and maintain good health (42). More recent definitions of health literacy also recognise organisational health literacy, which is the degree to which organisations make it easier for patients to understand health information, navigate the health care system, and engage in the health care process (43). Low levels of health literacy are associated with poor comprehension of medical and health information, low compliance with screening protocols and adherence to treatment, and poor overall health (44).

[5] The term "confidence" includes four dimensions of aspects that relate to individuals' assurance of vaccines; viz. confidence in the importance of vaccines, in their safety, in the effectiveness of vaccines, and compatibility of vaccines with religious or personal beliefs.

A selection of these results is included in Table 4 for ten countries (five with the highest HPV VCR and five with the lowest HPV VCR for girls in 2022). Vaccine confidence in the general population is particularly high in Portugal, which also recorded the highest VCR, whereas confidence was lowest in Latvia, which is among countries with a low VCR. The same pattern is also noticeable for the other countries with a high and low VCR, except for France and Luxembourg where the VCR is low but the vaccine confidence is rather high, and vice versa for Sweden. Vaccine confidence among nurses and physicians was high overall with >90% in all countries included in Table 4, except for Bulgaria where it was between 81% and 88%.

Table 4: Confidence in HPV vaccination among the general population in year 2022 for 10 countries sorted by the highest and lowest VCR in girls in 2022.

	Important	Safe	Effective	Compatibility
Portugal (94%)	93%	89%	89%	90%
Spain (86%)	83%	83%	82%	85%
Sweden (85%)	74%	75%	74%	71%
Ireland (83%)	83%	79%	80%	80%
Denmark (82%)	82%	79%	80%	79%
Slovenia (44%)	68%	67%	69%	68%
Latvia (44%)	57%	56%	54%	58%
Luxembourg (43%)	74%	72%	72%	75%
France (42%)	73%	72%	70%	73%
Bulgaria (9%)	69%	65%	68%	72%

Source: WHO immunisation database (21), Report by European Commission (48). Sample size of ~1000 individuals for all countries in the European Commission study.

3.1.4 Strategies to improve HPV vaccination rates and reduce inequalities

The latest available data on HPV vaccination uptake across the EU countries demonstrate that an HPV vaccination programme is necessary but not sufficient to ensure high HPV uptake. A successful programme should not only ensure free access to the vaccine but also include interventions to raise awareness and educate parents. A monitoring system of the VCR is important to measure progress towards the target VCR rate and the effect of misinformation campaigns (30, 49). A gender-neutral vaccination programme should be implemented to achieve a herd immunity effect and to protect people with certain conditions (e.g., with immunosuppression) who cannot be vaccinated (20).

Several SLRs have investigated the effectiveness of different interventions to increase HPV vaccination uptake. An SLR covering 31 European countries concluded that school-based delivery within structured vaccination programmes and the use of invitation letters and reminders tended to be associated with a higher HPV VCR (23). According to Prof. Charalambous, school-based systems should be characterised by a multi-level approach, involving the schools, primary health care, and parents in order to increase the chances of reaching as many boys and girls as possible (38).

Another SLR found that narrative education, reminders, financial incentives, motivational and behavioural interventions, and provider prompts were associated with a higher HPV VCR (47). One literature review by the European Cancer Organisation also concluded that different educational interventions are effective, especially face-to-face communication and printed educational material (50). An SLR study of studies mainly conducted in the United States investigated the use of mobile health interventions (such as text-messages or educational material) to improve HPV vaccination uptake and found that these types of interventions in

the short-term can improve vaccination knowledge, intent, and uptake (51). In terms of healthcare professional's promotional strategies in improving HPV vaccination uptake, an SLR found that open-communication, motivational approaches, and sexual health education were effective in addressing vaccine misconceptions (52).

A silver bullet to achieve a high HPV VCR does not exist. A multi-level approach targeting parents, schools, and primary health care is needed. Based on the findings of proposed strategies in the literature and the expert interview with Prof. Charalambous, the following recommendations can be made to tackle inequalities between and within countries:

- Include boys in the national HPV vaccination programme (Bulgaria, Estonia, Romania).
- Raise awareness and tailor education material to why boys also should get vaccinated.
- Countries with a low vaccination uptake, should consider switching to a school-based system if they do not already have one.
- Increase efforts to ensure that parents are adequately educated about issues on HPV-related diseases, the importance and safety of the vaccine, as well as to address various misconceptions, such as that the vaccination promotes sexual activity.
- Prioritise vaccination campaigns in areas with lower socioeconomic status.
- Consider catch-up vaccinations for boys and girls.
- Ensure that a monitoring system of HPV vaccination uptake is in place to be able to (i) alert health authorities when sudden drops in the vaccination rate occur and (ii) measure progress towards vaccination goals.
- Improve official annual reporting of the HPV VCR.

3.2 Colorectal cancer screening

3.2.1 Background and aims defined in the EBCP

Colorectal cancer (CRC) is responsible for a substantial disease burden with an estimated 356,000 newly diagnosed cases and 159,000 deaths in the EU in 2022 (1). CRC ranks as the second most common cause of cancer-related deaths in the EU (12% of all cancer-related deaths) (1). There are large differences in CRC mortality rates between EU member states; see Figure 12. For instance, Austria, Finland, and Luxembourg have a mortality rate of around 24 deaths per 100,000 inhabitants while Croatia, Hungary, and Slovakia have mortality rate of around 50 deaths per 100,000 inhabitants. In the EU, CRC is more common in men (55% of all new cases and 56% of deaths) than in women (1).

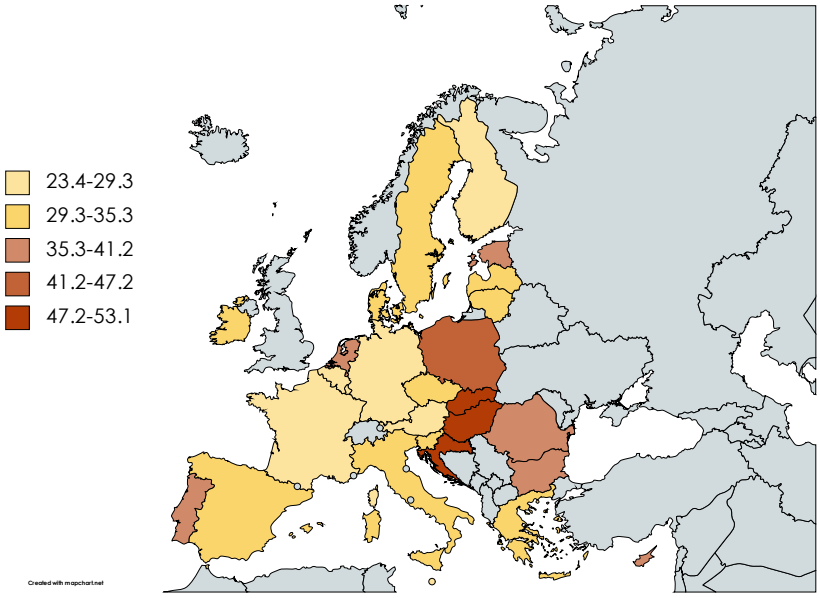

Figure 12: Age-standardised mortality rates (per 100,000) for CRC in the EU (estimates for 2022).
Source: ECIS (1).

CRC is to a large extent curable if diagnosed early and if appropriate treatment is provided (53). Since it is normally a slow developing cancer, early detection via screening can significantly reduce mortality (53-56). If CRC is diagnosed and treated in a localised state, the 5-year overall survival is around 90% as compared to 75% if the cancer has progressed to surrounding tissues and only 10% if the cancer has metastasised (53). In addition, the treatment costs of CRC are lowest at early-stages and highest at advanced stages (57, 58).

There are multiple CRC screening methods. They include stool-based tests – faecal occult blood test (FOBT), faecal immunochemical testing (FIT), multitarget stool DNA test – blood-based tests, and imaging-based tests such as colonoscopy, computed tomography colonography, colon capsule, and flexible sigmoidoscopy (56). Review studies of the cost-effectiveness of CRC screening compared to no screening indicate that CRC screening is not just a cost-effective strategy but might even be cost saving under certain conditions due to a reduction in CRC incidence and treatment costs (59, 60).

In the EU, the Council of the European Union recommended member states the introduction of colorectal cancer screening (along with breast cancer screening and cervical cancer screening) in 2003 (61). The initial recommendation was to screen men and women aged 50–74 years with FOBT. Guidelines from 2010 added FIT as a recommended test method (62). These guidelines stated that the screening interval with FOBT should not exceed two years, and the screening interval for FIT should not exceed three years. They also noted that there is evidence showing that FIT is superior to FOBT with respect to detection rates and positive predictive value for adenomas and cancer, and that there is evidence that FIT is a cost-effective alternative to FOBT (62). In 2022, the Council of the European Union confirmed the screening recommendation for CRC and the age group 50–74 years (63), and the European Commissions' group of chief scientific advisors established FIT as the preferred triage test for referring individuals for follow-up colonoscopy (64).

As part of the EBCP, the European Commission acknowledged the wide disparities between countries in screening rates for breast cancer (ranging from 6% to 90%) and cervical cancer (ranging from 25% to 80%). The EBCP specifies the aim to "*ensure that 90% of the EU*

population who qualify for breast, cervical and colorectal cancer screenings are offered screening by 2025". This effectively calls for the introduction of nationwide organised screening programmes for the appropriate age groups. The European Commission also emphasises the importance of equal access to screening and the necessity to take into account the needs of particular socioeconomic groups, persons with disabilities, and people living in rural or remote areas (65).

3.2.2 Current inequalities

A majority of EU member states has introduced national screening programmes for CRC since the initial Council recommendation in 2003. As of 2019, 17 member states had such a programme, whereas Poland and Portugal had partially rolled out their programme and Estonia was running a pilot (66). Austria and Sweden had an organised[6] programme in some regions, while Germany, Greece, and Latvia only offered opportunistic screening. Bulgaria and Romania had no screening programme (66). Most of the programmes target a specific age group (most commonly age 50–74) and may also provide opportunistic screenings for other high-risk groups (67).

According to latest available data from the European Health Interview Survey (EHIS), there are substantial between-country differences in CRC screening rates. Figure 13 shows screening rates with stool-based tests among peopled aged 50–74 in the EU (68). Denmark recorded the highest screening rate with 76% of the target population reporting a screening within the last three years. Cyprus, Bulgaria, and Romania all had screening rates of 4–5%. The EU average was 40% and an additional 10% reported that they had been screened at least once in their life.

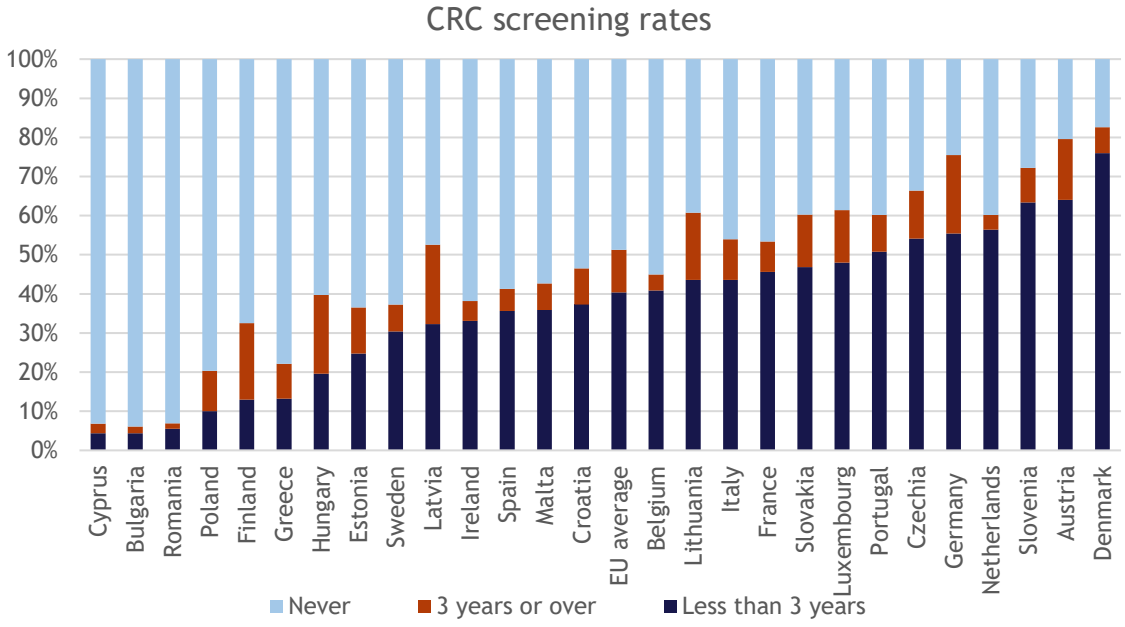

Figure 13: CRC screening rates (self-reported) by time since last screening in people aged 50-74 in the EU (year 2019).

Source: EHIS, Eurostat (68).

[6] An organised screening programme sends out invitations based on population registry data, whereas opportunistic screening either occurs when a physician assesses the need for it or upon an individual's request.

Evidence on inequalities and social determinants of getting screened for CRC between and within countries is rather scarce as pointed out in a recent SLR (69). Data from the EHIS are available to study some within-country inequalities. Differences in CRC screening rates by sex are shown in Figure 14. Latvia, Lithuania, and Germany are the three countries with the largest difference between women and men in CRC screening rates (+13 percentage points (pp), +11pp and +8pp higher in women than in men, respectively). In most other countries, sex differences are less than 2pp. An SLR reported that men with a family history of CRC were less likely to participate in CRC screening programmes than women (69). Other related studies also found that men generally participate less in CRC screening programmes (70-73).

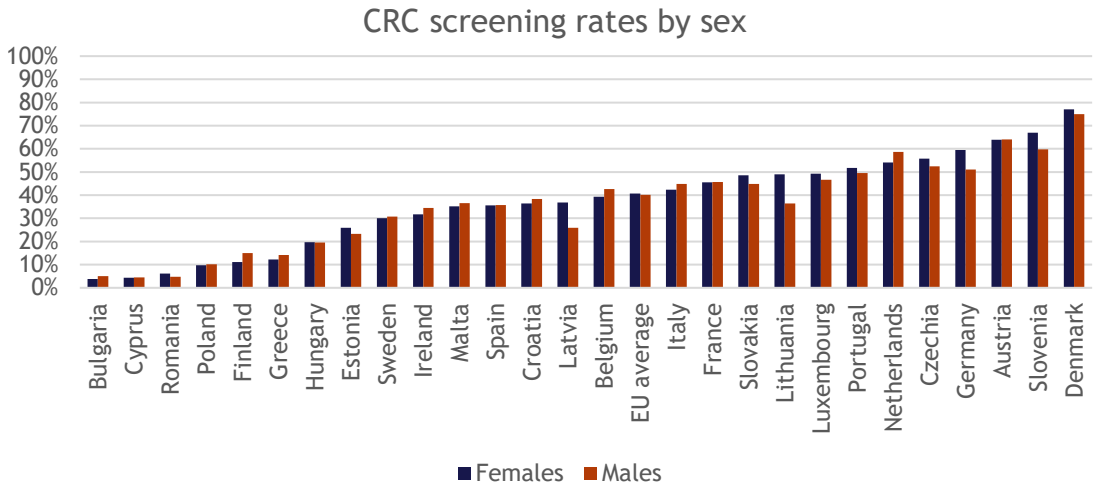

Figure 14: CRC screening rates by sex, ages 50-74 years (year 2019).
Source: EHIS, Eurostat (68).

CRC screening rates also vary by education level in some countries; see Figure 15. For instance, in Croatia the difference in the screening rate between people with lower secondary education and tertiary education was 17pp, and in Hungary, Lithuania, and Slovakia it was 14pp according to the data from the EHIS for 2019. There were also clear differences in Hungary, Latvia, and Austria.

Data on rural-urban differences in CRC screening rates from the EHIS and related studies in the EU do not indicate a clear relationship; see Figure A1 in the Appendix (74). One study in Norway found that a longer travel distance to the health clinic to collect the screening test kit was associated with lower CRC screening rates (75). Additionally, one study in France found that longer distance to the regional capital was significantly associated with longer time between a positive screening test and colonoscopy uptake (76). In contrast, one study in the Netherlands found that CRC screening programme participation was lower in areas with a higher urban density (77).

Regarding inequalities by income level, an SLR identified one study in the United States that indicated that a higher income level was associated with higher screening participation (69, 78). Similarly, a study in the Netherlands observed that people with low income level are less likely to get screened (72). The same Dutch study found that singles compared to couples were less likely to participate in screening, and also that Moroccan migrants were less likely to get screened compared to people with a Dutch background (72).

In addition, a large cross-sectional study in Europe (based on screening data from the second wave of the EHIS in the years 2013-2015) found that groups with lower self-perceived health and with lower age within the target interval (50-74 years) exhibited lower CRC screening rates (74). Lower health status in terms of obesity, being a smoker, and having a sedentary lifestyle were identified as determinants of not participating in CRC screening programmes in another SLR (69).

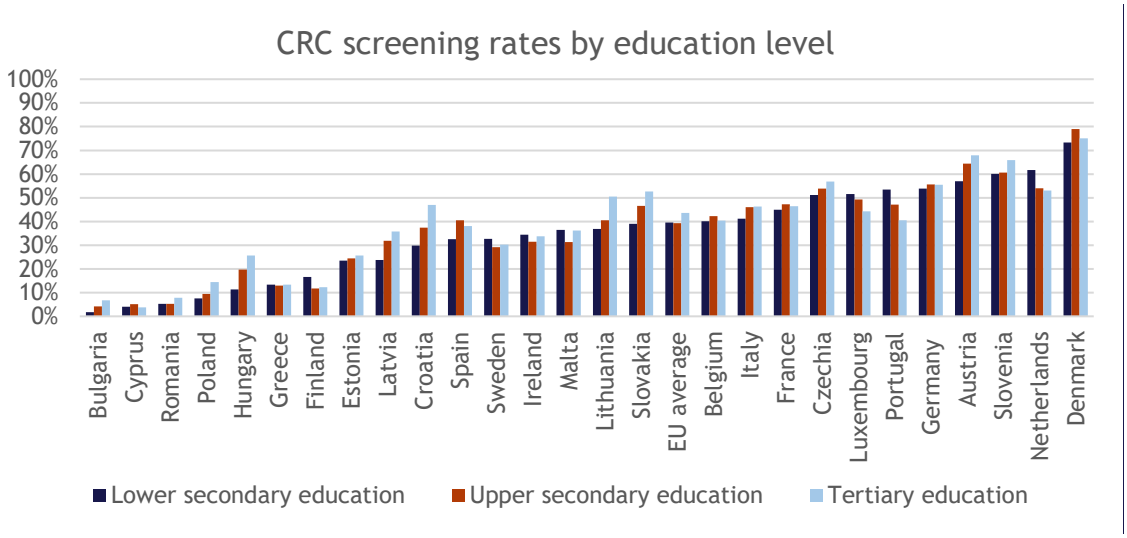

Figure 15: CRC screening rates by education level, ages 50-74 years (year 2019).
Source: EHIS, Eurostat (68).

Table 5: Level of inequalities in CRC screening between and within EU countries by dimension.

Country	Sex	Age	Education level	Socioeconomic status	Urbanisation level

Notes: Scoring of the level of inequalities observed according to the following categories: “inconclusive or lack of evidence” (grey), “noticeable” (light brown), “important” (medium brown), “very important” (dark brown).

3.2.3 Reasons for inequalities

A major source for between-country differences in CRC screening rates relates to the availability of an organised screening programme or recommendation for opportunistic screening. In the absence of a programme, Bulgaria and Romania only achieve screening rates of 4–5%. Countries with organised programmes tend to achieve the highest screening rates; see Figure 13. Nonetheless, Germany and Austria achieved relatively high CRC screening rates despite lacking a national organised screening programme in 2019 (79, 80). The age interval of the screening programme might also explain why countries such as Estonia, Finland, Ireland, Malta, and Sweden with a narrow target group (mostly 60–69 years; (66)) achieve below EU-average screening rates in the recommended target population of 50–74 years shown in Figure 13. General health system readiness and enough available human resources, such as gastroenterologists to perform follow-up colonoscopies, are barriers to implementing a CRC screening programme and widening the target age group.

Among countries with an organised CRC screening programme, the likelihood of participating in the programme depends on factors such as the invitation method and how and where the

testing is done. For instance, a comparison of the CRC screening programmes in the Basque region in Spain (with a high participation rate) and in Paris in France (with a lower participation rate) showed that residents in Paris needed to collect the sample test kit from the primary health care centre whereas it was sent home in the Basque region (81). Several other studies also found that sending test kits to people's homes leads to higher participation rates (82, 83).

From a health system perspective, a high participation in screening programmes is helped by a successful collaboration between relevant stakeholders, such as programme facilitators, hospitals and laboratories, and general practitioners (GPs) (53). There is some mixed evidence on the role of GPs to actively promote screening. One SLR found limited evidence on the effect of GP involvement on screening test uptake (82), whereas another review of screening programmes in Northwestern Europe found that screening rates can increase with active involvement of GPs (84).

Regarding individual factors, barriers to participate in CRC screening programmes are mostly related to low health literacy. This includes thinking that the risk of receiving a false alarm and the worries it brings along is too high, a low perceived risk of getting CRC, not having someone in the closest family diagnosed with CRC, concerns and disgust about the test procedure involving taking a stool sample, and the thought of potentially having a colonoscopy if tested positive (85-87).

Digestive Cancers Europe has highlighted several important barriers that should be considered when setting up CRC screening programmes (88). The following barriers can possibly explain between-country and within-country differences in screening rates:

- **Patient barriers**, such as fear, socio-demographic, psychosocial, economic or geographic factors as well as awareness, understanding or lifestyle.
- **Health care providers' barriers**, such as weak screening recommendation, poor coordination and communication between patients and providers, or lack of follow-up.
- **Health system barriers**, such as inadequate access, screening costs, test-specific factors or delays, as well as the capacity to move patients from screening to colonoscopy to effective treatment.

3.2.4 Strategies to improve CRC screening rates and reduce inequalities

An SLR of strategies to improve CRC screening rates found that notification letters, the ability to send faecal tests by post, written reminders, and telephone contacts with a health care provider are important features (82). In particular, facilitating screening participation by sending the test kit home has proven to be a successful strategy, which several countries adopted during the COVID-19 pandemic and are still using today. Results from another SLR also support the use of sending faecal tests by post as well as the use of a multilevel interventions such as CRC screening paired with a vaccination strategy (such as the influenza vaccine) (83). Limited evidence of financial incentives to increase screening participation has been found (83, 89).

In the near future, a change in the testing method might help to increase participation of individuals who are discouraged by the prospect of taking a stool sample. CRC screening test methods using blood samples (liquid biopsy) are currently being developed (90-92).

As noted above, the Basque region in Spain has been described as a success story in the implementation of an organised CRC screening programme with its participation rate of 68% (93). The main strategies in this programme are the use of a coordination office for planning and managing, invitation letters to residents in the target population with programme information and assignment to specific health care centres. The test kit is sent 4-6 weeks after the invitation letter (81).

Digestive Cancers Europe has put forward the following key recommendations to increase screening rates (88), which might also help to reduce inequalities between and within countries:

- Organise and support CRC awareness-raising campaigns and education.
- Involve all key stakeholders to set up or improve colorectal cancer screening programmes targeted at the total population of 50-74 years old; to have a concerted action between the regions and the national government to discuss collaboration on funding and savings.
- Review and improve national colorectal cancer programmes (from screening to treatment) and their implementation, including effectiveness of awareness programme, and adherence and effectiveness of screening programme. These reviews should be based on an integrated care approach (including standardised patient pathways).
- Ensure that the necessary capacity is available to diagnose and treat patients.
- Undertake consistent and regular monitoring at EU level of adherence and effectiveness of screening programmes, including Key Performance Indicators of the colorectal cancer national programmes.
- Undertake health economic analyses to track how money can be best invested and how the programmes need to be adjusted to improve outcomes.
- Organise an annual conference on colorectal cancer screening to exchange best practices between Member States, Regions and Healthcare Organisations.
- Promote multi-stakeholder colorectal cancer initiatives, such as European and National Councils in charge of leading, managing, monitoring and assessing colorectal cancer detection, treatment and outcomes.
- Create education materials for citizens and primary care to increase the possible diagnosis of colorectal cancer.

3.3 Biomarker testing

3.3.1 Background and aims defined in the EBCP

The implementation of precision medicine in oncology has increased significantly in the last decade due to advancements in biomarker testing technologies and approvals of targeted cancer treatments (94, 95). “Precision oncology” (PO) refers to treatments that are biomarker driven, which means that biomarker tests are used to identify a subgroup of patients for which tumour-tailored treatments can be used (95). A variety of genomic biomarker testing methods are available. They can be broadly grouped into single[7] testing methods and multiple[8] testing methods. In cancer types with multiple potential mutations

[7] Evaluating the presence of a single gene mutation, gene or protein expression within a biopsy associated with a particular form of cancer.

[8] Genomic biomarker testing (e.g., next-generation sequencing, NGS) of tumour tissue or blood samples to simultaneously detect multiple alterations in genes that are known to drive cancer growth.

that are targetable by available medicines, single-biomarker testing has become impractical. Instead, multigene biomarker testing methods, more specifically next-generation sequencing (NGS), is increasingly becoming standard of care in several cancer types (96).

The European Society for Medical Oncology (ESMO) has introduced a metric called the ESMO Scale for Clinical Actionability of molecular Targets (ESCAT) that ranks molecular targets for PO according to their value; see Box 1 (97). Based on the ESCAT classification, ESMO subsequently 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 (98).

Box 1: ESCAT - Measuring the value of molecular targets

Launched in 2018, the ESCAT provides a systematic framework to rank molecular targets based on evidence available supporting their value as clinical targets (97). The ESCAT defines six levels of clinical evidence for molecular targets according to the implications for patient management:

- ESCAT I = Target ready for routine use
- ESCAT II = Investigational target
- ESCAT III & IV = Hypothetical target
- ESCAT V = Combination development
- ESCAT X = Lack of evidence

ESMO used the ESCAT systems to inform its initial recommendations for the use of NGS testing in patients with metastatic cancers published in 2020 (98). The recommendations on whether to use NGS in a particular cancer type took into account a public health perspective, the perspective of academic clinical research centres, and an individual patient perspective.

The EBCP's flagship initiative "Cancer Diagnostic and Treatment for All" includes several action plans and aims that are specifically related to PO and the use of NGS (2). The overall aim is to improve cancer diagnosis and treatments through personalised medicine and the use of the latest innovations in cancer care.

3.3.2 Current inequalities

Access of cancer patients to biomarker testing varies widely across the EU (99, 100). In particular, access to NGS testing is a challenge, and it is estimated that fewer than 10% of eligible patients have access (99). A recent study commissioned by the International Quality Network for Pathology, the European Cancer Patient Coalition, and EFPIA, henceforth called "L.E.K. report", investigated EU countries' implementation and use of biomarker testing methods (101). The main finding is that large between-country inequalities exist for NGS testing methods in terms of availability (see Figure 16), reimbursement (see Figure 17), and use (see Figure 18). The availability of NGS testing methods was highest in Western European and Nordic countries as well as Cyprus and Portugal with access to NGS technologies at over 90% of laboratories; see Figure 16. In many Eastern European countries, the availability was estimated to be less than 75%.

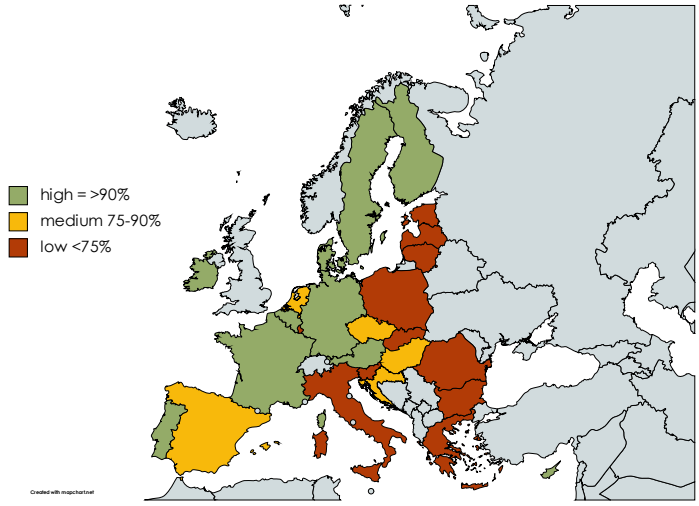

Figure 16: Availability of multigene biomarker tests (NGS) in 2020.

Notes: Availability was estimated from 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. Source: L.E.K. report (101).

The Nordic countries, Germany, and Cyprus funded the highest proportion of NGS tests (over 90%) through the public reimbursement system; see Figure 17. In Eastern European countries, fewer than 75% of tests were reimbursed.

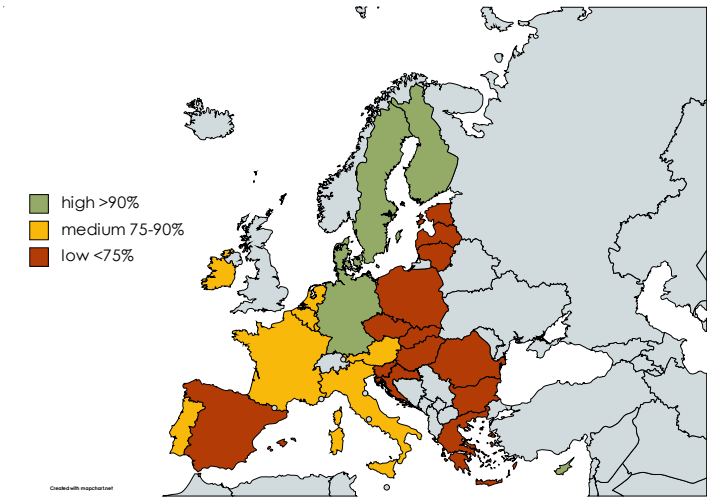

Figure 17: Reimbursement of multigene biomarker tests (NGS) in 2020.

Notes: Calculated based on the average proportion of tests reported to be covered by public reimbursement in year 2020. Source: L.E.K. report (101).

The active use of NGS among EU countries is shown in Figure 18. Denmark and the Netherlands were the only countries to report use in more than half of all biopsies. No biopsy samples were reported to be analysed with NGS in Czechia and Slovakia.

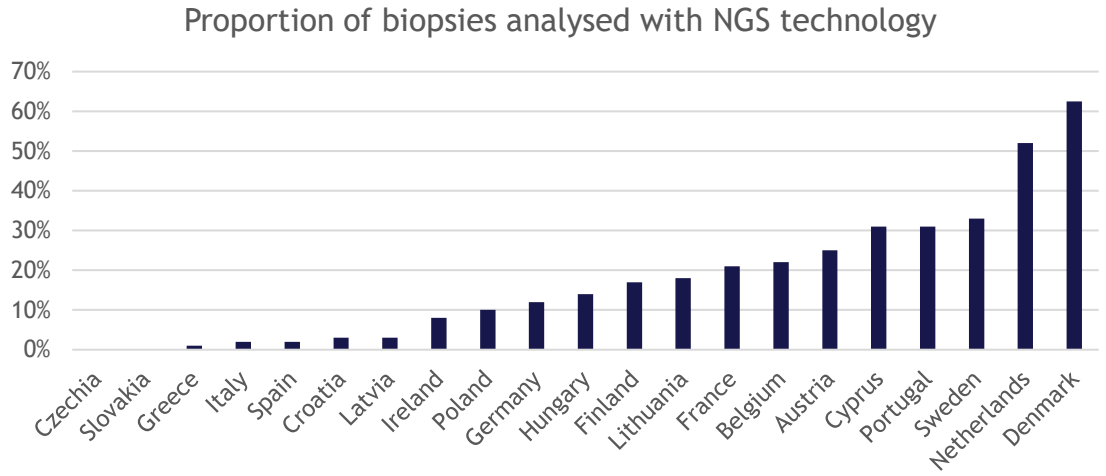

Figure 18: Proportion of biopsies analysed with NGS technology in 2020.

Notes: In Bulgaria, Estonia, Luxembourg, Romania, and Slovenia, the use of NGS was graded as less than 50%. In Denmark, the use of NGS was estimated to be between 50-75% (average 62.5%). Source: L.E.K. report (101).

Access to single biomarker testing methods also varies considerably across the EU, although to a somewhat lower extent than to NGS technologies (101). The access level is lowest in Eastern European countries (Slovakia, Romania, and Bulgaria) and highest in the Nordic countries (Sweden, Finland, and Denmark) and Western European countries (Germany, Belgium, Luxembourg, Austria, and France). Single biomarker testing methods (e.g., for EGFR and ALK mutations in NSCLC) have been introduced in Eastern European countries long ago, but a lack of adequate infrastructure and limited public budgets make it difficult for patients to gain access (102).

There is limited evidence around inequalities within countries in access to multigene or single biomarker testing among different patient groups. One recent SLR found that a low socioeconomic status was modestly related to lower use of predictive biomarker testing (103). Nevertheless, there is a growing body of evidence showing socioeconomic inequalities in access to novel cancer treatments that depend on access to related biomarker testing (103). For instance, a large population-based cohort study in England found that living in a deprived area, living in a rural area, being male, and age over 80 years are all factors associated with a lower likelihood of using novel cancer therapies for NSCLC treatment (104).

Table 6: Level of inequalities in biomarker testing between and within EU countries by dimension.

Country	Sex	Age	Education level	Socioeconomic status	Urbanisation level

Notes: Scoring of the level of inequalities observed according to the following categories: “inconclusive or lack of evidence” (grey), “noticeable” (light brown), “important” (medium brown), “very important” (dark brown).

3.3.3 Reasons for inequalities

The L.E.K. report identified several key barriers that can possibly explain between-country differences in biomarker testing:

- Limited availability of precision medicines linked to biomarkers
- Unclear value assessment approaches for diagnostic tests
- Very diverse laboratory infrastructure, capabilities, and referral pathways
- Limited stakeholder awareness and education
- Inconsistent participation of laboratories in quality assurance schemes

The availability and use of biomarker testing methods and PO medicines are intertwined. Although there is a centralised process of regulatory approval of PO medicines through the EMA and increasingly more joint health technology assessments (HTAs) of EU member states, there is no automatic link between approvals of precision medicines and matched biomarker tests (101). One reason for this is that there are simply no requirements for matched diagnostic tests to be assessed together with new PO medicines (95). Between-country differences in value determination procedures of novel PO medicines can further increase inequalities (95). A study by ESMO also concluded that costs and availability of both treatment and test are the two main factors limiting patient access to multigene biomarker tests and consequently novel cancer medicines in Europe (105).

From a health system perspective, the major reason for between-country differences in access to NGS testing methods relates to challenges in implementation (100). Countries with lower spending on cancer care (see Figure 5) tend to do worse in ensuring access to NGS testing methods (see Figure 16 and Figure 17). Multigene biomarker test uptake is higher among countries with centralised systems of health care funding, as this allows for economies of scale to justify infrastructure investments (101). Existing shortages of medical staff including pathologists in the EU are a likely barrier to ensure access to NGS testing for all eligible patients (106). Countries with a regional health care system, such as Italy, tend to have challenges in implementing a national strategy for precision medicine (101). However, despite the regional health care system in Sweden, a national genomic infrastructure could be established through a bottom-up approach led by university hospitals (107).

Another reason for differences in the use of NGS between countries is the variation in adherence to testing guidelines. An international survey by the International Association for the Study of Lung Cancer found that around one third of all responding health care professionals were not up-to-date with recent guidelines for molecular testing (108). Different aims and use of molecular tumour boards among EU countries have also been highlighted as barriers to equal access to NGS (100). There are also variations in policies and processes for raw genomic data retention and personal access (genomic data management) among EU countries that may partly explain differences (109).

In terms of within-country inequalities, the geographical location of patients can have an impact on access to NGS testing methods due to the concentration of specialised cancer care in university hospitals, including laboratory infrastructure. If NGS tests are not reimbursed, inequalities may arise between patients who can afford to pay for these tests out-of-pocket and also between patients treated at university hospitals vs. non-academic hospitals, because the former can pay for NGS testing for research purposes out of their local budget (110).

In countries where NGS tests are not reimbursed, patients may instead enrol in clinical trials to access such tests (110). However, there are large disparities in the number of clinical trials

in oncology across EU countries, with the highest number available in Northwestern European countries and the lowest number in Eastern European countries (111).

3.3.4 Strategies to improve access to biomarker testing and reduce inequalities

Short-term and long-term recommendations to improve access to biomarker testing in the L.E.K. report are summarised in Table 7. These recommendations can help to reduce inequalities between and within countries.

Table 7: Recommendations to improve access to biomarker testing methods.

Short-term strategies	Long-term strategies
• Parallel approval of the medicine and associated testing • Adopt a national system for biomarker test value assessment • Dedicated biomarker test budgets • Mandatory ISO accreditation and External Quality Assessment (EQA) scheme participation • Regional testing centres • Stakeholder education • Centralised data collection • Horizon scanning	• Harmonise approaches along the test development continuum, including guidance on biomarker use during clinical trials and test value assessment to inform reimbursement decisions • Centralised testing infrastructure: Promote development of networks of specialised labs at national level to carry out testing and interpret results • Data sharing: Encourage sharing of biomarker data and collaboration between key stakeholders across Europe • Guidelines on comprehensive testing: Develop EU-wide guidelines to promote use of comprehensive testing at various stages of the disease journey and implementation of best practice methods

Notes: ISO = International Organization for Standardization. Source: L.E.K. report (101).

3.4 Cancer medicines and evidence-based care

3.4.1 Background and aims defined in the EBCP

Improving access to innovative and evidence-based treatment is one of the key elements of the EBCP. The "Cancer Diagnostic and Treatment for All" initiative aims to help optimise cancer diagnosis and treatment and reduce unequal access to personalised medicine in cancer care (2). Another aim is to ensure that 90% of eligible patients have access to Comprehensive Cancer Centres by 2030, which will be linked by an EU network that will be established by 2025 (2). The network of Comprehensive Cancer Centres is hoped to facilitate the uptake of quality-assured diagnosis and treatment, including training, research, and clinical trials across the EU.

Lung cancer is a cancer type that is quite prominently featured in the EBCP, in terms of efforts to prevent (smoking), diagnose (screening), and treat the disease. Lung cancer was the leading cause of cancer-related deaths (20% of all cancer-related deaths) in the EU in 2022 (1). The prognosis of lung cancer is generally poor with an estimated survival rate of 10–20% across EU countries in 2010–2014; see Figure 19.

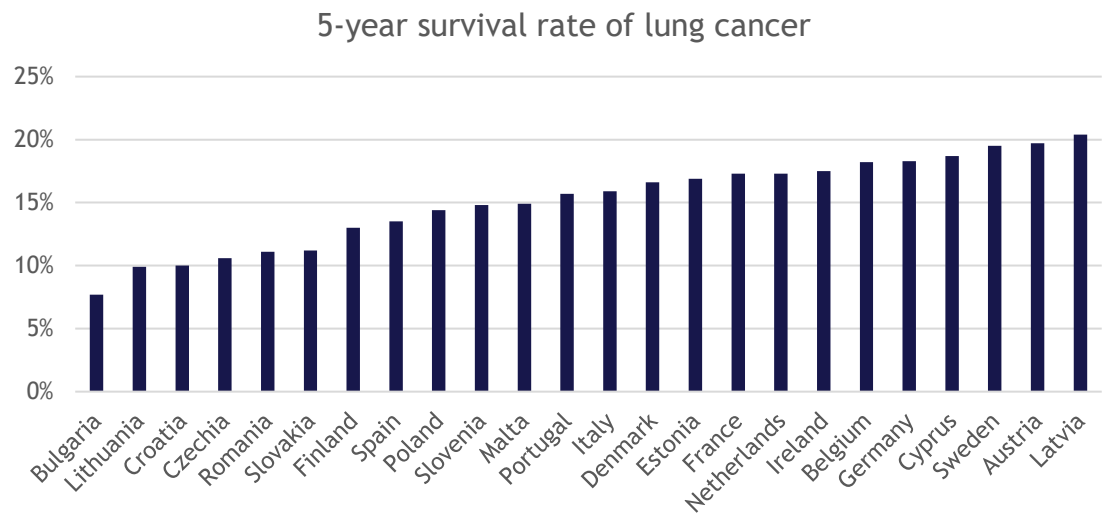

Figure 19: 5-year survival rates in lung cancer of patients diagnosed in 2010-2014 in the EU.

Notes: Data not available for Greece, Hungary, and Luxembourg. Source: CONCORD-3 (11).

Late diagnosis of lung cancer and limited availability of effective treatments have for a long time made it difficult to improve survival rates (112). For patients with non-small cell lung cancer (NSCLC), which accounts for around 85% of all lung cancer cases, this dire situation started to change gradually over the last 15 years with the introduction of new medicines that have started to replace the sole treatment with chemotherapy. In 2009, the first medicine targeting EGFR mutations in NSCLC was approved by the EMA, followed by medicines targeting other mutations (ALK in 2012, ROS1 in 2016, BRAF in 2017, NTRK in 2019, RET in 2021, KRAS and MET in 2022) (112). In 2015, the first immunotherapy for NSLCC patients without targetable mutations was approved by the EMA (112). The introduction of new treatment options is positive news for patients but also constitutes a challenge for health care systems. National or sub-national HTA bodies need to evaluate new medicines and, upon a positive reimbursement decision by the public payer or sickness fund, new medicines need to be implemented in clinical practice.

National clinical guidelines are an important element to ensure equal access to evidence-based treatment for patients irrespective of the treating hospital. At a European level, ESMO publishes clinical guidelines for the treatment of various cancer types (113). These guidelines are prepared and reviewed by leading experts and based on the findings of evidence-based medicine in order to help patients with the best care options. They also include the ESMO Magnitude of Clinical Benefit Scale (MCBS) for newer medicines to direct the use towards medicines with a substantial clinical benefit; see Box 2. For advanced-stage NSCLC, the ESMO guidelines recommend treatment with cancer medicines (systemic anti-cancer therapy, SACT) (114). With the introduction of targeted therapies and immunotherapies over the last decade, the recommended types of SACT have gradually changed in various updates of the guidelines.

Box 2: ESMO-MCBS - Measuring the clinical benefit of medicines

Launched in 2015, the ESMO-MCBS provides a scale of relative magnitude of clinical benefit for new indications of cancer medicines used in solid tumours (115, 116). The scale is based on data derived from pivotal clinical trials or meta-analyses and considers overall survival, progression-free survival, disease free survival, hazard ratio, response rate, quality of life, prognosis of the condition, and toxicity.

- Indications in a curative setting receive a score of A, B, or C. A is the highest score and C is the lowest score.
- Indications in a non-curative setting receive a score of 5, 4, 3, 2, or 1. 5 is the highest score and 1 is the lowest score.

An indication is said to have a "substantial magnitude of clinical benefit" if it receives a score of A or B in the curative setting or a score of 5 or 4 in the non-curative setting.

ESMO has proposed the scale to be used as a tool for evaluating value in order to support the process of prioritization of access to cancer medicines by national health authorities when resources are constrained (115, 116).

3.4.2 Current inequalities

Inequalities in patient access to cancer medicines and evidence-based care can be illustrated based on the example of advanced-stage NSCLC. Given the clinical recommendation to treat this patient group with cancer medicines, several studies have previously assessed the use of SACT in different European countries (117-119). In a recent comparative study, SACT rates – defined as the proportion of patients treated with SACT among all potentially clinically eligible patients – in advanced-stage NSCLC were estimated for several EU member states between 2014 and 2020 (120); see Figure 20. A benchmark-SACT rate was also defined based on guidelines from ESMO. The benchmark for the overall SACT rate was around 75%, following the recommendation that SACT should be offered to all patients with good performance status.[9] No country had reached this benchmark value in 2014, and by 2020[10] only Belgium and Portugal met or exceeded it. In 2014, the SACT rate ranged from 29% in Poland to 62% in Portugal. Although the SACT rate improved in all countries over time, it exhibited large variations from 46% in Romania to 88% in Portugal in 2020. These results indicate that a sizable proportion of clinically eligible patients in several EU member states seems to remain untreated and hence not receive evidence-based care.

[9] Good performance status (PS) refers to ECOG PS 0-2, whereas patients with poor performance status (ECOG PS 3-4) are recommended to receive best supportive care.
[10] Estimates for 2020 are less reliable due to the impact of COVID-19 on potentially eligible patients.

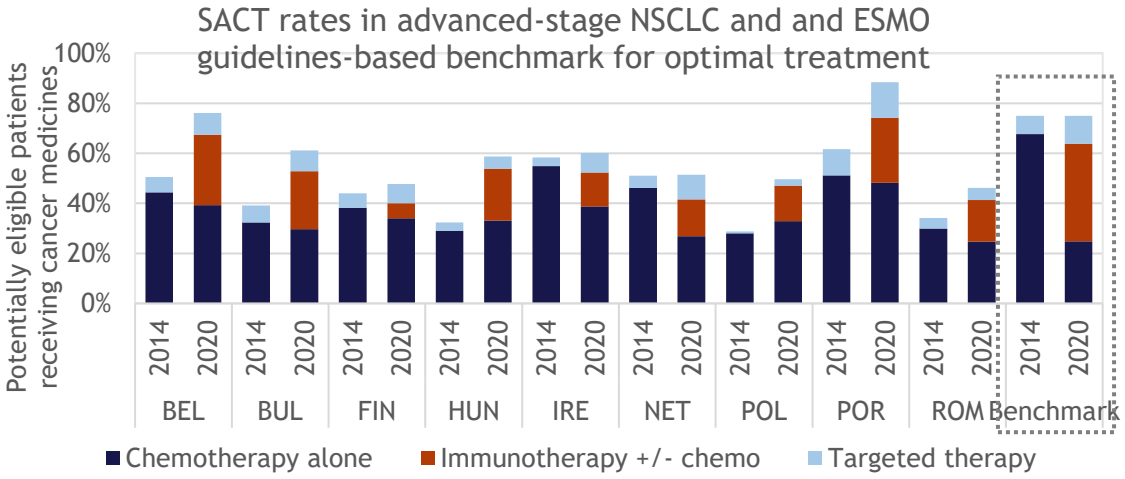

Figure 20: SACT rates in advanced-stage NSCLC in selected EU countries.

Notes: Country abbreviations: BEL- Belgium, BUL- Bulgaria, FIN- Finland, HUN- Hungary, IRE- Ireland, NET-Netherlands, POL- Poland, POR- Portugal, ROM- Romania. Source: Hofmarcher et al. (120).

The composition of the recommended treatment rate changed profoundly from 2014 to 2020, with the introduction of immunotherapy and the expansion of the use of targeted therapies at the expense of chemotherapy. In both 2014 and 2020, all countries except for Portugal seemed to treat a small proportion of patients with targeted therapies compared to the ESMO-benchmark; see Figure 20. In 2020, all countries administered immunotherapy to at least some patients, but the proportion was considerably below the ESMO-benchmark (120). Overuse of chemotherapy instead of guideline-recommended immunotherapy was also found in a recent study including patients from France, Germany, Italy, Spain, and the UK (117).

Patient access to novel treatments through clinical trials is also unequal across the EU. Available clinical trials for lung cancer are largely located in Western Europe (121). In addition, a survey by Lung Cancer Europe from year 2022 found that 48% of lung cancer patients reported a lack of information about clinical trials (122).

With regards to within-country inequalities, socioeconomic inequalities in the use of conventional NSCLC treatments have been largely covered in the literature but to a lesser extent by SLRs. One SLR found that patients living in more socioeconomically deprived circumstances are less likely to receive any type of treatment, surgery, and chemotherapy (123). Notably, these inequalities could not be accounted for by socioeconomic differences in stage at presentation or by differences in health care system (123). The place of residence might also affect the level of access to appropriate treatments. For instance, in Italy, disparities in standard of care, including the presence of specialised centres and multi-disciplinary teams, differs between southern and northern regions (121). Receipt of treatment might also be influenced by the age of patients. A study in the UK found that older patients, who were more likely to have poor performance status, were less likely to receive treatment within target times, indicating possible age discrimination (124). Differences in treatment between men and women might also occur. Research by Lung Cancer Europe showed that men tended to seek help for their symptoms earlier compared to women (122), which subsequently affects the possibility to receive treatment.

Table 8: Level of inequalities in cancer medicines and evidence-based care between and within EU countries by dimension.

Country	Sex	Age	Education level	Socioeconomic status	Urbanisation level

Notes: Scoring of the level of inequalities observed according to the following categories: "inconclusive or lack of evidence" (grey), "noticeable" (light brown), "important" (medium brown), "very important" (dark brown).

3.4.3 Reasons for inequalities

Several important barriers may prevent countries from providing patient access to modern cancer medicines and evidence-based treatment. Based on the example of advanced-stage NSCLC and the SACT rates shown in Figure 20, a multitude of potential explanations for between-country inequalities have been identified (112). Patients might remain untreated due to long delays in time from diagnosis to treatment caused by poor organisation and coordination of different service providers. Overly long delays risk making a patient ineligible to get treated because their health status deteriorates too much or because they die. Another reason why certain patient groups remain untreated in some countries are varying clinical eligibility criteria in national guidelines and/or varying reimbursement criteria for specific medicines. In the case of advanced-stage NSCLC, especially patients with a fair performance status might be excluded from receiving treatment in some countries. Another example are patients with locally advanced, non-metastatic yet unresectable NSCLC who might receive chemoradiotherapy instead of only SACT.

On an individual level, poor functional status at the time of diagnosis is a major reason why NSCLC patients do not qualify for SACT (112). Data from EU countries show that around 40% of lung cancer patients wait more than one month from the onset of symptoms until they contact a physician (122). This could be due to the perception that the symptoms might not be serious, lack of knowledge about lung cancer signs, and belief that this disease only affects people who have a smoking history (122). Patients might also remain untreated because they refuse treatment. Treatment refusal can be due to stigma (especially for current and former smokers), fear of side effects of treatments, overall emotional stress, or low trust in health care professionals (112). There might also be inadequate information-sharing with patients about their diagnosis. A large study by ESMO in several European countries found that 11% of lung cancer patients did not know what type of lung cancer they had (125).

From a health provider perspective, there is also a recognised stigma around smoking individuals from society in general (126). A survey study in Sweden found that GPs were less inclined to treat patients who smoke compared to oncologists (127). Indeed, there is evidence both from a patient and care giver perspective that negative attitudes towards individuals with lung cancer who smoke can result in discriminatory behaviours (126).

There are several recognised barriers why patients do not have adequate access to novel cancer medicines and thus need to rely on older, ineffective medicines. One major factor is delays in reimbursement of novel medicines (128, 129). According to the latest W.A.I.T. survey by EFPIA, fewer than half of the cancer medicines approved by the EMA in 2018–2021 were reimbursed in Bulgaria, Croatia, Cyprus, Estonia, Hungary, Ireland, Latvia, Lithuania, Malta, Poland, and Romania at the beginning of 2023 (130). Table 9 summarises reasons for delays in reimbursement and unavailability of novel medicines from a report by EFPIA (131).

Table 9: Root causes of unavailability and delayed access to novel medicines.

Category	Potential root causes
The time prior to market authorisation	• The speed of the regulatory process • Accessibility of medicines prior to market authorisation
The price and reimbursement process	• Initiation of the process • The speed of the national timelines and adherence
The value assessment process	• Misalignment on evidence requirements • Misalignment on value and price • The value assigned to product differentiation and choice
Health system readiness	• Insufficient budget to implement decisions • Diagnosis, supporting infrastructure and relevance to patients
Delay from national to regional approval	• Multiple layers of decision-making processes

Source: EFPIA (131).

For the case of advanced-stage NSCLC, molecular testing and immunohistochemistry are prerequisites for administering targeted therapies and immunotherapy. The inequalities in access to these newer classes of medicines observed in Figure 20 were partly explained by limited resources for biomarker testing (112). This included constrained testing capacity stemming from shortages of adequate infrastructure and qualified medical staff such as pathologists as well as lack of reimbursement of biomarker testing. Another reason for the slow uptake of newer kinds of treatments is limited continuing medical education of health care professionals at all treating hospitals across a country (112).

3.4.4 Strategies to improve access to cancer medicines and evidence-based care and reduce inequalities

There are ample opportunities to improve patient access to innovative cancer treatments and evidence-based care across the EU and reduce inequalities. Based on the example of advanced-stage NSCLC, Table 10 provides a summary of recommendations, which are also applicable to other cancer types.

Table 10: Recommendations to improve access to evidence-based care in advanced-stage NSCLC.

Ensure that all clinically eligible patients have the opportunity to receive treatment with cancer medicines	Facilitate access and use of novel cancer medicines
• Earlier diagnosis through improving awareness of common symptoms and rapid referral to diagnostic services as well as introduction of lung cancer screening • Faster time to treatment upon diagnosis, e.g., through rapid care pathways • Broaden and harmonise the eligibility criteria for treatment with medicines • Obtain evidence on the effectiveness of cancer medicines in less evident groups not covered in clinical trials • Convince patients of the benefits of receiving modern medicines while respecting patient choice • Improve the general capacity to deliver lung cancer care in terms of infrastructure and medical staff	• Faster local reimbursement of new medicines which are recommended as standard of care, by prioritising medicines with a substantial clinical benefit in the reimbursement process • Higher public budgets for medicines to enable faster reimbursement and to remove access restrictions to already reimbursed medicines • Greater resources to improve biomarker testing capacity through modernising infrastructure and recruiting and training additional staff • Ensure continuing medical education of medical staff at all treating hospitals across the country

Source: Hofmarcher et al. (112).

In terms of faster time to treatment upon diagnosis, rapid referral pathways have been implemented in some European countries with large reductions in time between referral to first appointment and treatment initiation (122). According to a survey conducted by Lung Cancer Europe, implementing screening programmes for lung cancer was seen as the key priority to improve early diagnosis (122). In December 2022, the Council of the European Union issued a recommendation to member states to explore the feasibility and effectiveness of lung cancer screening. On an individual level, improving resilience[11] and health literacy could help seeking care at an early stage of symptoms (126).

3.5 Access to financial products for survivors

3.5.1 Background and aims defined in the EBCP

Advances in cancer care over the last decades have increased the survival prospects of cancer patients. This is leading to an increasing number of cancer survivors. It is estimated that there are over 12 million cancer survivors in Europe[12] (including non-EU countries), of which around 300,000 are childhood cancer survivors (2). These numbers are estimated to grow by around 3% every year (133). The number of cancer survivors (5-year prevalence) also differs between EU countries, ranging from fewer than 1,300 survivors per 100,000 inhabitants in Cyprus and Romania to over 2,000 survivors per 100,000 inhabitants in Denmark and the Netherlands; see Figure 21.

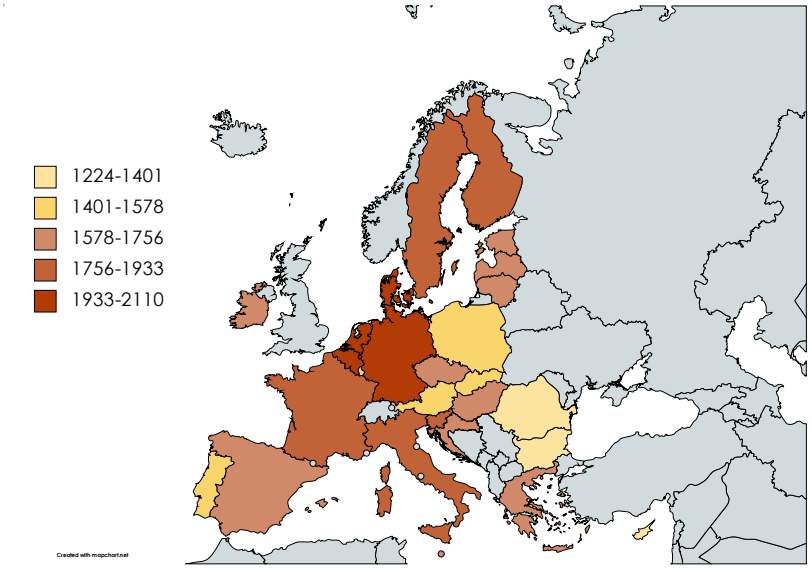

Figure 21: 5-year prevalence of cancer per 100,000 inhabitants in the EU (estimates for 2020).
Notes: Cancer is defined as all cancers excl. non-melanoma skin cancer. Source: IARC (134).

Cancer survivors face a wide range of physical, psychological, and professional consequences because of their disease (135). In addition, the topic of disadvantaged access to financial products of cancer survivors has gained more attention in recent years. It has become apparent among individuals and patient advocacy groups that one's cancer history may result in higher premiums or total exclusion from various financial products, such as mortgages,

[11] The process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress.
[12] There are also other recent estimates from the EUROCARE-6 study by the iPAAC Joint Action indicating that there are around 20 million people living after a cancer diagnosis in Europe (132).

loans, and life or travel insurance (136). This restricts cancer survivors' full participation in society. Even many years after successful recovery from the disease, this prevents survivors from obtaining a mortgage to buy an apartment or a house in some countries (136). For instance, a study from Spain found that 80% of people between 18 and 35 years who have suffered from leukaemia have had difficulties with obtaining insurance and other bank services (137). This might aggravate socioeconomic differences between survivors and other people as well as between wealthy and less wealthy survivors.

To improve access to financial products for survivors, the concept of "the right to be forgotten" (RTBF) was introduced.[13] The concept implies that cancer survivors – after a certain number of years after treatment completion – do not have to report their cancer history when applying for financial products to cover certain consumer or business and real estate loans (138). The legal codification of the RTBF for cancer survivors was first implemented in France in 2016 after being championed by breast cancer patient advocates (139).

The EBCP acknowledges that because of their medical history, many cancer survivors experience unfair treatment in accessing financial products (2). The European Commission committed to "*closely examine practices in the area of financial services (including insurance) from the point of view of fairness towards cancer survivors in long term remission.*" A first explorative study report about this topic was published in 2022 (138). In addition, the EBCP states that the European Commission "*will work with relevant stakeholders to address access to financial products for cancer survivors. The Commission will also engage in dialogue with businesses to develop a code of conduct to ensure that developments in cancer treatments and their improved effectiveness are reflected in the business practices of financial service providers to ensure that only necessary and proportionate information is used when assessing the eligibility of applicants for financial products, notably credit and insurance linked to credit or loan agreements*" (2).

EU legislation on the RTBF has been progressing since the publication of the EBCP. More specifically, a revision of the Consumer Credit Directive (Directive 2008/48/EC) was adopted by the European Parliament and the Council in October 2023 and came into force on 19th November 2023 (Directive (EU) 2023/2225) (140). Article 14, paragraph 4 states the following: *"Member States shall require that personal data concerning consumers' diagnoses of oncological diseases are not used for the purpose of an insurance policy related to a credit agreement after a period of time determined by the Member States, not exceeding 15 years following the end of the consumers' medical treatment"*. The member states have two years to transpose the directive into national law and one further year for the provisions to apply, at the latest by 20th November 2026. In 2024, the Mortgage Credit Directive (Directive 2014/17/EU) is planned to be revised,[14] and it remains to be seen if the RTBF for cancer survivors will be included there as well.

3.5.2 Current inequalities

As of December 2023, eight EU member states – Belgium, Cyprus, France, Italy, the Netherlands, Portugal, Romania, and Spain – have adopted national legislation regulating fair access to financial products through the RTBF for cancer survivors (141); see Figure 22. In

[13] RBTF is not a new term, as it is also used in relation to GDPR legislation and individuals right to erasure of personal data.
[14] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13090-Mortgage-credit-review-of-EU-rules_en

addition, some member states – Czechia, Denmark, Finland, Greece, Ireland, and Luxembourg – have self-regulatory actions ("code of conduct") by the financial service industry in place (138). In Czechia, a self-regulation standard was issued by the Czech Insurance Association (CAP), which represents more than 98% of the Czech insurance sector, in November 2023 (142). In Denmark, insurers provide a life insurance to persons with a history of cancer upon certain conditions, such as the type of cancer and the time after cure or no relapse. Danish patient organisations have entered into partnerships with insurance companies, which has resulted, amongst others, in better terms for travel health insurance (138). In Ireland, the industry organisation, Insurance Ireland, has agreed on a code of practice which entered into force in December 2023 (143). According to the Irish code of practice, insurers will disregard a cancer diagnosis where treatment ended more than seven years (five years if the applicant was under 18 at the time of diagnosis) before the insurance application. In Luxembourg, the Ministry of Health, Luxembourg Insurance and Reinsurance Association (ACA), and eight insurance companies developed a convention in 2020, according to Dr. Meunier (144).

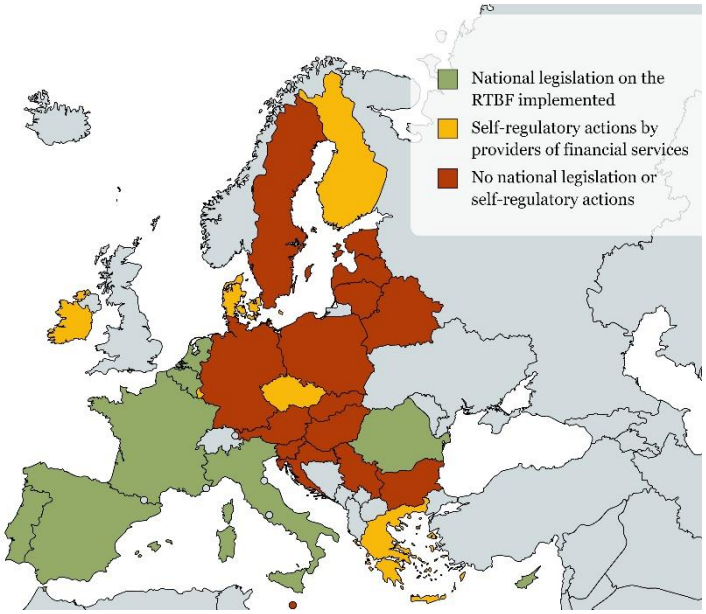

Figure 22: Policies of access to financial products for cancer survivors in the EU (December 2023).
Source: European Commission (138), "Ending discrimination against cancer survivors" website (141), and articles cited above.

Among the eight countries with legislation on the RTBF in place, the time period until a cancer history cannot be used to prevent access to financial services differs. In France and Spain, this time period is 5 years, while it is 7 years in Romania, 8 years in Belgium[15], and 10 years in Cyprus, Italy, the Netherlands, and Portugal (136, 139, 141, 145, 146). If the cancer occurred in children, the medical history will be forgotten after 5 years (age limit of 18 years in Romania, 21 years in Cyprus, France, Italy, the Netherlands, Belgium, and Portugal while in Spain no age limit for children has been specified) (141, 145). For certain cancer types and/or disease stages, the medical history can be forgotten even faster in Belgium, France, and the Netherlands (147). In Belgium, the time period has been completely removed for breast cancer in situ.

[15] The initial period in Belgium was 10 years and it is expected to be shortened to five years in 2025.

No studies were identified that explore how cancer survivors with different socioeconomic status are affected by the RTBF legislation (or the absence of it) in comparison with the cancer-free population. Cancer survivors with lower socioeconomic status and income level might be more affected by the absence of an RTBF legislation.

Table 11: Level of inequalities in RTBF between and within EU countries by dimension.

Country	Sex	Age	Education level	Socioeconomic status	Urbanisation level

Notes: Scoring of the level of inequalities observed according to the following categories: "inconclusive or lack of evidence" (grey), "noticeable" (light brown), "important" (medium brown), "very important" (dark brown).

3.5.3 Reasons for inequalities

Awareness and political prioritisation might explain the current scattered landscape across EU countries in the implementation of the RTBF. The topic of access to financial products for cancer survivors is not recognised to the same extent at the national level and/or there is a lack of strong patient advocacy groups that would help to put this topic on the political agenda in every country (138, 144). In member states in Eastern Europe (with the exception of Romania), the lower number of cancer survivors might contribute to the lack of general awareness around the issue, according to Dr. Meunier (144).

The legal need to implement the RTBF might also differ between countries and between financial products depending on whether the medical history needs to be disclosed at all. In countries where a person does not need to disclose her/his medical history to get a mortgage (e.g., Sweden), the lack of the RTBF has no consequences for cancer survivors. For other financial products such as life insurances or in countries where a life insurance is needed to obtain mortgage, there is a greater need for the RTBF.

In countries with no legislation on the RTBF, health insurance companies are free to discriminate against cancer survivors by either increasing the insurance premium or refusing access to financial products completely. A code of conduct by the insurance industry can help to improve the situation. However, self-regulatory actions in the form of a voluntary code of conduct are not legally binding. Cancer survivors thus cannot enforce fair access to financial products.

A major barrier to implementing legislation on the RTBF or a code of conduct is resistance among insurance and reinsurance companies and banks. For instance, the industry organisation Insurance Europe has expressed great concern regarding the inclusion of the RTBF in the revised Consumer Credit Directive (148). Insurance Europe holds that the RTBF will, amongst others, lead to higher premiums for all customers and the disappearance of certain financial products (148). Instead they suggest a flexible code of conduct that takes different country characteristics, needs, and cancer types into consideration as well as allowing for insurers to individually determine premiums (149). In France, the first country to introduce the RTBF, the concerns of the national insurance industry were met by inviting them for talks with all stakeholders (144). No insurance company went into bankruptcy because of the subsequent introduction of the RTBF in France, according to Dr. Meunier (144). No public study or report seems to exist that has investigated the economic consequences of introducing the RTBF legislation for insurers and banks in comparison with no legislation or a code of conduct. However, a modelling study in France investigated the

possible economic consequences of allowing cancer survivors below 55 years of age with a good prognosis[16] to be forgotten after 5 years instead of 15 years when applying for a real estate loan by cross-linking epidemiological data with banking data (150). One conclusion was that the increase in the total number of new loans granted would be negligible (~0.005% increase in real estate credit granted).[17]

Among countries with legislation on the RTBF, a combination of several factors might explain why the time period of the RTBF ranges from 5 to 10 years for adults and is shorter for childhood cancer survivors as well as for survivors of certain cancer types. Differences in the number of years to be forgotten can possibly reflect a compromise to accommodate the concerns of financial service providers. In Belgium, the initial time period was 10 years, and it is now 8 years and will be reduced to 5 years in 2025. According to Dr. Meunier, the consensus is that a patient can be considered cured five years after the end of treatment without signs of relapse (144).

3.5.4 Strategies to improve access to financial products and reduce inequalities

The experiences from France and other countries which implemented the RTBF show that local patient advocacy groups are very important in raising awareness around the issue, according to Dr. Meunier (144). Patient advocacy groups should start contacting decision-makers and draw their attention to the discrimination that cancer survivors are facing. Governments should be compelled to assess the current difficulties in accessing financial products for cancer survivors and review the national legal frameworks. Among countries with self-regulatory actions by the financial service industry, regular audits could be established to hold insurance entities and banks accountable for their commitments.

The revised Consumer Credit Directive (EU) 2023/2225 will improve access to certain financial services for cancer survivors across the EU after it is being transposed and applied by the member states (at the latest from 20th November 2026). However, there might be considerable differences in the number of years to be forgotten in each member state, as the directive specifies a maximum duration of 15 years (140). The inclusion of the RTBF in the upcoming revision of the Mortgage Credit Directive could further contribute to reducing inequalities in access to financial products. The development of a code of conduct on the RTBF that the European Commission mentioned in the EBCP could help to bridge the years until all member states are required to transpose the RTBF into national legislation.

[16] A cancer with good prognosis was classified to have a 5-year net survival rate >80% which included the following cancer types: breast cancer, prostate cancer, testicular cancer, lip cancer, thyroid cancer, chronic lymphocytic leukaemia, and melanoma.
[17] Cancer survivors with a diagnosis dating back more than 15 years were not included in the analysis.

4. Main findings and policy recommendations

This section provides a summary of:

- Main findings of existing inequalities between and within countries and possible reasons.
- Key policy recommendations (long-term and short-term) to reduce inequalities in all areas of cancer care based on proposed strategies identified in each case study in section 3.

4.1 Current inequalities in cancer care

This report applied an input-process-outcomes perspective of cancer care to examine existing inequalities in EU member states. The collected evidence demonstrates substantial between-country inequalities across the EU in terms of spending on cancer care ("the inputs"), how available resources are organised and used along the cancer care pathway ("the processes"), and consequently, the resulting survival rates ("the outcomes").

A particular emphasis was placed on highlighting inequalities along the entire disease pathway ("the processes"). Table 12 provides a succinct summary of the level of inequalities in six dimensions for each case study. These studies demonstrated large differences between countries in their performance pertaining to prevention (HPV vaccination), early detection (CRC screening), diagnosis and treatment (access to biomarker testing, cancer medicines, and evidence-based care), and survivorship (RTBF). Presently, only a minority of EU member states reaches the aims set forth in the EBCP or other relevant benchmarks used in this report.

Table 12: Level of inequalities between and within EU countries by dimension.

	HPV vaccination	CRC screening	Biomarker testing	Cancer medicines and evidence-based care	Access to financial products
Country					
Sex					
Age					
Education level					
Socioeconomic status					
Urbanisation level					

Notes: Scoring of the level of inequalities observed according to the following categories: "inconclusive or lack of evidence" (grey), "noticeable" (light brown), "important" (medium brown), "very important" (dark brown).

Considerable within-country inequalities were found across five dimensions. Age, socioeconomic status, and urbanisation level (rural/urban place of residence) exhibited high levels of inequalities. Differences in access to cancer care according to people's formal education level were modest. However, other individual aspects relating to health literacy,

such as general awareness and knowledge, and perceived risks of disease, and how to acquire information, were identified as significant factors influencing access to cancer care.

4.2 Reasons for inequalities

In order to reduce inequalities both between and within member states, it is necessary to understand the root causes. Across all case studies, the following common reasons for the observed between-country inequalities in cancer care were discerned:

- **Political prioritisation of cancer care**: National governments have varying political priorities. Despite the heavy and growing disease and economic burden of cancer, improving cancer care might not be a top priority. Political prioritisation is essential to raise awareness around the disease, increase health care budgets, and adopt policies and legislations. For instance, national policies and governance are crucial to enable equal access to NGS testing methods, innovative treatments, and adoption of legislation to ensure fair access to financial products (the RTBF) for everyone. In addition, establishing and investing in an HPV vaccination programme or a CRC screening programme requires a persistent political will, because the full benefits of such programmes will only accrue several years or decades after their initial implementation.
- **Health expenditure on cancer care (funding)**: Countries have different capacities to increase public funding for health care and cancer care. The adoption of innovative technologies typically requires additional spending upfront but may lead to savings for health care system later on, such as with HPV vaccination and CRC screening. Differences in the ability to further increase investment in cancer care risks aggravating country differences in the adoption of new technologies and consequently patient outcomes.
- **Availability of supporting infrastructure**: The effectiveness of HPV vaccination and CRC screening programmes is dependent on supporting infrastructure that integrates different parts of the health care system (including IT and personal data management) with other parts of the society (e.g., schools and transportation). For biomarker testing, well-functioning IT systems and logistics systems are also important for centralised pathology labs to be able to receive biopsy samples and communicate test results to the treatment teams at the network of hospitals they serve.
- **Availability of medical professionals**: Medical staff shortages inhibit swift patient access to various services. For instance, the use of innovative treatments requires pathologists and biomedical scientists to use NGS testing methods. A CRC screening programme requires gastroenterologists for diagnosis, and surgeons, radiologists, and medical oncologists for ensuing treatment.
- **Up-to-dateness of clinical guidelines**: Local clinical guidelines may primarily determine what treatments patients receive and when. A uniform provision of evidence-based care and adoption of new treatments and procedures (e.g., using FIT instead of FOBT for CRC screening; or using immunotherapy in non-oncogene driven NSCLC instead of chemotherapy) at health facilities throughout a country, can be aided by regularly updating local clinical guidelines.

In terms of reasons for inequalities within countries, the following common reasons were identified:

- **Level of health literacy**: The level of health literacy may differ between various groups in society. For instance, if information about the benefit of HPV vaccination and CRC screening programmes is not adequately received and interpreted (personal health literacy), barriers emerge in terms of lack of knowledge about the benefits and general awareness leading to hesitancy to participate and utilise these programmes. Fear of diagnosis of cancer and fear of treatment can be related to low health literacy and explain why certain people will seek care late and/or do not adhere with the provided treatments (organisational health literacy).
- **Geographic distance to university hospitals and comprehensive cancer centres**: Since many cancer care services are specialised and therefore concentrated in certain locations to build up and maintain expertise, individuals in rural areas are at a risk of worse access. For instance, NGS testing capacity or knowledge and/or availability of innovative treatments may only be available (at least initially upon introduction of a new technology) at university hospitals and comprehensive cancer centres. Moreover, the place of residence might be a barrier to participate in CRC screening programmes if test kits are not sent out by post.

4.3 Recommendations to reduce inequalities

Based on the findings of potential reasons for the observed inequalities, several long-term strategies and short-term strategies to reduce inequalities can be advised. These recommendations are mostly directed to national policymakers of the member states who are in charge of health care provision. The implementation of these recommendations would help to enhance and ensure more equal access to cancer care for everyone.

Long-term recommendations

To address the root causes of inequalities, countries should put forward more holistic strategies – ideally integrated within a national cancer plan – to improve cancer care. This includes policies to reach the aims defined in the EBCP and evidence-based strategies to reduce within-country inequalities. The following long-term recommendations can be put forth:

- ✓ **Improve personal and organisational health literacy of cancer patients and the public**: Improving personal health literacy is linked to several identified barriers in HPV vaccination and CRC screening in terms of how well individuals can find, understand, and make use of available information. Furthermore, patients' knowledge of the health care system (how to access and use health services as well as available treatment options) can specifically be linked to barriers in access to NGS testing methods and innovative treatments if those services are not readily provided in rural areas.
- ✓ **Ensure education and continuous training of medical staff**: Along with the rising demand for cancer care, shortages of specialised medical professionals and medical staff have become apparent in many EU countries. Strategies to improve these circumstances are necessary. Apart from increasing the enrolment capacity to medical schools, continuous education and training of medical staff is a cornerstone in making the workforce more efficient, resilient, and up to date with the latest innovations. Policies to retain medical staff in the long run are also vital. Supporting

education for medical staff that are routinely meeting patients should also be tailored to improve cultural sensitivity and reduce unconscious bias.

- ✓ **Adopt innovations in early detection, diagnosis, and treatment of cancer**: The incorporation of innovations in clinical practice is key for enhancing patient outcomes and reducing inequalities. For instance, the future use of liquid biopsy in CRC screening could possibly reduce individual barriers in participating in the screening programmes. The use of modern cancer medicines such as immunotherapies and targeted therapies along with appropriate diagnostic methods can improve the survival prospects of patients. However, countries need to be vigilant around within-country inequalities that arise if only university hospitals and comprehensive cancer centres offer such services, thereby limiting access for patients in rural areas. Moreover, between-country inequalities in patient outcomes will increase if the latest innovations are only affordable for wealthier EU member states.
- ✓ **Take a societal perspective in national cancer control planning**: Utilising a broader societal perspective in national cancer control planning can help to optimise resource allocation in cancer care and reduce inequalities in society. If a cancer case is completely prevented (e.g., thanks to HPV vaccination) or if treatment can start at an early stage due to screening, there might be substantial societal gains from avoiding/reducing productivity losses from sick leave, early retirement, premature mortality as well as avoiding/reducing the need for informal care. Those gains should be considered in decision-making about the funding and reimbursement of a new technologies.
- ✓ **Collect relevant data and continuously evaluate the quality of cancer care services**: The provision and monitoring of evidence-based care requires data. Relevant data throughout the care pathway need to be systematically collected to facilitate continuous evaluation of performance. This is necessary to determine whether a programme needs to be adjusted to improve outcomes as well as to inform decision makers about the effectiveness and cost-effectiveness of new technologies in clinical practice.

Short-term recommendations

Based on the proposed strategies to improve access to cancer care and reduce inequalities for each case study, short-term recommendations (minimum requirements) to remedy some of the most salient inequalities are the following:

- ✓ Introduce a **free-of-charge gender-neutral HPV vaccination programme** and consider a school-based system for its implementation
- ✓ Improve **participation in CRC screening programmes** by making participation as easy as possible, e.g., by sending and collecting test kits by post
- ✓ Prioritise **reimbursement of NGS testing methods** for all cancer types with a clear clinical recommendation
- ✓ Prioritise **reimbursement of medicines** with a high clinical benefit
- ✓ Adopt **legislation on the "right to be forgotten"** for cancer survivors

References

1. European Commission. ECIS - European Cancer Information System. 2023 [2023-12-12]. Available from: https://ecis.jrc.ec.europa.eu/.
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. European Commission. European Cancer Inequalities Registry. 2022 [2023-07-11]. Available from: https://cancer-inequalities.jrc.ec.europa.eu/.
5. European Cancer Organisation. European Cancer Pulse. 2022 [2023-07-11]. Available from: https://www.europeancancer.org/pulse.
6. Berwick D, Fox DM. "Evaluating the Quality of Medical Care": Donabedian's Classic Article 50 Years Later. Milbank Q. 2016;94(2):237-41.
7. Donabedian A. The quality of care. How can it be assessed? JAMA. 1988;260(12):1743-8.
8. 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.
9. Eloranta S, Smedby KE, Dickman PW, Andersson TM. Cancer survival statistics for patients and healthcare professionals - a tutorial of real-world data analysis. J Intern Med. 2021;289(1):12-28.
10. Mariotto AB, Noone AM, Howlader N, Cho H, Keel GE, Garshell J, et al. Cancer survival: an overview of measures, uses, and interpretation. J Natl Cancer Inst Monogr. 2014;2014(49):145-86.
11. 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.
12. Loke AY, Kwan ML, Wong YT, Wong AKY. The Uptake of Human Papillomavirus Vaccination and Its Associated Factors Among Adolescents: A Systematic Review. J Prim Care Community Health. 2017;8(4):349-62.
13. Serrano B, Brotons M, Bosch FX, Bruni L. Epidemiology and burden of HPV-related disease. Best Pract Res Clin Obstet Gynaecol. 2018;47:14-26.
14. 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.
15. European Cancer Organisation. A Four Step Plan for Eliminating HPV Cancers in Europe. 2020.
16. Kjaer SK, Nygård M, Sundström K, Dillner J, Tryggvadottir L, Munk C, et al. Final analysis of a 14-year long-term follow-up study of the effectiveness and immunogenicity of the quadrivalent human papillomavirus vaccine in women from four nordic countries. EClinicalMedicine. 2020;23:100401.
17. World Health Organization (WHO). Human papillomavirus vaccines: WHO position paper, December 2022. 2022 [2023-06-15]. Available from: https://www.who.int/publications/i/item/who-wer9750-645-672.
18. European Center for Disease Control and Prevention (ECDC). Vaccine Scheduler: Human Papillomavirus Infection: Recommended vaccinations. ECDC; 2023 [2023-06-01]. Available from: https://vaccine-schedule.ecdc.europa.eu/Scheduler/ByDisease?SelectedDiseaseId=38&SelectedCountryIdByDisease=-1.
19. Euractiv. Poland last EU country to make HPV vaccine free of charge. 2023 [2023-08-28]. Available from: https://www.euractiv.pl/section/zdrowie/news/poland-last-eu-country-to-make-hpv-vaccine-free-of-charge/.
20. 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.

21. 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=.
22. European Center for Disease Control and Prevention (ECDC). Introduction of HPV vaccines in European Union countries- an update. 2012.
23. Nguyen-Huu NH, Thilly N, Derrough T, Sdona E, Claudot F, Pulcini C, et al. Human papillomavirus vaccination coverage, policies, and practical implementation across Europe. Vaccine. 2020;38(6):1315-31.
24. Lebanova H, Stoev S, Naseva E, Getova V, Wang W, Sabale U, et al. Economic Burden of Cervical Cancer in Bulgaria. Int J Environ Res Public Health. 2023;20(3).
25. Ministry of Health of the Czech Republic. Czech National Cancer Control Plan 2030 - Summary of analytical study. 2022.
26. Ministry of Health Romania. Plan National de Combatere a Cancerului. 2022.
27. Fernández de Casadevante V, Gil Cuesta J, Cantarero-Arévalo L. Determinants in the Uptake of the Human Papillomavirus Vaccine: A Systematic Review Based on European Studies. Front Oncol. 2015;5:141.
28. Wemrell M, Vicente RP, Merlo J. Mapping sociodemographic and geographical differences in human papillomavirus non-vaccination among young girls in Sweden. Scand J Public Health. 2023;51(2):288-95.
29. Feiring B, Laake I, Molden T, Cappelen I, Håberg SE, Magnus P, et al. Do parental education and income matter? A nationwide register-based study on HPV vaccine uptake in the school-based immunisation programme in Norway. BMJ Open. 2015;5(5):e006422.
30. Corcoran B, Clarke A, Barrett T. Rapid response to HPV vaccination crisis in Ireland. Lancet. 2018;391(10135):2103.
31. Jean S, 3rd, Elshafei M, Buttenheim A. Social determinants of community-level human papillomavirus vaccination coverage in aschool-based vaccination programme. Sex Transm Infect. 2018;94(4):248-53.
32. Schülein S, Taylor KJ, König J, Claus M, Blettner M, Klug SJ. Factors influencing uptake of HPV vaccination among girls in Germany. BMC Public Health. 2016;16:995.
33. Wemrell M, Gunnarsson L. Attitudes Toward HPV Vaccination in Sweden: A Survey Study. Front Public Health. 2022;10:729497.
34. Karafillakis E, Simas C, Jarrett C, Verger P, Peretti-Watel P, Dib F, et al. HPV vaccination in a context of public mistrust and uncertainty: a systematic literature review of determinants of HPV vaccine hesitancy in Europe. Hum Vaccin Immunother. 2019;15(7-8):1615-27.
35. Bulgarian News Agency. Council of Ministers Adopts National Cancer Control Plan 2030. 2023 [2023-08-23]. Available from: https://www.bta.bg/en/news/bulgaria/384877-council-of-ministers-adopts-national-cancer-control-plan-2030-in-the-republic-of.
36. Colzani E, Johansen K, Johnson H, Pastore Celentano L. Human papillomavirus vaccination in the European Union/European Economic Area and globally: a moral dilemma. Euro Surveill. 2021;26(50).
37. Riesen M, Konstantinoudis G, Lang P, Low N, Hatz C, Maeusezahl M, et al. Exploring variation in human papillomavirus vaccination uptake in Switzerland: a multilevel spatial analysis of a national vaccination coverage survey. BMJ Open. 2018;8(5):e021006.
38. Andreas Charalambous. Interview on the topic of HPV vaccination and inequalities. In: Andreas Pousette, Thomas Hofmarcher, editors. 2023.
39. University of Groningen. Study on guidance on methodologies to assess the performance of vaccination programmes. 2022 [2023-06-09]. Available from: https://www.nivel.nl/en/project/study-guidance-methodologies-assess-performance-vaccination-programmes.
40. Karafillakis E, Peretti-Watel P, Verger P, Chantler T, Larson HJ. 'I trust them because my mum trusts them': Exploring the role of trust in HPV vaccination decision-making among adolescent girls and their mothers in France. Vaccine. 2022;40(8):1090-7.
41. World Health Organization (WHO). Roadmap to accelerate the elimination of cervical cancer as a public health problem in the WHO European Region 2022–2030 2022.

42. World Health Organization (WHO). Health Promotion: Track 2: Health literacy and health behaviour. 2023 [2023-07-14]. Available from: https://www.who.int/teams/health-promotion/enhanced-wellbeing/seventh-global-conference/health-literacy.
43. 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.
44. Coughlin SS, Vernon M, Hatzigeorgiou C, George V. Health Literacy, Social Determinants of Health, and Disease Prevention and Control. J Environ Health Sci. 2020;6(1).
45. Holden CE, Wheelwright S, Harle A, Wagland R. The role of health literacy in cancer care: A mixed studies systematic review. PLoS One. 2021;16(11):e0259815.
46. European Commission. Mission on Cancer: Implementation plan. 2021.
47. Mavundza EJ, Iwu-Jaja CJ, Wiyeh AB, Gausi B, Abdullahi LH, Halle-Ekane G, et al. A Systematic Review of Interventions to Improve HPV Vaccination Coverage. Vaccines (Basel). 2021;9(7).
48. European Commission. State of Vaccine Confidence in the EU. 2022.
49. Hansen PR, Schmidtblaicher M, Brewer NT. Resilience of HPV vaccine uptake in Denmark: Decline and recovery. Vaccine. 2020;38(7):1842-8.
50. European Cancer Organisation. Improving HPV Vaccine Uptake in Children, Adolescents, and Young Adults: An Umbrella Review of Interventions. 2020.
51. Ilozumba O, Schmidt P, Ket JCF, Jaspers M. Can mHealth interventions contribute to increased HPV vaccination uptake? A systematic review. Prev Med Rep. 2021;21:101289.
52. Efua Sackey M, Markey K, Grealish A. Healthcare professional's promotional strategies in improving Human papillomavirus (HPV) vaccination uptake in adolescents: A systematic review. Vaccine. 2022;40(19):2656-66.
53. Digestive Cancers Europe. Roadmap for the Prevention and Treatment of Colorectal Cancer in Europe. 2020.
54. Zheng S, Schrijvers JJA, Greuter MJW, Kats-Ugurlu G, Lu W, de Bock GH. Effectiveness of Colorectal Cancer (CRC) Screening on All-Cause and CRC-Specific Mortality Reduction: A Systematic Review and Meta-Analysis. Cancers (Basel). 2023;15(7).
55. Gini A, Jansen EEL, Zielonke N, Meester RGS, Senore C, Anttila A, et al. Impact of colorectal cancer screening on cancer-specific mortality in Europe: A systematic review. Eur J Cancer. 2020;127:224-35.
56. Shaukat A, Levin TR. Current and future colorectal cancer screening strategies. Nat Rev Gastroenterol Hepatol. 2022;19(8):521-31.
57. Ibarrondo O, Lizeaga G, Martinez-Llorente JM, Larranaga I, Soto-Gordoa M, Alvarez-Lopez I. Health care costs of breast, prostate, colorectal and lung cancer care by clinical stage and cost component. Gac Sanit. 2022;36(3):246-52.
58. Mariotto AB, Warren JL, Zeruto C, Coughlan D, Barrett MJ, Zhao L, et al. Cancer-Attributable Medical Costs for Colorectal Cancer Patients by Phases of Care: What Is the Effect of a Prior Cancer History? J Natl Cancer Inst Monogr. 2020;2020(55):22-30.
59. Lansdorp-Vogelaar I, Knudsen AB, Brenner H. Cost-effectiveness of colorectal cancer screening - an overview. Best Pract Res Clin Gastroenterol. 2010;24(4):439-49.
60. Ran T, Cheng CY, Misselwitz B, Brenner H, Ubels J, Schlander M. Cost-Effectiveness of Colorectal Cancer Screening Strategies-A Systematic Review. Clin Gastroenterol Hepatol. 2019;17(10):1969-81 e15.
61. Council of the European Union. Council Recommendation of 2 December 2003 on cancer screening. 2003.
62. 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, 2010.
63. 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.
64. European Commission - Directorate-General for Research and Innovation - Group of Chief Scientific Advisors. Cancer screening in the European Union. Luxembourg: Publications Office of the European Union, 2022.

65. European Commission. Council recommendation on cancer screening (update). 2023 [2023-06-15]. Available from: https://www.europarl.europa.eu/legislative-train/theme-promoting-our-european-way-of-life/file-cancer-screening.
66. United European Gastroenterology (UEG). Colorectal Screening Across Europe. 2019.
67. OECD/European Union. Health at a Glance: Europe 2022: State of Health in the EU Cycle. Paris: OECD Publishing, 2022.
68. Self-reported last colorectal cancer screening test by sex, age and educational attainment level [database on the Internet]. 2019.
69. Unanue-Arza S, Solís-Ibinagagoitia M, Díaz-Seoane M, Mosquera-Metcalfe I, Idigoras I, Bilbao I, et al. Inequalities and risk factors related to non-participation in colorectal cancer screening programmes: a systematic review. Eur J Public Health. 2021;31(2):346-55.
70. Klabunde C, Blom J, Bulliard JL, Garcia M, Hagoel L, Mai V, et al. Participation rates for organized colorectal cancer screening programmes: an international comparison. J Med Screen. 2015;22(3):119-26.
71. Nielsen JB, Berg-Beckhoff G, Leppin A. To do or not to do - a survey study on factors associated with participating in the Danish screening program for colorectal cancer. BMC Health Serv Res. 2021;21(1):43.
72. van de Schootbrugge-Vandermeer HJ, Lansdorp-Vogelaar I, de Jonge L, van Vuuren AJ, Dekker E, Spaander MCW, et al. Socio-demographic and cultural factors related to non-participation in the Dutch colorectal cancer screening programme. Eur J Cancer. 2023;190:112942.
73. Artama M, Heinävaara S, Sarkeala T, Prättälä R, Pukkala E, Malila N. Determinants of non-participation in a mass screening program for colorectal cancer in Finland. Acta Oncol. 2016;55(7):870-4.
74. Bozhar H, McKee M, Spadea T, Veerus P, Heinävaara S, Anttila A, et al. Socio-economic inequality of utilization of cancer testing in Europe: A cross-sectional study. Prev Med Rep. 2022;26:101733.
75. Berthelsen M, Berstad P, Randel KR, Hoff G, Natvig E, Holme Ø, et al. The impact of driving time on participation in colorectal cancer screening with sigmoidoscopy and faecal immunochemical blood test. Cancer Epidemiol. 2022;80:102244.
76. Dupont-Lucas C, Dejardin O, Dancourt V, Launay L, Launoy G, Guittet L. Socio-geographical determinants of colonoscopy uptake after faecal occult blood test. Dig Liver Dis. 2011;43(9):714-20.
77. de Klerk CM, van der Vlugt M, Smagge BA, Toes-Zoutendijk E, Lansdorp-Vogelaar I, Dekker E, et al. Urban density differences in colorectal cancer screening participation and screening yield in The Netherlands. Prev Med Rep. 2022;27:101791.
78. Katz ML, Reiter PL, Young GS, Pennell ML, Tatum CM, Paskett ED. Adherence to Multiple Cancer Screening Tests among Women Living in Appalachia Ohio. Cancer Epidemiol Biomarkers Prev. 2015;24(10):1489-94.
79. Gartlehner G, Schernhammer E, Lax SF, Preusser M, Bachler H, Tietzer H, et al. Screening for colorectal cancer. Wiener klinische Wochenschrift. 2023.
80. Federal Joint Committee. Directive on organized cancer screening programs. 2020 [2023-07-05]. Available from: https://www.g-ba.de/richtlinien/104/.
81. Errea M, Skedgel C, Zamora B, Hampson G, Althin R, Hofmarcher T, et al. Opportunities to Increase Efficiency in Healthcare. OHE Contract Research, 2020.
82. Rat C, Latour C, Rousseau R, Gaultier A, Pogu C, Edwards A, et al. Interventions to increase uptake of faecal tests for colorectal cancer screening: a systematic review. Eur J Cancer Prev. 2018;27(3):227-36.
83. Issaka RB, Avila P, Whitaker E, Bent S, Somsouk M. Population health interventions to improve colorectal cancer screening by fecal immunochemical tests: A systematic review. Prev Med. 2019;118:113-21.
84. Toes-Zoutendijk E, Portillo I, Hoeck S, de Brabander I, Perrin P, Dubois C, et al. Participation in faecal immunochemical testing-based colorectal cancer screening programmes in the northwest of Europe. J Med Screen. 2020;27(2):68-76.
85. de Bekker-Grob EW, Donkers B, Veldwijk J, Jonker MF, Buis S, Huisman J, et al. What Factors Influence Non-Participation Most in Colorectal Cancer Screening? A Discrete Choice Experiment. Patient. 2021;14(2):269-81.
86. Berg-Beckhoff G, Leppin A, Nielsen JB. Reasons for participation and non-participation in colorectal cancer screening. Public Health. 2022;205:83-9.

87. Moutel G, Duchange N, Lievre A, Orgerie MB, Jullian O, Sancho-Garnier H, et al. Low participation in organized colorectal cancer screening in France: underlying ethical issues. Eur J Cancer Prev. 2019;28(1):27-32.
88. Digestive Cancers Europe. Colorectal cancer screening in Europe: Saving Lives & Saving Money. 2019.
89. Facciorusso A, Demb J, Mohan BP, Gupta S, Singh S. Addition of Financial Incentives to Mailed Outreach for Promoting Colorectal Cancer Screening: A Systematic Review and Meta-analysis. JAMA Netw Open. 2021;4(8):e2122581.
90. Liles EG, Coronado GD, Perrin N, Harte AH, Nungesser R, Quigley N, et al. Uptake of a colorectal cancer screening blood test is higher than of a fecal test offered in clinic: A randomized trial. Cancer Treatment and Research Communications. 2017;10:27-31.
91. Mauri G, Vitiello PP, Sogari A, Crisafulli G, Sartore-Bianchi A, Marsoni S, et al. Liquid biopsies to monitor and direct cancer treatment in colorectal cancer. British Journal of Cancer. 2022;127(3):394-407.
92. Zhou H, Zhu L, Song J, Wang G, Li P, Li W, et al. Liquid biopsy at the frontier of detection, prognosis and progression monitoring in colorectal cancer. Mol Cancer. 2022;21(1):86.
93. Portillo I, Arana-Arri E, Gutiérrez-Ibarluzea I, Bilbao I, Luis Hurtado J, Sarasqueta C, et al. Factors related to the participation and detection of lesions in colorectal cancer screening programme-based faecal immunochemical test. Eur J Public Health. 2018;28(6):1143-8.
94. Mateo J, Steuten L, Aftimos P, André F, Davies M, Garralda E, et al. Delivering precision oncology to patients with cancer. Nat Med. 2022;28(4):658-65.
95. The London School of Economics and Political Science (LSE). Access to Personalised Oncology in Europe. 2020.
96. Malone ER, Oliva M, Sabatini PJB, Stockley TL, Siu LL. Molecular profiling for precision cancer therapies. Genome Med. 2020;12(1):8.
97. Mateo J, Chakravarty D, Dienstmann R, Jezdic S, Gonzalez-Perez A, Lopez-Bigas N, et al. A framework to rank genomic alterations as targets for cancer precision medicine: the ESMO Scale for Clinical Actionability of molecular Targets (ESCAT). Ann Oncol. 2018;29(9):1895-902.
98. 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.
99. Normanno N, Apostolidis K, Wolf A, Al Dieri R, Deans Z, Fairley J, et al. Access and quality of biomarker testing for precision oncology in Europe. Eur J Cancer. 2022;176:70-7.
100. Horgan D, Curigliano G, Rieß O, Hofman P, Büttner R, Conte P, et al. Identifying the Steps Required to Effectively Implement Next-Generation Sequencing in Oncology at a National Level in Europe. J Pers Med. 2022;12(1).
101. IQN Path & European Cancer Patient Coalition (ECPC) & European Federation of Pharmaceutical Industries and Associations (EFPIA). Unlocking the potential of precision medicine in Europe. 2021.
102. Ryska A, Berzinec P, Brcic L, Cufer T, Dziadziuszko R, Gottfried M, et al. NSCLC molecular testing in Central and Eastern European countries. BMC Cancer. 2018;18(1):269.
103. Norris RP, Dew R, Sharp L, Greystoke A, Rice S, Johnell K, et al. Are there socio-economic inequalities in utilization of predictive biomarker tests and biological and precision therapies for cancer? A systematic review and meta-analysis. BMC Med. 2020;18(1):282.
104. Norris RP, Dew R, Greystoke A, Todd A, Sharp L. Socioeconomic Inequalities in Novel NSCLC Treatments During the Era of Tumor Biomarker-Guided Therapy: A Population-Based Cohort Study in a Publicly Funded Health Care System. J Thorac Oncol. 2023.
105. 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.
106. Märkl B, Füzesi L, Huss R, Bauer S, Schaller T. Number of pathologists in Germany: comparison with European countries, USA, and Canada. Virchows Arch. 2021;478(2):335-41.

107. Fioretos T, Wirta V, Cavelier L, Berglund E, Friedman M, Akhras M, et al. Implementing precision medicine in a regionally organized healthcare system in Sweden. Nat Med. 2022;28(10):1980-2.
108. Smeltzer MP, Wynes MW, Lantuejoul S, Soo R, Ramalingam SS, Varella-Garcia M, et al. The International Association for the Study of Lung Cancer Global Survey on Molecular Testing in Lung Cancer. J Thorac Oncol. 2020;15(9):1434-48.
109. Narayanasamy S, Markina V, Thorogood A, Blazkova A, Shabani M, Knoppers BM, et al. Genomic Sequencing Capacity, Data Retention, and Personal Access to Raw Data in Europe. Front Genet. 2020;11:303.
110. Morash M, Mitchell H, Beltran H, Elemento O, Pathak J. The Role of Next-Generation Sequencing in Precision Medicine: A Review of Outcomes in Oncology. J Pers Med. 2018;8(3).
111. Carneiro A, Amaral TMS, Brandao M, Scheffler M, Bol K, Ferrara R, et al. Disparities in access to oncology clinical trials in Europe in the period 2009-2019. Annals of Oncology. 2020;31:S1196.
112. Hofmarcher T, Lindgren P, Wilking N. Diagnosed but not treated: How to improve patient access to advanced NSCLC treatment in Europe. Lund: IHE, 2022.
113. European Society for Medical Oncology (ESMO). Guidelines. 2023 [2023-08-29]. Available from: https://www.esmo.org/guidelines.
114. Planchard D, Popat S, Kerr K, Novello S, Smit EF, Faivre-Finn C, et al. Metastatic non-small cell lung cancer: ESMO Clinical Practice Guidelines for diagnosis, treatment and follow-up. Ann Oncol. 2018;29(Suppl 4):iv192-iv237.
115. Cherny NI, Dafni U, Bogaerts J, Latino NJ, Pentheroudakis G, Douillard JY, et al. ESMO-Magnitude of Clinical Benefit Scale version 1.1. Ann Oncol. 2017;28(10):2340-66.
116. Cherny NI, Sullivan R, Dafni U, Kerst JM, Sobrero A, Zielinski C, et al. A standardised, generic, validated approach to stratify the magnitude of clinical benefit that can be anticipated from anti-cancer therapies: the European Society for Medical Oncology Magnitude of Clinical Benefit Scale (ESMO-MCBS). Ann Oncol. 2015;26(8):1547-73.
117. Bailey H, Lee A, Eccles L, Yuan Y, Burlison H, Forshaw C, et al. Treatment patterns and outcomes of patients with metastatic non-small cell lung cancer in five European countries: a real-world evidence survey. BMC Cancer. 2023;23(1):603.
118. 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.
119. Sorensen JB, Horvat P, Rosenlund M, Kejs AM, Patel D, Juarez-Garcia A, et al. Initial treatment and survival in Danish patients diagnosed with non-small-cell lung cancer (2005-2015): SCAN-LEAF study. Future Oncol. 2022;18(2):205-14.
120. Hofmarcher T, Lindgren P, Wilking N. Systemic anti-cancer therapy patterns in advanced non-small cell lung cancer in Europe. J Cancer Policy. 2022;34:100362.
121. Lung Cancer Europe. LuCE report on lung cancer: disparities in diagnosis, care and treatment access. 2017.
122. Lung Cancer Europe. 7th LuCE report on lung cancer: challenges in the care pathway and preferences of people with lung cancer in Europe. 2022.
123. Forrest LF, Adams J, Wareham H, Rubin G, White M. Socioeconomic inequalities in lung cancer treatment: systematic review and meta-analysis. PLoS Med. 2013;10(2):e1001376.
124. Forrest LF, Adams J, White M, Rubin G. Factors associated with timeliness of post-primary care referral, diagnosis and treatment for lung cancer: population-based, data-linkage study. Br J Cancer. 2014;111(9):1843-51.
125. Beattie V, Boerckel W, Rigney M, O'Hagan K, Hennink M, Fox J. 209P_PR Understanding patient experience in Europe: The first global lung cancer coalition patient experience survey. J Thorac Oncol. 2021;16(4).
126. Lung Cancer Europe. 5th LuCE report on lung cancer: Psychological and social impact of lung cancer. 2020.
127. Björk J, Lynøe N, Juth N. Are smokers less deserving of expensive treatment? A randomised controlled trial that goes beyond official values. BMC Med Ethics. 2015;16:28.

128. The London School of Economics and Political Science (LSE). Access to medicines in Europe: delays and challenges for timely patient access. 2021.
129. Cufer T, Ciuleanu TE, Berzinec P, Galffy G, Jakopovic M, Jassem J, et al. Access to Novel Drugs for Non-Small Cell Lung Cancer in Central and Southeastern Europe: A Central European Cooperative Oncology Group Analysis. Oncologist. 2020;25(3):e598-e601.
130. European Federation of Pharmaceutical Industries and Associations (EFPIA). EFPIA Patients W.A.I.T. Indicator 2022 Survey. 2023.
131. 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.
132. De Angelis R. Cancer Prevalence in Europe 2020: results from the EUROCARE-6 study. 2020.
133. European Cancer Patient Coalition. Right to Be Forgotten for Cancer Survivors. 2023 [2023-07-07]. Available from: https://ecpc.org/policy/the-right-to-be-forgotten/.
134. International Agency for Research on Cancer (IARC). Cancer Today. 2020 [2023-08-23]. Available from: https://gco.iarc.fr/today/online-analysis-map?v=2020&mode=population&mode_population=continents&population=900&populations=900&key=asr&sex=2&cancer=23&type=0&statistic=5&prevalence=0&population_group=0&ages_group%5B%5D=0&ages_group%5B%5D=17&nb_items=10&group_cancer=1&include_nmsc=0&include_nmsc_other=0&projection=natural-earth&color_palette=default&map_scale=quantile&map_nb_colors=5&continent=5&show_ranking=0&rotate=%255B10%252C0%255D.
135. European Cancer Organisation. Achieving Quality of Life for All Cancer Patients and Survivors. 2020.
136. Scocca G, Meunier F. Towards an EU legislation on the right to be forgotten to access to financial services for cancer survivors. Eur J Cancer. 2022;162:133-7.
137. Joseph Carreas Foundation. Jóvenes y leukemia: más allá de sobrevivir. 2022.
138. European Commission. Access to financial products for persons with a history of cancer in EU Member States. 2022.
139. Scocca G, Meunier F. A right to be forgotten for cancer survivors: A legal development expected to reflect the medical progress in the fight against cancer. Journal of Cancer Policy. 2020;25(100246).
140. European Parliament & Council. Directive (EU) 2023/2225 of the European Parliament and of the Council of 18 October 2023 on credit agreements for consumers and repealing Directive 2008/48/EC. 2023.
141. Meunier F. Ending discrimination against cancer survivors. 2023 [2023-12-12]. Available from: https://endingdiscrimination-cancersurvivors.eu/.
142. Euractiv. Czech health insurers agree to 'forget' cancer survivors' former diagnoses. 2023 [2023-11-21]. Available from: https://www.euractiv.com/section/health-consumers/news/czech-health-insurers-agree-to-forget-cancer-survivors-former-diagnoses/.
143. Insurance Ireland. Insurance Ireland Life Members to Introduce New Code of Practice for Cancer Survivors Seeking Mortgage Protection Insurance,. 2023 [2023-08-24]. Available from: https://www.insuranceireland.eu/news-and-publications/news-press-release/insurance-ireland-life-members-to-introduce-new-code-of-practice-for-cancer-survivors-seeking-mortgage-protection-insurance.
144. Françoise Meunier. Interview on the topic of equal access to financial services among cancer survivors. In: Andreas Pousette, Hofmarcher T, editors. 2023.
145. Osservatorio Malattie Rare. Oblio oncologico: approvata al Senato una legge dedicata. 2023 [2023-12-12]. Available from: https://www.osservatoriomalattierare.it/news/politiche-socio-sanitarie/20427-oblio-oncologico-approvata-al-senato-una-legge-dedicata.
146. Philenews. Cancer survivors granted 'right to be forgotten' after Parliament landmark legislation. 2023 [2024-01-03]. Available from: https://in-cyprus.philenews.com/local/cancer-survivors-granted-right-to-be-forgotten-after-parliament-landmark-legislation/.
147. European Cancer Patient Coalition. Factsheet on the Right to be forgotten for cancer survivors in the EU National Legislations. 2020.

148. Insurance Europe. Consumer Credit Directive: Including right to be forgotten for persons with prior diagnosis would be bad for consumers. 2022 [2023-07-07]. Available from: https://www.insuranceeurope.eu/news/2706/consumer-credit-directive-including-right-to-be-forgotten-for-persons-with-prior-diagnosis-would-be-bad-for-consumers.
149. Insurance Europe. The EC Beating Cancer Plan — reflections on the right to be forgotten (position paper). 2021.
150. Picot J. Droit à l'oubli pour les malades de cancers : un risque relatif pour les assurances. Assurances et gestion des risques / Insurance and Risk Management. 2017;84(3-4):153-63.

Appendix

Case study 1 – HPV vaccination

Table A1: HPV vaccination coverage by age 15, last dose, females, in the EU.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Austria						5%	9%	17%	26%	35%	45%	53%	53%
Belgium				61%	63%	64%	66%	67%	68%	69%	69%	70%	70%
Bulgaria							21%	15%	8%	7%	9%	9%	9%
Cyprus									54%	59%	64%	64%	64%
Denmark	70%	73%	73%	77%	79%	80%	80%	76%	73%	75%	81%	82%	82%
Estonia										48%	59%	60%	60%
Finland					61%	62%	61%	69%	67%	67%	67%	67%	67%
France	25%	22%	17%	16%	13%	20%	21%	24%	24%	33%	37%	37%	42%
Germany	27%	27%	27%	29%	31%	33%	37%	40%	43%	47%	51%	54%	54%
Hungary								74%	72%	73%	71%	75%	80%
Ireland					68%	87%	87%	88%	75%	58%	66%	82%	83%
Italy	10%	38%	67%	67%	68%	72%	68%	66%	68%	62%	61%	69%	61%
Latvia					61%	51%	57%	49%	26%	34%	35%	38%	44%
Lithuania											33%	66%	71%
Luxembourg	43%	53%	41%	42%	47%	45%	43%	43%	43%	43%	43%	43%	43%
Malta							84%	78%	95%	83%	81%	79%	78%
Netherlands			55%	57%	57%	60%	63%	56%	51%	52%	52%	62%	66%
Portugal	92%	94%	97%	96%	96%	93%	72%	90%	92%	95%	97%	96%	94%
Slovenia					44%	45%	49%	38%	43%	39%	40%	42%	44%
Spain			58%	63%	69%	74%	73%	82%	87%	80%	76%	78%	86%
Sweden								78%	76%	75%	80%	84%	85%
EU average (of countries with data)	***45%***	***51%***	***54%***	***56%***	***58%***	***57%***	***56%***	***58%***	***57%***	***57%***	***58%***	***62%***	***64%***

Source: WHO immunisation database (21).

Table A2: Countries that have or will include boys in the national HPV vaccination programme during 2023.

Country	Source
France	News link: https://www.connexionfrance.com/article/French-news/Health/France-to-roll-out-free-vaccine-for-sexually-transmitted-infection-HPV
Latvia	Mandatory for both girls and boys according to ECDC: https://vaccine-schedule.ecdc.europa.eu/Scheduler/ByDisease?SelectedDiseaseId=38&SelectedCountryIdByDisease=115 News link: https://eng.lsm.lv/article/society/health/02.05.2023-hpv-vaccines-to-be-provided-for-all-adolescents-in-latvia.a507126/
Lithuania	News link: https://www.lrt.lt/en/news-in-english/19/1879495/lithuania-launches-hpv-vaccination-for-boys
Malta	https://www.maltatoday.com.mt/news/national/120570/boys_aged_12_to_be_offered_hpv_vaccine_as_well#.ZF4lkXZBw2w
Poland	https://pubmed.ncbi.nlm.nih.gov/37631939/
Romania	Boys up to 18 can receive free HPV vaccines, Romanian health minister says | Romania Insider (romania-insider.com)
Spain	https://www.isglobal.org/en/healthisglobal/-/custom-blog-portlet/-por-que-vacunar-a-los-ninos-contra-el-virus-del-papiloma-humano-vph-/9764198/0

Case study 2 – Colorectal cancer screening

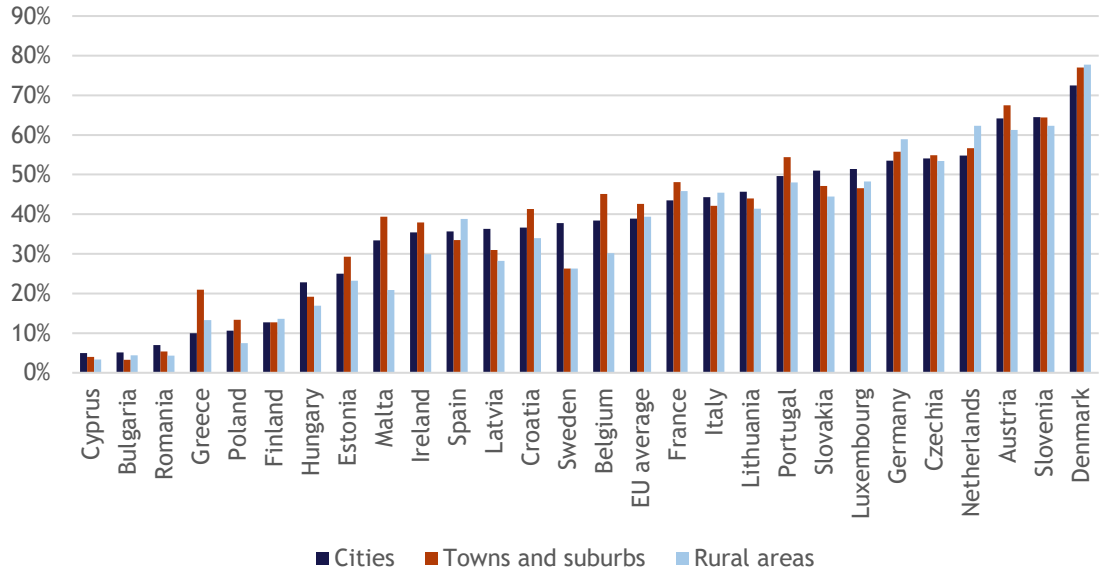

Figure A1: CRC screening rates by urbanisation level, ages 50-74 years (year 2019).
Source: EHIS, Eurostat (68).

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IHE REPORT 2024:1