



Earlier is Better: Advancing Cancer Screening and Early Detection

Action Across Tumour Types and Challenges



Prevention, Early Detection and Screening Network



The Prevention, Early Detection and Screening Network is one of the European Cancer Organisation's Focused Topic Networks, established as part of our Strategy for 2020–2023. The Prevention, Early Detection and Screening Network was launched in July 2020.

More information is available on our [website](#).

If you would like to find out more about the Prevention, Early Detection and Screening Network, please contact us at: info@european-cancer.org

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Introduction

Nearly 3 million people are diagnosed with cancer each year in the EU, and over 1.2 million people die from it.¹ Unless decisive action is taken, lives lost to cancer in the EU are set to increase by more than 24% by 2035, making it the leading cause of death in the EU.²

Cancer is a disease of unwanted growth, potentially affecting any organ of the human body, where an individual's cells grow and multiply in an uncontrolled manner into a tumour; as cancer progresses, the tumour acquires the ability to invade the patient's body through metastases, potentially resulting in multiple organ failure and death.

Due to this evolving and worsening nature of the disease, **early detection strategies**, also known as secondary prevention, **are a key component of the health systems' armamentarium in their fight against cancer**, bearing a potential to greatly lighten the burden of cancer for patients and societies across Europe. Detecting cancer early indeed leads to better patients' outcomes, with a greater probability of survival and reduced impacts on their quality of life, whilst allowing for a less expensive treatment and care.³ Accordingly, the International Agency for Research on Cancer (IARC) estimates for instance that **women attending breast cancer screening have a 40% reduction in their risk of dying from breast cancer**⁴ and recent evidence suggests that over 21 000 yearly deaths have been prevented through such screening,⁵ while it has been estimated that the **total cost associated with late-stage colorectal cancer is at least 10 times higher** than by early-stage colorectal cancer.⁶

Early detection of cancer can be achieved through:

- **Cancer screening programmes**, which aim to identify cancer before the onset of symptoms, by means of examinations, tests, imaging or other procedures that can be applied rapidly and accessed widely by a defined, apparently healthy, target population, and need to be organised and population-based, as opposed to opportunistic, to ensure maximised equity in access and benefits;^{7,8} and,

- **Early diagnosis of cancer**, which aims to identify as early as possible after the onset of symptoms, on the occasion of a medical consultation, involving awareness of cancer warning signs among the general public as well as healthcare providers, and a pivotal role of primary care.^{9,10,11}

Meanwhile, the **Covid-19 pandemic and the associated disruptions to cancer systems have dramatically affected cancer screening and early detection**. In the context of its Time To Act campaign on the impact of Covid-19 on Cancer,¹² the European Cancer Organisation has, indeed, estimated that **100 million cancer screening tests were not performed in Europe** as a result of the pandemic, while urgent referrals of suspected cancer patients were cut by up to half. As a result of this cancer backlog, **1 million cancer patients could be undiagnosed** in Europe.¹³ At the national level, as shown by the European Cancer Organisation's 'Cancer & Covid-19 Data Navigator',¹⁴ the measured impact of the pandemic on cancer screening programmes has exceeded 70% in several European countries, such as Austria,¹⁵ Belgium,¹⁶ Czech Republic¹⁷ or Poland.¹⁸ Importantly, these disruptions are expected to lead to significant excess mortality from cancer.¹⁹

All this data makes it sound and clear: **urgent action must be prioritised to advance cancer screening and early detection across Europe**, clearing the Covid-19-associated backlog and tackling pre-existing deficiencies towards a lower cancer burden in Europe moving forward.

Policy Context

The Current EU Policy Framework in Cancer Early Detection

Early detection of cancer is a policy area where the European Union has admittedly a comparatively long track record of activity, largely based on a **Council Recommendation on cancer screening** issued in 2003, including a shared commitment by EU Member States for implementation of population-based **screening programmes for breast, cervical and colorectal cancer**.²⁰ This Recommendation is regarded as a landmark by the European cancer community, as it gave an undoubted impetus for EU countries to go further and faster on cancer screening than may otherwise have been the case.

Importantly, this Recommendation has been accompanied by a range of complementary key EU initiatives, such as the European guidelines for quality assurance in breast,²¹ cervical²² and colorectal²³ cancer screening; the European Commission Initiatives on Breast Cancer²⁴ and Colorectal Cancer;²⁵ the reports on the implementation of the Council recommendation on cancer screening by IARC;²⁶ and the inclusion of cancer screening within the European Code Against Cancer.²⁷

Europe's Beating Cancer Plan: A Crucial Step Towards Earlier Detection of Cancer Across Europe

The EU's commitment towards the advancement of cancer screening has been repeated in the **much-welcomed ambitions expressed by the European Commission in its Beating Cancer Plan**, primarily through a promised **update of the 2003 Council Recommendation on cancer screening in 2022** to reflect latest scientific evidence, exploring its **expansion to include additional cancer types, such as prostate, lung and gastric cancer**.²⁸

The latter will be prepared through the **European Commission's Scientific Advice Mechanism**, involving:

- The SAPEA (Science Advice for Policy by European Academies) consortium, bringing

together over 100 European Academies across the disciplines of engineering, humanities, medicine, natural sciences and social sciences through their respective networks, including the Federation of European Academies of Medicine (FEAM),²⁹ and,³⁰

- The European Commission's Group of Chief Scientific Advisors.

In practice, the European Academies, with leadership from FEAM within SAPEA, will produce a report by the end of February 2022, evaluating the current status of evidence and discussions in cancer screening and early detection within the scientific and healthcare community, around three key questions:

- How can cancer screening programmes targeting breast, cervical and colorectal cancer be improved throughout the EU?
- What is the scientific basis for extending such screening programmes to other cancers (lung, prostate and gastric cancer), and ensuring the feasibility of such extension throughout the EU?
- Which are the main scientific elements to consider and best practices to promote for optimising risk-based cancer screening and early diagnosis throughout the EU?

In addition to this update of the Council Recommendation on cancer screening, Europe's Beating Cancer Plan includes other measures relevant to early detection of cancer, such as:

- The development of a new EU Cancer Screening Scheme, aiming at meeting a **target of 90% target population coverage for breast, cervical and colorectal cancer screenings by 2025**.
- An **expansion of the European Cancer Information System** to routinely monitor and assess cancer screening programmes.
- The establishment of a **Cancer Inequalities Registry**, identifying trends, disparities and inequalities in cancer between Member States and regions.³¹

Challenges and Opportunities in Cancer Early Detection Policies

Cancer Screening: Beyond Recommendations, Implementation is Key

The 18 years' experience since 2003 have shown **great insufficiencies in the national implementation of cancer screening programmes**. Indeed, only 19 EU Member States currently have population-based screening programmes for breast, cervical and colorectal cancer, with some of these programmes still being at planning or piloting phase, or incompletely rolled out.^{32,33}

Coverage of respective target populations by these screening programmes also remains far from reaching sufficient levels, down to 14% on average across the EU for colorectal cancer as per latest available data.³⁴ This is accompanied by **wide disparities both across European countries**, with breast cancer screening coverage for instance ranging from 6 to 90%,³⁵ **and across social groups**, as women of lower socio-economic status are known to harbour a comparatively decreased access to breast cancer screening,³⁶ notably due to insufficient application of best screening invitation practices and to low public awareness of cancer screening programmes.

Dramatically, such insufficiencies and disparities are associated with significant excess mortality; recent evidence suggests, for instance, that **over 12 000 deaths could be avoided every year from breast cancer if maximal coverage was achieved** for breast cancer screening throughout the EU.³⁷ Interestingly, it has been suggested that cancer screening programmes achieving best coverage were also the ones recovering the fastest from the disruptions associated to the Covid-19 pandemic, showing how best practices in screening programmes' performance relate to both more equitable citizen access to cancer screening and increased resilience to health crises.

Cancer Early Detection: Beyond Screening, Attention Required for ALL Cancers

Cancer screening programmes are typically applied to entire, asymptomatic populations. Hence, it is of heightened importance that the accuracy of their associated cancer screening test, as well as

their cost-effectiveness, are demonstrated before they can be implemented, in order to ensure that they yield higher benefits than harms for patients and healthcare systems.^{38,39} It must crucially be remembered that **cancer screening is therefore only available for a very limited subset of the over 200 cancer types by which European citizens may be affected**.⁴⁰

As a result of cancer screening programmes being therefore only currently recommended for breast, cervical and colorectal cancer, **75% of European cancer cases are so far not subject to recommended cancer screening programmes**,⁴¹ with some of the most frequent and lethal cancer types in Europe, such as lung, prostate, pancreatic or liver cancer, not being covered. This, alongside with the still limited implementation of recommended cancer screening programmes, leads to a situation in which the great majority of European cancer cases are currently detected outside of cancer screening.

In this context however, EU cancer policies have comparatively given less attention to cancer early diagnosis strategies, while national initiatives, articulating such a vision of earlier detection of all cancers, could serve as an inspiration.⁴² In addition, **awareness of cancer warnings signs is still at worryingly low levels among the general population**⁴³ and **the role of primary care providers in cancer early detection still remains largely unrecognised**.^{44,45} Furthermore, according to a pan-European survey performed by the All.Can collaboration among over 4000 cancer patients in 2019, as many as 32% of cancer patients whose cancer was detected outside of screening revealed that their cancer had been diagnosed as something else – either initially or multiple times.⁴⁶

Meanwhile, **attention by cancer early detection strategies is required for ALL cancer types, cases and patients, beyond those already concerned by cancer screening**, as they all deserve optimal outcomes, of which early detection is a crucial component.

Keeping Up with Ever-Faster Innovation: Scientific and Technological Opportunities to Be Leveraged in Cancer Early Detection

Risk-based early detection: The right test for the right person at the right time

Cancer screening programmes are traditionally population-based, i.e. applied to an entire fraction (age range) of the population recognised as of higher risk of cancer. However, recent years have seen the emergence of a number of reports pleading for a transition towards risk-based cancer early detection.

Risk-based early detection corresponds to evaluating every individual's cancer risk and tailoring the individual application of early detection strategies accordingly. It has therefore the potential of giving increased attention to those with a higher risk of cancer, including through prioritisation in cases of limited health resources, such as during the Covid-19 pandemic, whilst decreasing risks of cancer over-diagnosis for those with a lower risk of cancer. Thereby, **risk-based early detection offers the promise of better and more equitable cancer early detection, saving more lives with lower harms, higher cost-effectiveness and improved resilience to health crises, learning lessons from Covid-19.**

Cancer risk prediction to be used for risk-based early detection can be achieved on the basis of:

- Genetic factors (i.e. cancer family history and polygenic risk scores^{47,48}), that can be identified through genetic testing.
- Lifestyle factors (i.e. exposure to known cancer risk factors, such as tobacco smoking and hazardous alcohol consumption), that can be identified through personal questionnaires and personal health records.
- Individual physical or molecular features known to increase cancer risk or to potentially signal the ongoing development of a cancer (e.g. extremely dense breast,^{49,50} higher rate of faecal blood,⁵¹ or elevated blood rates of Prostate-Specific Antigen (PSA)⁵²), that can be identified through initial examinations.

Whilst there should remain a focus on ensuring exhaustive implementation of established minimum requirements for cancer screening and early detection, recently generated evidence for

risk-based early detection strategies, that are yet to be implemented in practice across Europe, include benefits of:

- **Tailoring breast cancer screening programmes** (age range and screening intervals) **according to individual breast cancer risk**,⁵³ as well as of **incorporating breast cancer genetic risk prediction** based on family history and polygenic risk scores,⁵⁴ resulting in improved cost-effectiveness and benefit-harm ratio of breast cancer screening programmes.
- **Providing women with extremely dense breast with supplemental imaging** in addition to mammography, such as through magnetic resonance imaging (MRI), resulting in earlier detection of breast cancer in this particular women group.⁵⁵
- **Prioritising patients with suspected colorectal cancer** based on high rates of faecal haemoglobin detected through Faecal Immunochemical Test (FIT) for access to colonoscopy to mitigate impacts of Covid-19-associated disruptions of the colorectal cancer urgent diagnostic pathway on early detection of colorectal cancer.^{56,57}
- **Adopting a risk stratification approach to early detection of prostate cancer**, using PSA testing, age-adapted risk groups, risk calculators and imaging through MRI to select patients for prostate biopsy and thereby minimise overdiagnosis, and active surveillance to minimise overtreatment,^{58,59,60} with evidence on:
 - » Reduced mortality from prostate cancer following implementation of PSA testing;⁶¹
 - » Increased mortality from prostate cancer likely as a result of interrupted implementation of PSA testing;^{62,63,64}
 - » Harms of opportunistic, as opposed to organised, early detection of prostate cancer;
 - » The predictive power of high PSA rates on risks of developing metastatic prostate cancer;⁶⁵ and,
 - » The ability of such risk stratification of patients at high risk of prostate cancer to decrease the numbers of biopsies and surgical interventions in this population group by over 50%.⁶⁶

- **Targeting high-risk former and current smokers for early detection of lung cancer**, or other patients identified as of at high risk through risk models, using low-dose computed tomography (LDCT),⁶⁷ with evidence on:
 - » Its performance to detect lung cancer;⁶⁸
 - » Promising cost-effectiveness especially if combined to smoking cessation interventions;^{69,70,71}
 - » Its impact on decreased lung cancer mortality;⁷²
 - » Promising participation rates of patients invited to LDCT;⁷³ and,
 - » Minimal physical and psychosocial harms resulting from it.⁷⁴

In addition to the above, there have been campaigns by a number of prominent scientific organisations to promote stronger national policies on risk-based early detection of other specific cancer types, such as liver, gastric and skin cancer.^{75,76,77}

New tests and approaches to cancer early detection

In addition to risk-based early detection, another particularly dynamic area of scientific and technological development has been the development of new tests and approaches to cancer early detection, awaiting further research and implementation. These include in particular:

- **Human Papillomavirus (HPV) DNA testing**, as a better alternative to pap-smear screening for cervical cancer screening, allowing for better accuracy and significant increases in screening coverage, particularly in socially conservative countries.^{78,79}
- **Self- and home-cancer screening tests**, where people collect their samples themselves, as an alternative to clinic-based cancer screening, such as **HPV self-sampling** for cervical cancer screening, **Faecal Immunochemical Test (FIT)** for colorectal cancer screening and **PSA home-testing kits** for early detection of prostate cancer, allowing for spectacular improvements in screening adherence whilst reducing invasiveness of screening procedures, reducing geographical, personal and cultural barriers towards access to cancer screening, and

allowing for cancer screening programmes' faster recovery from Covid-19-associated disruptions.^{80,81,82}

- **Liquid biopsies**, i.e., a test done on a sample of body fluid, mostly blood, to look for circulating cancer cells or DNA pieces from a tumour,⁸³ **and multi-cancer early detection strategies**, offering the promise of detecting multiple cancer types with a single blood test.

Beyond Cancer Early Detection: Attention Required Throughout the Cancer Diagnostic Pathway

Crucially, **the full benefits of early detection can only be achieved if converted into an optimal cancer diagnosis, treatment and care pathway for cancer patients.**

Following initial cancer suspicion detected through both cancer screening or early diagnosis approaches, **key to the cancer diagnosis pathway is indeed the timely referral of the patient to pathologists and other oncology specialists** for confirmation of the cancer diagnosis, accurate cancer staging and optimal cancer treatment decision-making and initiation within Cancer Centres. The relevance of these elements is further increased in the context of the ongoing development of precision medicine approaches in cancer, requiring individual patients' tumours to be accurately profiled at the molecular level (notably through biomarker testing) in order to identify potential actionable genetic mutations and inform subsequent optimal therapy selection.

Furthermore, as cancer suspicion or detection may lead to significant distress and stigma in affected individuals, **healthcare counselling on the interpretation of the results and professional psycho-social support are crucial** to ensure maximised quality of life for patients from the very start of the disease pathway.

In this context however, the 2019 All.Can survey revealed that **26% of surveyed cancer patients cited diagnosis as the area of cancer care where they identified the most inefficiency in their experience, more than any other area of cancer care**, with speed of diagnosis having a particularly high impact on respondents' entire experience of care.⁸⁴

In addition, while the pathology workforce plays a pivotal and unique role in this cancer diagnostic pathway, there has been a **long-standing issue of pathologists' shortages across Europe**, as recent data showed for instance their density in relation to the general population to be on average 21% lower in Europe than in the United States, with this ratio mounting up to 60% in some EU Member States.^{85,86}

Accordingly, the EU-funded Cancer Control Joint Action (CanCon) has recommended within its European Guide on Quality Improvement in Comprehensive Cancer Control that health systems have in place core indicators to measure interval of time between symptom suspicion/referral by a physician, detection and confirmation of the diagnosis, and delays in the delivery of treatments due to diagnostic delays.⁸⁷

Recommendations

The forthcoming update of the EU Council Recommendation on Cancer Screening presents an ideal moment to leverage the well-demonstrated extended benefits of cancer early detection and screening towards a lower cancer burden in Europe and invigorate a brand-new agenda for the earlier detection of cancers across all of Europe, tackling known deficiencies and learning lessons from the past 20 years and the ongoing pandemic.

The European Cancer Organisation, through its Prevention, Early Detection and Screening Network, calls on the EU to ensure that this update lives up to citizens' expectations and needs, and to the promise and goals of Europe's Beating Cancer Plan. This requires **high ambition and a holistic and inclusive approach, extending the current scope towards a new Council recommendation on cancer screening and early detection.**

The 2022 Council Recommendation on cancer screening and early detection should therefore address evident policy needs for **earlier detection of ALL cancers**, in particular:

- **Take full account of evolutions in science and practice in currently recommended cancer screening programmes**, including fostering the redesigning of these programmes through a risk-based approach, accelerating:
 - » The integration of **genetic testing for polygenic risk scores and supplemental imaging for women with extremely dense breast** within breast cancer screening programmes
 - » The implementation of **HPV DNA testing and HPV self-sampling** within cervical cancer screening programmes
 - » The **use of Faecal Immunochemical Test (FIT)** as a means to increase adherence to, and stratify high-risk patients in, colorectal cancer screening programmes
- Foster **a step change improvement of early detection of lung and prostate cancer**, as the most lethal, and most common male cancer types in Europe respectively, making best use of

latest available evidence on the benefits of risk-based strategies to this aim.

- Incorporate **a range of clear and binding mid- and long-term targets on earlier detection of cancer** throughout the implementation of the new Recommendation, accompanied by regular public reporting on progress.
- Provide additional **advice to Member States on achieving improved early detection across a range of particular cancer types**, such as, but not limited to, gastric, liver, skin, ovarian and bladder cancer.
- Establish a new **EU platform of screening agencies**, inspired from the network of Heads of Medicines Agencies, aimed at structuring and accelerating sharing of best screening practices between EU countries.
- Include decisive action on **increasing public awareness of cancer warning signs**, through support for the development and wide distribution of a **European Code of Cancer Symptoms**, taking inspiration from the successes of the European Code Against Cancer and the **European Code of Cancer Practice**.⁸⁸
- **Provide due attention to the key role of primary healthcare providers** in cancer early detection, by ensuring that they have access to clear and useable guidelines and risk assessment tools for detecting and preventing cancer, to be integrated into electronic medical records.

The proposed Council Recommendation on Cancer Screening and Early Detection should be fully informed by expert organisations in the relevant fields. In recognition of the fast pace of science and practice in these fields, **the Recommendation should also be reviewed and updated at least every 5 years**. A mechanism should be in place for earlier review should scientific evidence point to such a need.

Crucially, the 2022 Council Recommendation on cancer screening and early detection should also be accompanied with a **strengthened and robust implementation framework** to maximise

its effective impact **towards equitable access to cancer early detection across Europe**. Such framework should include:

- **Regular updating of the European guidelines for quality assurance in cancer screening** every 2 years, ensuring and supporting continued involvement of healthcare professionals and cancer patient advocates in the updating process.
 - Producing regularly updated **EU guidance to Member States on the best means to achieve optimal cancer early detection** based on identified best practices and informed by the new EU platform of screening agencies.
 - **Monitoring of cancer early detection, progress towards agreed goals and key indicators such as stage at diagnosis, timeliness of post-detection patient referral and time to diagnosis within the new Cancer Inequalities Registry**, with particular attention to social inequalities and ‘hard-to-reach’ groups for cancer early detection.
 - Fostering the deployment of **interoperable real-time or near-real-time data on cancer early detection to allow for timely policy action** in health crisis situations.
 - Funding actions under the EU4Health Programme and other relevant mechanisms to **support increased awareness and education about cancer early detection** among citizens, young people, healthcare professionals, the education sector and others.
 - Address **pressing needs of the European healthcare workforce involved in cancer detection and diagnosis**, including:
 - » Promoting cancer educational opportunities for primary healthcare providers, both through support for strengthened cancer education to undergraduate medical students and a legal codification of the practice of Continuous Professional Development under Directive 2005/36/EC on the recognition of professional qualifications, including specific provisions on cancer education for all healthcare professionals; and,
 - » Tackling the long-standing issue of shortages in the European pathologist workforce, via:
 - Monitoring of patient access to all cancer professions, including pathologists, as part of the Cancer Inequalities Registry.
 - A cancer-related skills partnership under the EU ‘Pact for Skills’ strategy.
 - The establishment of a European mechanism to alleviate cancer workforce shortages, taking inspiration from the RescEU mechanism for medical equipment.
 - Including cancer workforce capacity mapping within the mandate of the new EU Health Emergency Response Authority.
 - A high-level EU study on pay, working conditions and career structure for healthcare professionals and workers in the cancer sector, including pathologists.
- Supporting research to:
 - » Develop and **improve new early detection methodologies**, such as for, but not limited to, gastric, liver, ovarian, skin or HPV-caused male cancers.
 - » Accelerate the **use of innovative technologies for cancer early detection**, such as Next-Generation Sequencing to identify further biomarkers of patients at higher risks and accurately profile diagnosed tumours, Artificial Intelligence to assist radiological interpretation or the opportunities from liquid biopsies and multi-cancer early detection strategies.
 - » Help establish scientific consensus on the **translation of promising risk-adapted strategies into practice**.
 - » Better understand behavioural aspects relating to individual participation in, and **barriers towards access to, early detection**, particularly among disadvantaged groups.

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47. As cancer is primarily driven by genetic mutations, ultimately making a cell prone to chronically multiply, individuals may harbour a higher risk of cancer due to inherited genetic mutations from their parents, independently from risk factors they may be exposed to throughout their lifetime. Such genetic susceptibility of cancer can notably be suspected or identified based on:
 - A “cancer family history”, i.e. the fact of having one or several relatives previously affected by cancer, in particular with an early age at diagnosis or the occurrence of multiple primary tumours;
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49. Extremely dense breast corresponds to breast with a strong rate of types of tissue (epithelium or stroma), appearing dense and light on a mammography. Due to this tissue composition, women with an extremely dense breast have a demonstrated significantly higher risk of both developing breast cancer and having their breast cancer missed through mammography, whose sensitivity is known to be particularly low in these patients, particularly to detect tumours at an early stage of development.
50. <https://www.nejm.org/doi/full/10.1056/NEJMoA1903986>
51. Faecal blood, i.e. the presence of small quantities of blood in a person’s stool, can indicate the ongoing development of a colorectal cancer; it may be detected through so-called either Faecal Occult Blood Test (FOBT) or Faecal Immunochemical Test (FIT)
52. Prostate-Specific Antigen (PSA) is a molecule naturally produced by men’s prostates, which quantities are known to be elevated in the case of prostate cancer; a high blood PSA rate can therefore indicate the ongoing development of a prostate cancer.
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Participants in the Prevention, Early Detection and Screening Network

Member Organisations Part of this Network



Patient Organisations Part of this Network



To view the latest list of the participants to the Prevention, Early Detection and Screening Network visit our [website](#).

If you would like to find out more about the Prevention, Early Detection and Screening Network, please contact us at: info@europeancancer.org

As the not-for-profit federation of member organisations working in cancer at a European level, the European Cancer Organisation convenes oncology professionals and patients to agree policy, advocate for positive change and speak up for the European cancer community.

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