European Code Against Cancer 5th edition: 14 ways you can help prevent cancer

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Abbreviations: EC, European Commission; ECL, Association of European Cancer Leagues; ECAC, European Code Against Cancer; ECAC4, 4th edition of the European Code Against Cancer; ECAC5, 5th edition of the European Code Against Cancer; ENDS, Electronic Nicotine Delivery Systems; EONS, European Oncology Nursing Society; ESMO, European Society for Medical Oncology; EU27, 27 Member States of the European Union; HBV, Hepatitis B virus; HCV, Hepatitis C virus; HIV, Human immunodeficiency virus; *H. pylori*, *Helicobacter pylori*; HPV, Human papillomavirus; IARC/WHO, International Agency for Research on Cancer, World Health Organization; MS, Member State; NCDs, Non-Communicable diseases; SC, Scientific Committee; SHS, Second-hand smoke; UVR, Ultraviolet radiation; WG, Working group

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Summary

Despite the growing cancer burden in the European Union, public awareness of effective prevention is low. In response, Europe's Beating Cancer Plan has supported the development of the 5th edition of the European Code Against Cancer (ECAC5). Using a transparent, stepwise decision-making process, around 80 experts reviewed the latest scientific evidence on cancer prevention and used modern communication strategies to update the previous edition. An innovation in ECAC5 is the inclusion of population-level recommendations, aiming to structurally influence the systems that shape individual choices and improve environmental conditions to which all citizens are involuntarily exposed. ECAC5 includes 14 actionable, evidence-based recommendations for individuals to reduce their cancer risk alongside their respective policy recommendations. All are presented through equity lens, with attention to co-benefits for preventing other non-communicable diseases and tailoring messages to diverse audiences. Clear evidence-based statements on cancer risks factors and effective preventive interventions will empower citizens to make healthier choices, call policymakers to act, foster public support for effective policies, and contribute to more effective cancer prevention.

Keywords: European code against cancer; Evidence-based recommendations; Primary cancer prevention; Cancer screening; European union

Introduction

Cancer is the second leading cause of death in Europe. For the 27 European Union Member States (EU27) the total population in 2022 was 446.7 million inhabitants, with an estimated cancer burden of 1.466 million new cancer cases in men and 1.277 million new cancer cases in women.[1,2] New cancer cases from 2012, at the time of the launch of the 4th edition of the European Code against Cancer (ECAC4),[3] were almost identical to those of 2022; although in the meantime the EU reference population had shrunk by 58 million inhabitants due the UK leaving the EU. Hence, for EU27, this corresponds to a rise of the cancer burden of around 13% mainly due to the increase of the average life expectancy and EU27's ageing population.[2] This rapid increase in cancer patients, however, signifies the urgent need for more effective primary and secondary cancer prevention.

Breast, colorectal, prostate, and lung cancers emerge as the top four cancers in EU27, each affecting more than 300,000 citizens every year. Breast cancer is the most common cancer and the leading cause of cancer death among women, while among men, prostate cancer is the most common, and lung cancer is the leading cause of cancer death (Fig. 1). Lung cancer accounts for 25% of all cancer-related premature deaths, defined as those occurring before the age of 70, followed by colorectal cancer, which accounts for just under 10%.[2] Comparisons across countries show a mixed picture with marked differences in the age-standardised cancer incidence rates, but with no clear North-South or East-West divide (Fig. 2, left). In contrast to incidence, age-standardised mortality rates are highest in Eastern Europe (Fig. 2, right). This suggests that a combination of differences in cancer risks and in the implementation of organised screening programmes, together with inequalities in access to timely, high-quality cancer diagnosis and care are shaping the overall cancer distribution across the EU27. It also points towards geographical disparities in health literacy, which entails accessing, understanding, evaluating, and using health information and services to make informed decisions about health.[4] Health literacy is fundamental to empowering individuals to adopt risk-reducing behaviours and benefit from preventive services, including cancer prevention. However, a prerequisite is the availability of evidence-based, accurate information on cancer prevention to act. The relationships between cancer prevention beliefs, health literacy, and behavioural change are complex,[5] usually requiring multiple interventions at scale across populations.[6]

Overall, awareness of the main cancer risks and protective factors remains low across the EU27,[7–10] and together with misinformation, impairs the successful implementation of safe and well-established preventive interventions.[11] In addition, social and commercial determinants of health strongly shape individual behaviours.[12] Therefore, effective and equitable cancer

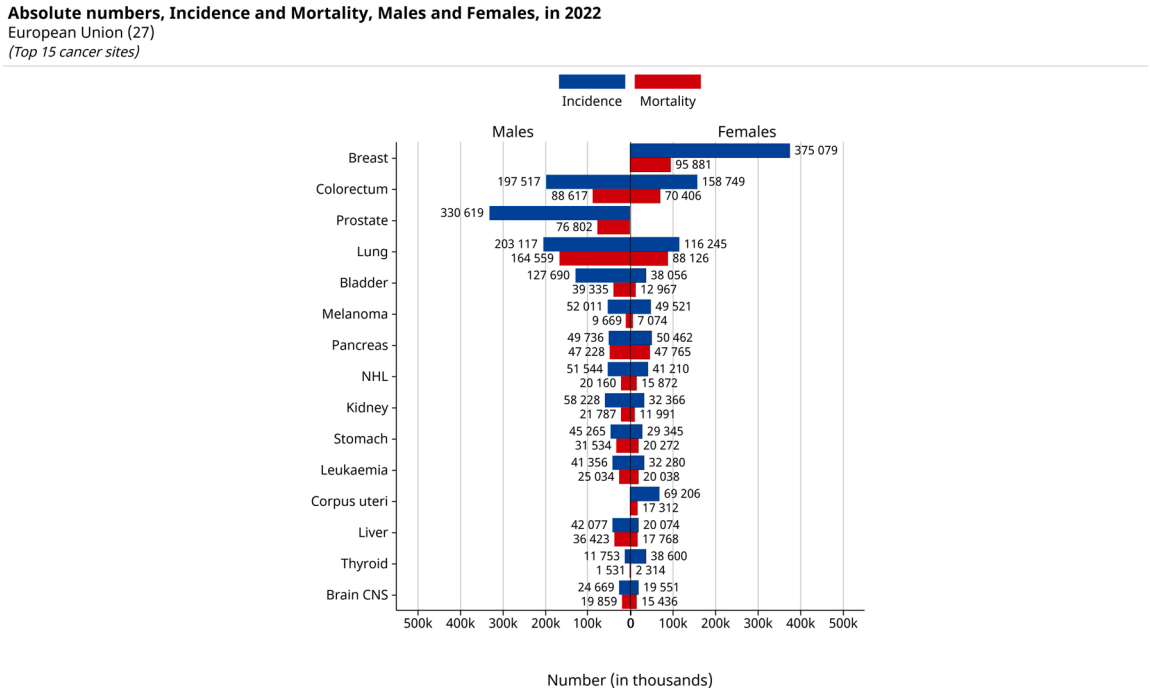

Fig. 1: Absolute numbers of newly diagnosed cancer patients and deaths from cancer in 2022, by the top 15 cancer sites, by males and females, for the EU27 countries (excluding non-melanoma skin cancer); NHL, Non-Hodgkin lymphoma; CNS, central nervous system.

prevention requires comprehensive approaches that combine individual behavioural change with population-level interventions and policies.[13] The latter aims to shape the environments in which individuals make choices and live their daily lives, making these settings more supportive of healthier behaviours and decisions that can reduce the cancer burden.

Overall, based on our current understanding of what causes cancer, it is estimated that around 40–50% of all cancers and 44% of all cancer deaths could be

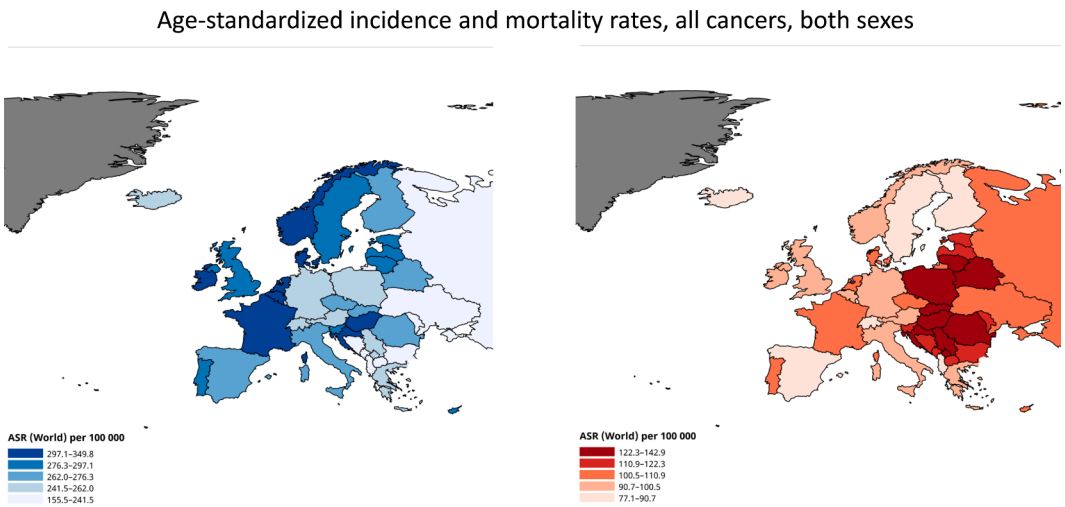

Fig. 2: Age-standardized rates (ASR) by World Standard Population for cancer incidence (left) and cancer mortality (right), all cancer sites except non-melanoma skin cancer combined, both sexes combined, by country (Europe), in 2022 (© Global Cancer Observatory, IARC, https://gco.iarc.fr).

prevented.[1,14] In this context, effective prevention policies play crucial roles, as meeting international policy targets for major cancer risk factors is estimated to prevent around 8% of all cancer cases, avert 12% of premature deaths due to cancer, and reduce the burden of cancer on health expenditure by 9% in the EU27.[15] Despite the fact that providing information alone has a small effect on behavioural change,[16] clear communication on cancer risk factors (including protective factors) and preventive interventions has the potential to increase awareness and, in turn, the public's support for effective policies and programmes.

Taking all these considerations together, including the rising cancer burden in the EU27, primary and secondary prevention interventions are more urgent than ever, calling for more awareness in the population of the causes of cancer, alongside effective prevention policies and programs and –in other words-a timely update of the ECAC. This paper provides an overview of the evidence underpinning ECAC5, including population-level recommendations for policymakers and novel aspects regarding the communication of the recommendations.

Rationale for updating ECAC and current status of the ECAC implementation

ECAC is a long-standing initiative of the European Commission that provides a comprehensive, evidence-based information tool featuring actionable recommendations on cancer prevention relevant to the EU. Since its inception in 1987, the ECAC has aimed to inform citizens on how to reduce their cancer risk, initially through recommendations on tobacco, alcohol, body weight, diet, sun exposure, workplace guidelines, and the early detection of cervical and breast cancers.[17] Scientific guidance on physical activity, second-hand smoke, Hepatitis B virus vaccination, and colorectal cancer screening was added in the second and third editions.[18,19] The fourth edition (ECAC4), coordinated by the International Agency for Research on Cancer from the World Health Organization (IARC/WHO), included new recommendations on breastfeeding, exposure to radon, hormone replacement therapy (HRT) and Human papillomavirus (HPV) vaccination, while also broadening the scope of all previous recommendations.[3]

In 2021, Europe's Beating Cancer Plan (EBCP) fostered a shared European vision for cancer control, harmonising cancer prevention efforts across EU Member States (MS) and supporting the update of the ECAC to issue the 5th edition (ECAC5).[20] Besides requesting a review of the latest scientific developments and improvements in literacy, the EBCP set an ambitious goal of raising awareness of the ECAC among at least 80% of the EU27 population by 2025. Furthermore, to align with other key EU-wide cancer prevention strategies, ECAC5 and future ECAC editions should include cost-effective, population-level cancer prevention measures while formulating the new recommendations with an equity lens. It should also consider co-benefits in preventing other non-communicable diseases (NCDs) with similar underlying risk factors and tailor messages to different target groups.[21]

Despite its longevity, the ECAC has not yet reached its potential of awareness amongst its principal target audience, the general population in the EU. A study published in 2021 involving 8171 adults surveyed in eight EU MS found that awareness ranged from just 2% to 21% across MS. Concomitant interviews with 28 representatives from cancer-specific civil society organisations confirmed widespread use of the ECAC by these organisations but acknowledged that this did not translate into public recognition of the ECAC itself.[22] Recent studies conducted in Spain and Sweden yielded similar findings.[23–25] At policy level, an assessment of National Cancer Control Programmes or equivalent documents from EU MS found explicit reference to the ECAC in a subset of plans, either citing it or structuring their prevention sections around the ECAC.[26]

Since the publication of the EBCP, many policy documents from EU MS and associated countries have directly expressed support for the EBCP's activities and ambitions. This reflects indirect adoption of the ECAC, as seen in Poland's National Cancer Strategy 2020–2030, or in public-oriented webpages at national and regional governmental levels (e.g., in Lithuania and in Belgium).

Principles and methods

Building on the principles developed for ECAC4,[3] IARC has established a two-level hierarchical mechanism to harmonise strategies, methods and work processes, to promote cancer prevention globally under the World Code Against Cancer Framework,[27] while developing region-specific Codes Against Cancer. The updated methodology and its robust step-by-step decision-making algorithm have been applied to review the scientific evidence, assess communication aspects and formulate the ECAC5 recommendations for individuals and, for the first time in ECAC, review and formulate population-level recommendations for policymakers at EU level. The four sequential criteria followed by the experts in developing ECAC5 are outlined below, summarised in Fig. 3 and further described by Espina et al.[28]

Criterion 1: Confidence in the evidence to maintain a recommendation that already exists in ECAC4, modify it, adapt it, or introduce a new recommendation that is relevant for the EU. This criterion accounts for: (a) the strength of the evidence for a recommendation to include an established cause of cancer that can be avoided or reduced, and/or an intervention proven effective to avert specific precancerous lesions, cancers or their consequences; and (b) an epidemiological

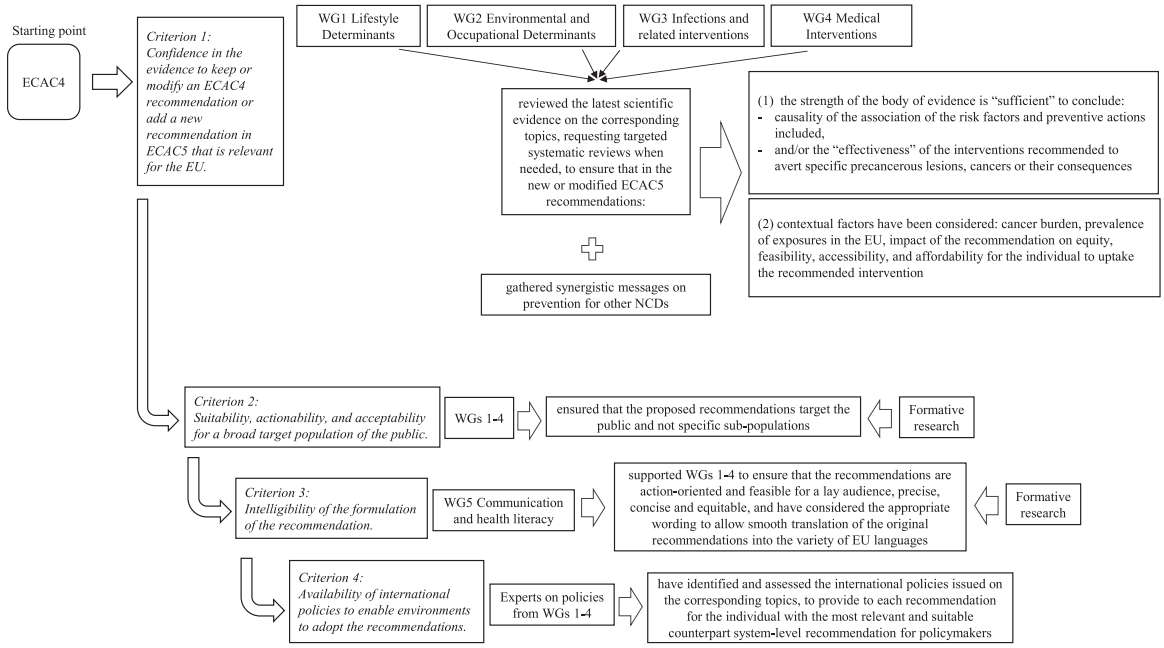

Fig. 3: Summary of the criteria and step-by-step decision-making algorithm followed by the experts to develop ECAC5 (methodological basis of the World Code Against Cancer Framework).[28]

assessment of the prevalence of exposures and cancer burden, the potential impact of the recommendation on equity, and the feasibility, accessibility, and affordability for the individual to uptake a recommended intervention.

Criterion 2: Suitability, actionability, and acceptability for a broad target population, ensuring that the proposed recommendation will target the public and not specific sub-populations that would benefit more from tailored preventive efforts. To inform Criterion 2, a formative exploratory qualitative research study was conducted in nine EU MS. In-depth semi-structured interviews, informed by the COM-B model and Theoretical Domains Framework, examined perceptions, capabilities, opportunities, and motivations related to each of the ECAC4's 12 recommendations.[29] The main factors identified across 141 adult citizens included limited health literacy, restricted access to health resources (e.g., screening programmes), economic constraints, the national policy environment, and limited time availability.[30]

Criterion 3: Intelligibility of the formulation of the recommendation for a lay audience, ensuring communication of the message in an understandable and unambiguous way. To support Criterion 3, an evaluation study was conducted across the EU to enable optimal and equitable awareness of the cancer risks presented in ECAC5 in all socioeconomic groups. The results of this study (see section "Evaluation study on the communication of ECAC5 to the public") indicated that including a brief introductory statement about the modifiable risk factors above each recommendation significantly increased awareness of cancer risk, which is currently very low among EU citizens.[31]

Criterion 4: Availability of international policies to enable environments to adopt the recommendations, ensuring that policies from authoritative organisations are included in the process. The policy selection process included a hierarchization of authoritative sources of existing policy documents, as described elsewhere,[28] prioritising those from supranational bodies with regulatory authority, with an EU focus (e.g., European Regulations and Directives), followed by a hierarchical strategy based on the Nuffield Ladder of Interventions[32] or the Hierarchy of Prevention and Control Measures used in the occupational field.[33] All policies assessed address contextual factors such as feasibility, acceptability, equity, cost-effectiveness, and resources required for implementation. The result was a summary of the most relevant policies according to the criteria listed above, protected from vested interests, that reinforce each of the recommendations for the public and that should create enabling environments in which individuals can make informed healthy choices, adopt the recommendations provided at individual level, and demand policy action. In most cases, the policy recommendations in ECAC5 are endorsed by the overarching policy documents EBCP[20] and the WHO Best Buys for NCDs.[34] The inclusion of policy recommendations represents a key innovation of ECAC5 compared to previous editions.

Results: 14 recommendations for the public and 14 recommendations for policymakers

The 5th edition of the ECAC contains 14 evidence-based recommendations on behavioural, environmental, occupational, and infectious cancer risk factors, as well as preventive medical interventions, aimed at the EU population (Fig. 4). ECAC5 also targets policymakers by including 14 complementary recommendations on population-level policies that can reinforce the recommendations for individuals. Due to the length of the policy recommendations, they are presented in the Supplementary Material—Annex 1 and summarised in Table 1, however, these recommendations are an integral part of ECAC5 along with the recommendations to the individuals and both should be presented and used together. As in the 4th edition, ECAC5 is supported by two additional levels of information to provide further information and support dissemination: (a) knowledge translation outputs targeted at the public, health professionals, and policymakers, as described below, and (b) ten peer-reviewed publications intended for the scientific community.[31,35–43] Each recommendation for individuals and for policymakers is described in detail in the corresponding publications, along with the systematic reviews performed to update some of the topics (Supplementary Material—Annex 2).

Recommendations for the public

ECAC5 builds upon the 12 recommendations from ECAC4,[3] which were revised and updated by five working groups (WGs) of experts (WG1 on Lifestyle Determinants, WG2 on Environmental and Occupational Determinants, WG3 on Infections, WG4 on Medical Interventions, and WG5 on Communication and Health Literacy) and later assessed and adopted by the ECAC5 Scientific Committee.[28] In addition, improvements on communication while providing the evidence have been key features to enhance dissemination and implementation of ECAC5. As a result, some new recommendations have been integrated into existing ones covering similar topics.

Novel features in ECAC5 recommendations

In summary, ECAC5 comprises a broad range of novel features compared to ECAC4 (Table 1). ECAC5 recommendation #11 on outdoor and indoor air pollution is a new stand-alone recommendation,[36] while the new recommendation on testing and treatment of relevant cancer-causing infections has been integrated into recommendation #12, together with vaccination (now also recommending HPV vaccination for boys).[41] The new recommendation on lung cancer screening has been included in recommendation #14 alongside all other recommended organised screening programmes.[40]

Recommendation #6 on physical activity is the only one that remains unchanged from ECAC4. On tobacco, Electronic Nicotine Delivery Systems (ENDS) like e-cigarettes have been included due to strong evidence that they induce tobacco smoking initiation in young people who have never smoked, and smoking cessation, a proven effective intervention, has been explicitly added to recommendation #1.[35] Regarding second-hand smoke (SHS), smoke-free cars have been added alongside homes to reduce exposure in private settings.[35]

Recommendations on overweight and obesity and on diet have been updated by adding to recommendation #3 those foods and drinks that increase cancer risk mostly indirectly through weight gain, including ultra-processed foods (UPFs), making it more actionable for individuals. Foods directly linked to cancer are addressed in recommendation #5.[42] The alcohol recommendation (#6) has been strengthened due to recent evidence highlighting the impact of even light to moderate alcohol consumption on cancer risk.[35]

Recommendations on environmental exposures (ultraviolet radiation (UVR) (#8) and radon (#9)) have improved communication features, reinforcing the ECAC4 messages of never using sunbeds and adding more actionable information on how individuals can reduce radon exposure at home, respectively.[38] As for recommendation #9 on occupational exposures, communication has been improved based on evidence showing that regulations and workplace measures aimed at reducing or eliminating risks are the most effective strategies. Empowering workers to foster a culture of prevention and holding employers accountable are given greater prominence.[33,37] Finally, breastfeeding and hormone replacement therapy (HRT) have been separated into two recommendations: recommendation #7 emphasises the increased protective effect of longer breastfeeding time,[42] and recommendation #13 advises that HRT be used only under healthcare professional supervision and for the shortest duration possible.[39]

Tobacco and nicotine-containing products

Despite tobacco having been firmly established as carcinogen decades ago, 28% of men and 21% women in the EU still smoked in 2023, with considerable variation across countries and social groups.[44] Smoking is responsible for over 256,000 cancer deaths each year in the EU, primarily among men,[45] and the number of future cases is projected to rise significantly, especially among disadvantaged women.[46] With the ultimate goal of a smoke-free society, especially aiming at preventing people to start smoking, smoking cessation is still a proven effective intervention to reduce the risk of many adverse health outcomes, including cancer.[47]

Novel tobacco products, such as heated-tobacco products (HTPs), and nicotine-containing products have gained popularity particularly amongst the youth in the EU.[35] Although there is currently no conclusive

European Code Against Cancer, 5th edition
14 ways you can help prevent cancer

1 **Smoking**
Do not smoke. Do not use any form of tobacco, or vaping products. If you smoke, you should quit.

2 **Exposure to other people's tobacco smoke**
Keep your home and car free of tobacco smoke.

3 **Overweight and obesity**
Take action to avoid or manage overweight and obesity:
- Limit food high in calories, sugar, fat, and salt.
- Limit drinks high in sugar. Drink mostly water and unsweetened drinks.
- Limit ultra-processed foods.

4 **Physical activity**
Be physically active in everyday life. Limit the time you spend sitting.

5 **Diet**
Eat whole grains, vegetables, legumes, and fruits as a major part of your daily diet. Limit red meat, and avoid processed meat.

6 **Alcohol**
Avoid alcoholic drinks.

7 **Breastfeeding**
Breastfeed your baby for as long as possible.

8 **Sun exposure**
Avoid too much sun exposure, especially for children. Use sun protection. Never use sunbeds.

9 **Cancer-causing factors at work**
Inform yourself about cancer-causing factors at work, and call on your employer to protect you against them. Always follow health and safety instructions at your workplace.

10 **Indoor radon gas**
Inform yourself about radon gas levels in your area by checking a local radon map. Seek professional help to measure levels in your home and, if necessary, reduce them.

11 **Air pollution**
Take action to reduce exposure to air pollution by:
- Using public transportation, and walking or cycling instead of using a car
- Choosing low-traffic routes when walking, cycling, or exercising
- Keeping your home free of smoke by not burning materials such as coal or wood
- Supporting policies that improve air quality.

12 **Cancer-causing infections**
- Vaccinate girls and boys against hepatitis B virus and human papillomavirus (HPV) at the age recommended in your country.
- Take part in testing and treatment for hepatitis B and C viruses, human immunodeficiency virus (HIV), and *Helicobacter pylori,* as recommended in your country.

13 **Hormone replacement therapy**
If you decide to use hormone replacement therapy (for menopausal symptoms) after a thorough discussion with your health-care professional, limit its use to the shortest duration possible.

14 **Organized cancer screening programmes**
Take part in organized cancer screening programmes, as recommended in your country, for:
- Bowel cancer
- Breast cancer
- Cervical cancer
- Lung cancer.

Fig. 4: European Code Against Cancer, 5th edition: recommendations for individuals (the 14 complementary policy recommendations are presented in the Supplementary Material—Annex 1).

ECAC 4	ECAC 5	
Recommendations for individuals	Recommendations for individuals	Summary of the main recommendations for policymakers
1 Do not smoke. Do not use any form of tobacco	1 Do not smoke. Do not use any form of tobacco, ***or vaping products. If you smoke, you should quit***	• To adopt, implement, and enforce comprehensive tobacco control policies, as per the WHO Framework Convention on Tobacco Control • To extend such regulations to apply to all tobacco products, electronic cigarettes, and all novel tobacco and nicotine-containing products. • Establish and work towards achieving national goals for a tobacco-free generation.
2 Make your home smoke free. Support smoke-free policies in your workplace	2 Keep your home and ***car*** free of tobacco smoke	• To enforce legislation to eliminate exposure to SHS. • To extend smoke-free laws to outdoor public places and to include all novel tobacco and nicotine-containing products.
3 Take action to be a healthy body weight	3 Take action to avoid or manage overweight and obesity: • ***Limit food high in calories, sugar, fat, and salt*** • ***Limit drinks high in sugar. Drink mostly water and unsweetened drinks*** • ***Limit ultra-processed foods***	• To implement fiscal policies targeting unhealthy foods. • To make the healthy choice the easiest—most affordable, accessible, and available—option in all settings. • To implement procurement policies with mandatory standards that limit foods high in sugars, fat, or salt. • To ban or restrict marketing, advertising, and promotion of foods high in sugars, fat, or salt, especially to children. • To agree upon and implement an effective EU-wide front-of-pack nutrition labelling scheme.
4 Be physically active in everyday life. Limit the time you spend sitting	4 Be physically active in everyday life. Limit the time you spend sitting	• To implement fiscal incentives for all forms of active travel, and promote and enable active public transportation for all. • To enhance urban planning policies to create safer, greener environments. • To promote physical activity at work and implement incentives for employers. • To introduce physical activity on prescription in primary care. • To work with vulnerable groups to address barriers to engaging in physical activity.
5 Have a healthy diet: • Eat plenty of whole grains, pulses, vegetables and fruits • Limit high-calorie foods (foods high in sugar or fat) and avoid sugary drinks • Avoid processed meat; limit red meat and foods high in salt	5 Eat whole grains, vegetables, legumes, and fruits as a major part of your daily diet. Limit red meat, and avoid processed meat	• To implement fiscal policies targeting unhealthy foods. • To make the healthy choice the easiest—most affordable, accessible, and available—option in all settings. • To agree upon and implement an effective EU-wide front-of-pack nutrition labelling scheme.
6 If you drink alcohol of any type, limit your intake. Not drinking alcohol is better for cancer prevention.	6 ***Avoid*** alcoholic drinks	• To increase prices of alcohol through taxation and establish a minimum price. • To restrict the availability and accessibility of all alcoholic beverages and to increase minimum legal age limits. • To ban or restrict advertising, promotion, and sponsorship alcohol in all media, especially those targeting minors. • To introduce health warning labels.
See ECAC4 #10	7 Breastfeed your baby ***for as long as possible***	• To ensure compliance with the International Code of Marketing of Breast-Milk Substitutes. • To establish and enforce policies that ensure a sufficient duration of parental leave and flexible working arrangements, and to enact policies and introduce incentives for employers. • To encourage breastfeeding-friendly policies and facilities in public areas.
7 Avoid too much sun, especially for children. Use sun protection. Do not use sunbeds.	8 Avoid too much sun exposure, especially for children. Use sun protection. ***Never*** use sunbeds	• To harmonise and enforce policies and recommendations on protection from exposure to UVR across the EU. • Continue to support measures to reduce exposure to UVR, including from sunbeds. • To provide collective protection from sun exposure at the local level, and specific measures in the workplace.
8 In the workplace, protect yourself against cancer-causing substances by following health and safety instructions.	9 ***Inform yourself*** about cancer-causing factors at work, and ***call on your employer to protect you*** against them. Always follow health and safety instructions at your workplace	• To scale up efforts to enforce existing EU legislation on occupational carcinogens. • To encourage all economic sectors to work with social partners to develop and implement social dialogue agreements for reduction of the prevalence and levels of exposure to carcinogens. • To include specific occupational safety and health requirements in the criteria for public procurement, to support the elimination and/or reduction of workers' exposure to carcinogens in the workplace. • To ensure knowledge on safe work practices.

(Table 1 continues on next page)

ECAC 4	ECAC 5	
Recommendations for individuals	Recommendations for individuals	Summary of the main recommendations for policymakers
(Continued from previous page)		
9 Find out if you are exposed to radiation from naturally high radon levels in your home. Take action to reduce high radon levels.	10 Inform yourself about radon gas levels in your area by ***checking a local radon map***. ***Seek professional help to measure levels in your home*** and, if necessary, reduce them	• To enforce basic safety standards for the protection of individuals' health against radon exposure. • To provide financial support for radon remediation in homes and other buildings. • To invest in general awareness programmes for radon and training.
	11 ***Take action to reduce exposure to air pollution by:*** • ***Using public transportation, and walking or cycling instead of using a car*** • ***Choosing low-traffic routes when walking, cycling, or exercising*** • ***Keeping your home free of smoke by not burning materials such as coal or wood*** • ***Supporting policies that improve air quality***	• To align EU air quality limit values with WHO global air quality guidelines for outdoor air pollution. • To align policies limiting air pollution with climate change, energy, and other environmental policies. • To improve spatial planning to reduce motorised traffic. • To develop and implement policies to discourage and phase out outdoor and indoor fossil and solid fuels, and incentivise cleaner forms of energy. • To support citizens to actively engage and participate in developing local plans to reduce emissions of air pollutants.
See ECAC4 #11	12 • Vaccinate girls and ***boys*** against hepatitis B virus and human papillomavirus (HPV) at the age recommended in your country • ***Take part in testing and treatment for hepatitis B and C viruses, human immunodeficiency virus (HIV), and Helicobacter pylori, as recommended in your country***	• To strengthen HBV and HPV gender-neutral vaccination programmes, ensuring the respective coverage targets and catch-up vaccination as recommended. • To introduce sustainable initiatives of testing and treating for HBV, HCV, HIV, and *H. pylori*, adopting policies that facilitate the offer affordable, ideally free of charge, tests; and treating individuals with confirmed HCV, HIV, or *H. pylori* infection as early as possible.
10 For women: • Breastfeeding reduces the mother's cancer risk. If you can, breastfeed your baby • Hormone replacement therapy (HRT) increases the risk of certain cancers. Limit use of HRT	13 If you decide to use hormone replacement therapy (for menopausal symptoms) ***after a thorough discussion with your health-care professional***, limit its use to the ***shortest duration possible***.	• To make provisions for easy access to health-care professionals for women to discuss the benefits and harms of using HRT, assessment of baseline cancer risk, availability of various HRT formulations, and periodic re-evaluation of symptoms and HRT use.
11 Ensure your children take part in vaccination programmes for: • Hepatitis B (for newborns) • Human papillomavirus (HPV) (for girls)	See ECAC5 #12	
12 Take part in organised cancer screening programmes for: • Bowel cancer (men and women) • Breast cancer (women) • Cervical cancer (women)	14 Take part in organised cancer screening programmes, as recommended in your country, for: • Bowel cancer • Breast cancer • Cervical cancer • ***Lung cancer***	• To implement sustainable, organised screening programmes for: o colorectal (bowel) cancer: FIT every two years for individuals aged 50–74 years, or once-only endoscopy o breast cancer: digital mammography every two years for women aged 50–69 years o cervical cancer: HPV screening at intervals no shorter than five years for women aged 30–65 years • To implement sustainable, organised screening programmes for lung cancer: LDCT every year or every two years with integrated smoking cessation interventions for individuals identified as being at increased risk of lung cancer.

Differences and new elements in the recommendations for individuals of the 5th edition are highlighted in bold and italics. The complete set of ECAC5 recommendations for policymakers can be found in the Supplementary Material—Annex 1.

Table 1: **Comparison between the European Code Against Cancer 5th (ECAC5) and 4th (ECAC4) editions.**

evidence linking ENDS use to cancer, including because insufficient time has passed to observe health long-term effects, these products emit certain carcinogens.[35] Moreover, both ever-use and regular use among youth are associated with over threefold higher odds of initiating combustible cigarette smoking.[35]

Second-hand smoke (SHS)

In 2023, 23% of people in the EU experienced high SHS indoors, despite the early implementation of smoke-free laws in public indoor settings across MS.[44] SHS exposure in private settings such as cars and homes particularly affects children and women.[35] In 2021, between 16% and 24% of lung cancer cases in never and former smokers in the EU were attributable to SHS exposure.[48] Parental smoking has also been identified as a cause of hepatoblastoma in children.[49] Exposure to SHS at home is a significant barrier to smoking cessation.[50] In addition, ENDS and HTPs emit potentially hazardous compounds that reduce indoor air quality.[35]

Overweight and obesity

Overweight and obesity have reached epidemic levels affecting 50.6% of people aged 16 years or over in the EU27.[51] The cancer burden attributable to excess body weight ranges from 3.6 to 4% in Italy to approximately 7% in Germany.[42] Due to the complex nature of this chronic condition, there is a need to give specific, actionable and inclusive information to help individuals prevent or manage overweight and obesity, in combination with recommendation #4 on physical activity. The updated ECAC5 recommendation now advises on the foods and drinks that should be reduced to avoid excess body fat; and introduces the concept of UPFs, which are industrial formulations with ingredients not used in home cooking, designed for convenience, palatability, and shelf life. They are typically energy-dense, nutrient-poor, linked to weight gain and obesity, and thereby indirectly associated with cancer onset.[42]

Physical activity

Physical inactivity and sedentary behaviour remain highly prevalent in the EU.[52] This recommendation remains unchanged from ECAC4,[53] and is now further supported by new evidence on various biological mechanisms associated with physical inactivity and cancer development.[42] Prolonged sedentary behaviour is also increasingly recognised as a significant cancer risk factor, both directly and indirectly.[54]

Diet

The cancer burden attributable to unhealthy diets including low intake of fibre, fruits, and vegetables, and high consumption of processed and red meat, independently of its contribution to the rise in overweight and obesity as highlighted above, ranges from 4.5–6% in Italy to 10% in the Netherlands.[42] In this recommendation, ECAC5 focuses on the evidence linking a reduced risk of colorectal cancer with high consumption of whole grains and fibre,[48,55] the avoidance of processed meat, and the reduction of red meat intake.[56]

Alcohol

Twenty-nine percent of EU adults, mostly men, consumed alcohol weekly[35] and another 23% consumed it on a monthly basis in 2019.[57] As a result, alcohol consumption is one of the main risk factors for cancer in the EU.[58] Recent evidence shows that even light ($\leq$1 standard drink per day) to moderate (up to two standard drinks per day) alcohol consumption caused nearly 23,000 new cancer cases in the EU in 2017, including 11,000 female breast cancers, accounting for 13.3% of all alcohol-attributable cancers.[59] Europe is the region with highest global share of alcohol-attributable cancer cases (4%).[1] Recent studies have proven that reducing or stopping alcohol consumption decreases the risk of oral cancer and oesophageal cancer.[60] Additionally, despite the previous believe on the protective cardiovascular effect, new research indicates that the assumed benefits of alcohol have been overestimated in the past.[35] Therefore, not drinking alcohol is the healthiest choice, as no safe level of alcohol consumption can be established.[61]

Breastfeeding

Most countries in Europe do not meet the WHO recommendation of exclusive breastfeeding for the first six months of life, followed by continued breastfeeding up to two years or beyond.[62] In the UK, 4.7% of breast cancer cases were attributed to not breastfeeding,[63] while in France, 3% were linked to breastfeeding for less than six months.[64] Accordingly, the slightly modified ECAC5 recommendation highlights that breastfeeding's protective effect increases with duration, with no upper benefit limit.[42]

Sun and ultraviolet radiation (UVR) exposure

Approximately 132,000 UVR-attributable cases of melanomas occurred in Europe in 2022.[65] While largely consistent with the ECAC4 recommendation, the ECAC5 recommendation uses more direct language regarding the harmful use of indoor tanning devices for cosmetic purposes. It more clearly reflects the evidence of harm and the absence of a safe threshold for use, emphasising that such devices should never be used.[38]

Cancer-causing factors at work

About 47% of the EU workforce is exposed to at least one occupational carcinogen, particularly solar UVR, diesel engine exhaust, benzene, respirable crystalline silica, and formaldehyde.[66] Work-related cancers accounted for over 37,000 cases across the EU between 2013 and 2022,[67] with lung cancer and mesothelioma being the most frequent. The ECAC5 recommendation builds on ECAC4 by emphasising awareness and proactive advocacy for workplace safety and health, while shifting the focus from individual self-protection to also holding employers accountable.[37]

Indoor radon gas

In 2019, around 19,000 lung cancer deaths in Europe may have been caused by exposure to indoor residential radon gas, a naturally radioactive gas that occurs as an intermediate decay product in the uranium decay chain.[68] The ECAC5 recommendation on indoor radon exposure now outlines a clearer and more practical sequence of actions, enabling individuals to understand and make informed decisions about reducing their exposure to radon.[38]

Air pollution

Outdoor air pollution was classified as a human carcinogen in 2013,[69] and since then, evidence on the effects of long-term exposure to outdoor air pollution

on cancer incidence and mortality has strengthened further.[36] Household use of coal and SHS, both important contributors to indoor air pollution, are also established carcinogens.[36] Most EU citizens live in areas where outdoor air pollution levels exceed the latest WHO guidelines on the maximum levels of major air pollutants,[70] and 23,000 cancer deaths in the EU have been attributed to particulate matter in outdoor air.[71] Although reducing outdoor air pollution primarily requires action at population level by local, national, and EU authorities, many individual-level measures have also been identified to reduce personal exposure (e.g. avoiding pollution hotspots and limiting walking or cycling along heavily trafficked routes), and to reduce personal contributions to air pollution (e.g. reducing car use, avoiding burning coal or wood).[36] In addition, citizens can advocate for policymakers to implement policies that improve air quality.

Cancer-causing infections and related interventions

The main cancer-causing infections in the EU are *Helicobacter pylori* (*H. pylori*), HPV, Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Human immunodeficiency virus (HIV), together contributing to approximately 5% of cancers in the EU in 2022.[41] Effective interventions include prophylactic vaccines for HBV and HPV already recommended in ECAC4.[72] ECAC5 expands the recommendation to gender-neutral HPV vaccination to generate stronger and faster herd protection against HPV infection, in addition to provide direct protection against HPV-related cancer in men.[41] Indeed, recommending gender-neutral vaccination improves equity, as population-level immunity will protect everyone. Also, prompt efficacious, safe, and accessible diagnostic tests and treatments that can either cure (HCV and *H. pylori*) or control the infection and reduce cancer risk (HBV and HIV).[41] Minimally invasive diagnostic assays and treatments are available, affordable, and have already been effectively offered to the general population in selected pioneering interventions in the EU for HBV, HCV and HIV.[41] *H. pylori* testing and treatment strategies have been found to be cost-effective in reducing gastric cancer incidence in high-risk areas.[73] Several efforts on gastric cancer prevention are currently underway in the EU and may provide guidance on broader implementation of *H. pylori* testing and treatment approaches.[74]

Hormone replacement therapy (HRT)

Prescriptions of HRT have increased since 2010, largely driven by the use of transdermal and vaginal formulations. Recent evidence supports the association between HRT and an increased breast cancer risk; however, the magnitude of excess risk depends on the formulation used, duration of use, and adiposity levels.[39] Since HRT often remains the only option for managing certain menopausal symptoms, ECAC5 underscores the importance of informed decision-making, especially HRT's use under the supervision of a healthcare professional, and limiting use to the shortest duration possible.[39]

Organised cancer screening programmes

ECAC4 recommended organised cancer screening programmes for colorectal, breast, and cervical cancer, which have been successfully implemented in the EU.[75] Lung cancer, however, remains the most common cancer-related death in Europe.[76] In 2022, the EU Council recommendation on cancer screening recommended the feasibility and effectiveness of organised lung cancer screening programmes to be explored.[77] For ECAC5, a comprehensive evaluation of the effectiveness and assessment of benefits and harms associated with lung cancer screening was conducted by Toes-Zoutendijk et al., concluding that low-dose computed tomography (LDCT) screening reduces lung cancer mortality by 21% and all-cause mortality by 5%.[40] Overdiagnosis was found to be low compared to no screening or chest X-ray, suggesting that LDCT screening can offer substantial benefits while minimising potential harms and keeping costs low.[78] Accordingly, ECAC5 now recommends lung cancer screening along with the established organised cancer screening programmes, and advises policymakers to use LDCT annually for individuals considered to be at elevated risk of lung cancer—identified by age, smoking history, and/or validated risk models-, in combination with smoking cessation interventions.[40]

Evaluation study on the communication of ECAC5 to the public

Another innovation in ECAC5 has been the optimisation of communication to increase awareness of modifiable cancer risks. To this end, an evaluation study using a 2 (message content) × 3 (message length) × 2 (message format) factorial design was conducted among 10,027 adult citizens across eight EU MS,[31] with the aim of identifying the most effective and equitable communication formats for conveying information on the modifiable risk factors for cancer and ways to prevent these. Participants were randomised online either to "no message" or one of ten drafts ECAC5 formats differing in message content, length, or format. Content refers to whether the messages included explicit information on the modifiable risk factors for cancer. Length refers to whether messages included long or shortened information on the actions citizens can take to avoid cancer risks. Format refers to whether information was presented as text only or text with images. The main outcome was awareness of 16 proposed avoidable cancer risks (from the draft ECAC5 messages), operationalised as the number of correctly freely recalled risk factors. The results showed that the

inclusion of risk factors in messages significantly increased the mean number of risk factors recalled: participants not presented with any form of ECAC5 (no message) recalled a mean of 1.95 risk factors, whereas those presented with messages that explicitly included information on the cancer risk factors alongside the preventive actions recalled a mean of 2.41 risk factors. Although the length of information regarding preventative actions and message format had no effect, longer messages about actions to prevent cancer, as well as images, provide more information to citizens without any measurable reduction in recall.[31] The results were consistent across countries and level of education. Consequently, it was recommended to include explicit information on the avoidable risk factors for cancer as a header to each of the preventive action recommendations (Fig. 4).

Co-benefits for prevention of non-communicable diseases (NCDs) other than cancer with similar risk factors and opportunities for health promotion

In ECAC5, significant efforts have been made to align the recommendations on primary prevention of cancer with other NCD-related messages to provide co-benefits in the prevention of other common NCDs that share similar underlying risk factors. For example, adopting healthy behaviours, such as not smoking, avoiding alcohol, maintaining a balanced diet, and regularly engaging in physical activity, not only reduces cancer risk but also lowers the incidence rates of heart disease, diabetes, and respiratory conditions. Mitigating exposures in the workplace and the daily environment can also help reduce the risk of respiratory diseases, among others. Comprehensive prevention and treatment strategies for infection-related cancers likewise prevent severe diseases associated with these infections, such as liver cirrhosis and peptic ulcer. Additionally, opportunities for health promotion have been identified in the context of attending organised cancer screening programmes. All this information has been compiled in ECAC5 (Supplementary Material—Annex 1) as well as in the knowledge translation outputs described below.

Recommendations for policymakers

Policymakers have the mandate and responsibility to propose and implement cancer control policies and practices at an international, national, regional, or local level. Policy recommendations can also be used by civil society and health professionals to advocate for policy changes towards cancer prevention, also fostering meaningful social participation in health governance. A major innovation in ECAC5 is the inclusion of recommendations on policies, underpinning each of the 14 recommendations for the individuals (Supplementary Material—Annex 1 and summarised in Table 1). By addressing upstream determinants, ECAC5 provides guidance to decision-makers and stakeholders on evidence-based policies, accounting for structural factors and health systems contexts, to promote healthier environments for all—regardless of individual engagement—while simultaneously empowering individuals to make informed, healthy choices in their daily lives.

A key strength of this work lies in the development of policy-level recommendations that draw on relevant contributions from other intergovernmental organisations and global health discussions, including legally binding legislative instruments such as EU Directives, thereby enhancing the relevance and applicability of the outputs generated by ECAC5. For example, on tobacco and SHS, the recommendations are based on the WHO Framework Convention for Tobacco Control, which all EU MS have ratified, along with EU-level actions such as the Tobacco Products Directive, the Tobacco Taxation Directive or the EU Council Recommendation on smoke-free environments.[35] For excess body weight, physical activity and diet, ECAC5 recommends fiscal policies targeting unhealthy foods, policies ensuring equitable access to affordable, nutrient-dense foods, incentives for all forms of active travel, and expansion of green spaces to promote physical activity.[42] For alcohol, ECAC5 supports integrated policy approaches aimed at reducing consumption and de-normalising its use, including taxation, age restrictions, and regulating marketing and advertising.[35] Policies that normalise and support breastfeeding are key to improving uptake and reducing stigma,[42] while for artificial UVR protection, existing EU policies require harmonisation and improved enforcement.[38] In the workplace, ECAC5 aligns with existing occupational safety and health policies and frameworks, and other international commitments.[37] Basic safety standards for the protection of individuals' health from radon exposure should be also enforced across the EU.[38] On air pollution, aligning EU air quality standards with WHO guidelines and integrating air pollution control with climate policies are urgent priorities.[36] Regarding infections, ECAC5 recommends strengthening vaccination programs, in line with the EU Council Recommendation on Vaccine preventable cancers,[79] and expanding sustainable testing and treatment strategies for the five major cancer-related infections, making preventive interventions the default option.[41] Effective policies also exist that support the use of HRT, with provisions to ensure the best possible outcomes.[39] Finally, policymakers must provide well-organised quality-assured screening programmes that guarantee fair or equitable access, support broad participation, and ensure high-quality health services across the entire continuum of cancer prevention and care.[40]

As overarching principles for the implementation of ECAC5, policymakers are urged to:

- Adopt the recommendations in a phased implementation manner when recommendations require infrastructure not yet available.
- Make the healthy choice the easiest—most affordable, accessible, and available—option in all settings.
- Ensure that all recommendations are implemented with an equity perspective by addressing the needs of vulnerable population groups, including those experiencing socioeconomic disadvantage.
- Safeguard the integrity of all recommendations by protecting against undue interference from groups with vested interests.
- Invest in regular capacity-building, monitoring and evaluation.

Finally, policymakers are also urged to support and engage in efforts to actively communicate the ECAC5 recommendations targeted to individuals, making use of tailored materials and approaches for this purpose developed in the frame of the ECAC5, as described below.

Knowledge translation outputs to improve dissemination: ECAC5 factsheets and policy briefs

Typically, targeted promotion of the ECAC to the general population is undertaken by civil society organisations.[80–82] In 2022, the European Oncology Nursing Society (EONS) launched PrEvCan—*Cancer Prevention Across Europe* in partnership with the European Society for Medical Oncology (ESMO), dedicated to ECAC4.[83] Additionally, the Association of European Cancer Leagues (ECL), alongside many of its member societies, built their cancer prevention advocacy and promotion around the ECAC since its inception, notably during the annual European Week Against Cancer.

As described in the World Code Against Cancer Framework,[28] knowledge translation outputs are produced as Level 2 of information to facilitate dissemination and outreach to different target groups. In the ECAC5 process, a dedicated factsheet and a policy brief have been developed for each ECAC5 recommendation. These outputs provide concise but yet detailed snapshots of the evidence and key actions that individuals and stakeholders can take to adopt the updated recommendations, and can be accessed in the dedicated ECAC5 website.[84] Factsheets are intended for a general audience as well as health professionals, who may have a particular interest in learning more about the recommendations and how to adopt them. This approach allows the ECAC5 recommendations to remain concise and impactful, while the factsheet provides additional key information to enhance public understanding of the issue. Policy briefs outline the corresponding policy recommendations in ECAC5 and are targeted at policymakers at any governance level. They expand on key policy actions, giving guidance on how to implement the policies and monitor progress. They are also relevant for any decision-makers whose responsibilities align with the implementation of these policy recommendations.

Both sets of knowledge translation outputs have been written by topic-specific experts from the respective WGs, with communication support from WG5 and the IARC Secretariat. These materials are intended to be freely and widely used by key stakeholders, including society organisations, who are also encouraged to develop their own materials based on these outputs.

Discussion

The ECAC is a long-established, multi-risk factor evidence-based tool for cancer prevention that now incorporates an essential new dimension: policy recommendations to support the public in adopting its recommendations, while aligning with messages for the prevention of other NCDs. ECAC is not only a unique cancer prevention tool that reviews and assesses the main risk factors and effective interventions for both primary and secondary cancer prevention; it has also served as model to expand the Code Against Cancer to other regions of the world.[28] In addition, ECAC5 has accounted for contextual socio-economic and health systems' factors such as equity, feasibility, accessibility, and affordability of the actions and interventions recommended to the public; as well as to guide policy implementation in the EU, based on established European and global policies (Fig. 3 and Supplementary Material—Annex 1). Many of the ECAC5 policy recommendations are consistent with the so called "WHO Quick buys", defined as cost-effective interventions that could exhibit measurable effects within short-term political cycles across European MS.[85]

ECAC is now in its 5th edition. For over 40 years the set of recommendations has been continuously reviewed and updated as new scientific evidence emerges. A notable feature of ECAC5 is its enhanced science communication, especially important in an era marked by public mistrust of traditional institutions, including the scientific community. In this context, ECAC5 has enabled formative research in broad populations across EU27 to better inform expert deliberations and decisions on risk and intervention communication, directly shaping the content and format of ECAC5.[30,31] While real-world challenges such as political resistance, commercial lobbying, and health system disparities persist, the ECAC has been continuously used by cancer prevention advocates and campaigners as an authoritative evidence base to go against such challenges.

With the launch of ECAC5 in the frame of EBCP, momentum is building to strengthen its dissemination and implementation at both EU and national level,

unifying a wide range of stakeholders and allies' efforts, supported by further strategies and tools, such as the upcoming EU Mobile App for Cancer Prevention.[86]

In addition, ECAC5 aims to engage policy- and health decision-makers to expand its impact beyond individual behaviours to broader structural and societal efforts in reducing cancer risk, several mechanisms have been put in place to achieve this goal: (a) ECAC5's various knowledge translation outputs described in section 3.3; (b) systems thinking activities performed to guide stakeholders in identifying dissemination actions to enhance the awareness and uptake of ECAC5 across the EU[43]; (c) a Dissemination Report that will be available in the ECAC5 website to guide stakeholders in their dissemination strategies and to anticipate and manage digital backlash to ECAC5[84]; and (d) a Partnership Declaration that aims at promoting ECAC5 within stakeholders' networks, communication channels, and activities, tailored to diverse target audiences. This Partnership Declaration will support education and awareness-raising initiatives towards innovative and locally adapted approaches to encourage the uptake of ECAC5 recommendations. It will also foster cross-sectoral and multidisciplinary collaboration with relevant stakeholders on cancer prevention.

Finally, to evaluate the reach and impact of ECAC5 on cancer prevention public awareness and motivation, as well as its influence on structural policies and health systems at national and EU levels, a comprehensive set of indicators will be essential for monitoring and evaluating the implementation of ECAC5 recommendations over the medium and long term. In this regard, several pilot research projects are currently being designed to measure cancer prevention literacy and awareness of ECAC and assist policymakers implementing ECAC5.

Conclusion

Overall, ECAC5 presents a concerted effort of the European scientific community and civil society to help reduce the substantial and growing cancer burden across the EU. It is hoped that the evidence-based messages and targeted policy advice provided in ECAC5 will serve as a strong foundation for effective cancer prevention. The evolution between ECAC editions shows the need of a permanent governance of the ECAC allowing re-assessing evidence on a more regular basis to ensure that the ECAC always remains up to date.

Reversing the upward trend in cancer incidence will depend largely on the successful dissemination and uptake of ECAC5 recommendations by both the public and decision makers in the years ahead. This includes more systematically using ECAC5 to shape national policy, including National Cancer Control Programmes, in the field of primary and secondary cancer prevention.

Contributors

CE: conception, design of the work, drafted the work.

All other co-authors: revised the work, approved the submitted version.

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T. Albreht has declared a leading role at a Think-tank on cancer for Slovenia for the past 5 years; I. Lansdorp-Vogelaar has declared being Member of the Screening Committee of the Dutch Health Council and having received payment or honoraria for the Digestive Disease Week; and U. Ivanus has declared a leading role at the National Screening Committee, NCCP Expert Board, National Cervical Cancer Screening Programmed ZORA and the Association of Slovenian Cancer Societies; The rest of the authors declare no competing interests.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lanepe.2026.101592.

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