CURTAIN

D2.3 - Report on the needs, capacities and education/training programs in cancer literacy in Europe

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20/12/2025	0.1	First draft
26/12/2025	0.2	Review
28/12/2025	0.3	Addressing comments
30/12/2025	1	Final version

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List of Abbreviations

AI - Artificial intelligence
CHL - Cancer health literacy
CI - Confidence interval
CL - Cancer literacy
CME - Continuing medical education
CPD - Continuing professional development
CRC - Colorectal cancer
DSM - Decision support materials
ECAC-5 - European Code Against Cancer, fifth edition
ECO - European Cancer Organisation
ECCO - European Cancer Organisation
eHealth - Electronic health
EONS - European Oncology Nursing Society
ESMO - European Society for Medical Oncology
ESO - European School of Oncology
EU - European Union
EU4H - EU4Health Programme
EU-TOPIA-EAST - EU-TOPIA-EAST Consortium
HCP / HCPs - Healthcare professional(s)
HL - Health literacy
HNSCC - Head and neck squamous cell carcinoma
HPM - Health promotion and prevention
HSS - Health system strengthening
IHC-C - Informed Health Choices – Cancer
ICT - Information and communication technology
IOM - International Organization for Migration
JBI - Joanna Briggs Institute
KPI - Key performance indicator(s)
mHealth - Mobile health
NCD - Non-communicable disease
NGO - Non-governmental organisation
OBS-PACE - Progress in Addressing Cancer in Europe
OECD - Organisation for Economic Co-operation and Development
PCC - Population–Concept–Context
PHC - Primary health care
PRISMA-ScR - Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews
PROM / PROMs - Patient-reported outcome measure(s)

QoC - Quality of care
QoL - Quality of life
ScR - Scoping review
SDM - Shared decision-making
SoHEU - State of Health in the European Union
ToT - Train-the-trainer
TSG - Transnational stakeholder group
UNFPA - United Nations Population Fund
UV - Ultraviolet
WHO - World Health Organization
WHO EURO - WHO Regional Office for Europe
WP - Work package

Executive Summary

- **Purpose**

To provide an evidence-based synthesis of cancer literacy needs, capacities, and existing education and training programmes across European countries in order to identify gaps and inform the development of a flagship European cancer literacy training model.

- **Objectives and scope of the deliverable**

Synthesis of cancer literacy needs and capacities and mapping of implemented education and training programmes in consortium countries.

- **Intended audience**

European Union institutions; national and regional authorities; public health bodies; education and training institutions; health system governance structures.

- **Methodology**

A combined approach was applied:

  - a scoping review of scientific, policy and institutional sources;
  - national mapping of implemented programmes in Belgium, Bulgaria, Ireland, Italy, Moldova, Montenegro, Portugal, Romania, and Ukraine.

- **What is new compared to existing knowledge**

The integration of international review evidence with empirical national mapping enabled the identification of a systemic gap between policy recognition of cancer literacy and its institutionalised educational implementation.

- **Most important findings**
  - Sustainable, institutionally integrated and scalable cancer literacy education models are lacking.
  - Existing initiatives are fragmented and weakly embedded in formal workforce education systems.
  - The number of formalised and reproducible programmes remains limited.
  - The level of institutionalisation of cancer literacy education varies substantially across countries.

- **Key gaps identified**

Absence of harmonised competency frameworks; weak integration into formal education and continuing professional development; limited mechanisms for scale-up and sustainability.

- **Priority target groups**

Healthcare professionals (primary care physicians, oncologists, nurses, pharmacists); public health professionals; health system managers and administrators.

- **Conclusions and main recommendation (EU-level implication)**

A key EU-level priority is the development and implementation of a unified, sustainable, institutionally embedded and scalable cancer literacy education model, integrated into health workforce education, public health practice and health system management.

Deliverable Introduction

Deliverable objective and scope

- To map and synthesise cancer literacy needs, capacities, and education and training programmes across European countries;
- To identify gaps and examples of good practice;
- To provide the evidence base for the development of a flagship European cancer literacy training programme for healthcare professionals;
- To summarise cancer literacy needs, existing capacities, and education and training programmes based on scientific, policy and institutional sources;
- To map and describe existing cancer literacy education and training programmes at country level in consortium member countries;
- To outline priority areas and content elements emerging from identified needs and gaps to support the further development of cancer literacy training activities.

Relation to other WPs and deliverables

The deliverable is conducted within the WP2, complementing the mapping of cancer literacy inequalities, cancer-related disinformation and relevant stakeholders. The present deliverable is linked with:

- The WP3 (Design of the cancer literacy tools and interventions) – D3.1 (Curriculums of the educational courses prepared in the frame of the WP).
- The WP5 (Cancer literacy education of Health Care Professionals and relevant stakeholders) – Task 5.1 (Training the health care professionals and key stakeholders for cancer literacy: pilot the Flagship European Cancer Health Literacy Training Programme) and Task 5.3 (Improvement of the Flagship European Cancer Health Literacy Training Programme based on evaluation recommendations)
- The WP6 (Developing a Virtual Cancer Literacy Library and Policy Guidelines for Cancer Literacy) – D6.3 (Report on the Roadmap for the Capacity Building training on Cancer Health Literacy for European countries).

Content of the deliverable

Summarize the content that can be found in this deliverable. Use bullet points if possible.

- Description of the conceptual framework and analytical approach to mapping cancer literacy;
- Results of the scoping review on cancer literacy needs, capacities, and education and training programmes;

- Analysis of policy documents, grey literature, and international platforms related to cancer literacy;
- Results of the national mapping of cancer literacy education and training programmes;
- Integrated analytical synthesis identifying key gaps and priority areas;
- Conclusions and recommendations for further action at the European Union level, with a focus on capacity building and the development of cancer literacy education models.

Introduction / Background

Cancer literacy (CL) is increasingly recognised as a key determinant of effective cancer prevention, early detection, treatment, and improvement of quality of life for people affected by cancer [1]. The terms «health» and «literacy» form a powerful concept that has evolved from the 1970s to one that has garnered the attention of a wide range of disciplines [2].

Approaches to health literacy (HL) emphasise individuals' ability to access, understand, appraise, and use health-related information in order to make decisions that support the maintenance and improvement of health in everyday life [3]. This vital competence is referred to as cancer health literacy (CHL) or cancer literacy when linked to cancer-related health literacy [4].

In the oncology context, the World Health Organization (WHO) conceptualises cancer literacy as an integrated set of knowledge, skills, and competencies required for effective interaction with information, health services, and decision-making processes across the entire cancer continuum, including prevention, screening, diagnosis, treatment, and post-treatment care [1].

Adequate levels of CL enhance individuals' capacity to navigate health systems, support informed decision-making, and constitute a prerequisite for the provision of accessible and equitable health services [4]. The issue of social inequality is of critical importance in the formation and implementation of cancer literacy programmes, since differences in socio-economic status, education and access to resources significantly affect the level of awareness and behavior of people regarding health. This is particularly evident in the context of preventive health programmes, where differences in policy approaches and resource allocation shape how cancer literacy initiatives are designed and implemented [5, 6].

European cancer policy confirms the importance of health literacy and cancer literacy as part of broader efforts to reduce inequalities in access to information, support informed choice, and strengthen the role of prevention. In Europe's Beating Cancer Plan, the official strategic document of the European Commission (COM/2021/44 final), the need for measures aimed at increasing public awareness, strengthening effective communication, and implementing educational approaches for various stakeholders in the context of cancer control is explicitly highlighted [7, 8].

In recent years, the concept of cancer literacy has expanded beyond the individual level of   decision-making at all stages of the cancer care pathway [9 - 11].

At the same time, a wide range of educational, training, and capacity-building initiatives in cancer literacy are being implemented across European countries, differing substantially in thematic focus, target groups, and levels of integration within health systems [12 - 15].

Within this context, the T2.3 report synthesises existing evidence on needs, capacities, and educational and training responses in the field of cancer literacy across European countries, drawing on a broad range of scientific, policy, and institutional sources, including academic publications, international and strategic documents, grey literature, and official online resources. The analysis focuses on how the CL concept is applied in education and training programmes, as well as on identifying opportunities and challenges for further capacity building at the European level.

Purpose

To map and synthesise cancer literacy needs, capacities, and training programmes, and to review relevant education and health promotion activities related to cancer literacy across European countries, in order to identify gaps, highlight best practices, and provide the evidence base for the development of a flagship European cancer health literacy training programme for healthcare professionals.

Objectives

1. To summarise cancer health literacy needs, existing capacities, and education and training programmes across European countries based on scientific, policy, and institutional sources.
2. To map and describe existing cancer health literacy education and training programmes in consortium member countries, and to identify gaps and examples of good practice.
3. To outline priority areas and content elements emerging from the identified needs and gaps, to support the further development of cancer health literacy training activities.

Methodology

To achieve the stated objectives, a combined methodological approach was applied, integrating a scoping review and secondary data analysis in order to assess needs, capacities, and educational and training responses in the field of cancer literacy across selected European countries, namely Romania, Portugal, Belgium, Bulgaria, Montenegro, Ukraine, Italy, Ireland, and Moldova.

At Stage 1, a scoping review was conducted to systematically synthesise scientific and institutional sources addressing cancer literacy needs, capacities, and training programmes. The review encompassed peer-reviewed scientific publications, international and policy documents, grey literature sources, as well as a targeted analysis of official web-based resources presenting cancer literacy–related education and training programmes at national and pan-European levels, available in English.

An adapted version of the Research Protocol for WP2: Mapping cancer literacy resources, stakeholders, initiatives, relevant KPIs (Milestone 5. Resources collection methodology) was applied.

At Stage 2, a secondary analysis of empirical data provided by partner countries within the consortium was undertaken. Consortium partners completed standardised Excel templates (Annex 1) containing information on existing training programmes, educational initiatives, publications, and relevant online resources.

The reference model for the national-level mapping was the Scoping Review Protocol for Mapping Cancer Literacy Training Programs conducted in Portugal and published in Portuguese.

The collected materials were further systematised and analysed to identify prevailing approaches, existing gaps, as well as opportunities and challenges for future development, scaling, and capacity-building in the field of cancer literacy at the European level.

Scoping Review

The study was conducted in the format of a scoping review, in accordance with the methodological guidance of the Joanna Briggs Institute (JBI) [16] and the PRISMA-ScR reporting standards [17]. This approach was selected to enable the systematic mapping of existing needs, tools, and education and training programmes related to cancer literacy, without a formal assessment of methodological quality or risk of bias of the included sources.

Review question

What needs, tools, education and training programmes related to cancer literacy are described in the scientific and grey literature across European countries, with a specific focus on the consortium partner countries?

Conceptually, the study was grounded in the PCC (Population–Concept–Context) framework, with a focus on cancer prevention and cancer care, as well as on regional inequalities and vulnerable population groups (Table 1).

Element	Definition
Population (P)	European countries (consortium countries: Romania, Portugal, Belgium, Bulgaria, Montenegro, Ukraine, Italy, Ireland, Moldova), including groups: general population, vulnerable groups (migrants, elderly, socially vulnerable, rural communities), cancer patients, healthcare workers
Concept (C)	Cancer literacy, encompassing identified needs (knowledge gaps, navigation and communication needs), barriers and facilitators, as well as existing capacities and education/training programmes, including CME/CPD and other professional or community-based initiatives across consortium countries, with relevance to cancer prevention and care.
Context (C)	Cancer prevention and cancer care, including public health, healthcare delivery and communication contexts in which cancer literacy–related needs, capacities and education/training programmes are implemented across European countries.

Table 1. PCC framework of scoping review on cancer literacy needs, capacities, and education and training programmes

Inclusion and exclusion criteria

Sources were included if they:

- were published between 1 January 2015 and the date of the search;
- addressed cancer literacy and/or health literacy in oncology;
- described needs, barriers, tools, or education and training programmes;
- were relevant to consortium partner countries or had a pan-European or global scope;
- were published in English;
- belonged to one of the following source types: original research studies; systematic or scoping reviews; education or training programmes; policy documents, guidelines, or reports.

Sources were excluded if they:

- had an exclusively clinical, molecular, or biomedical focus without an educational or communication component;
- were published before 2015;
- were not relevant to the European context.

Information sources

The following information sources were used:

- Scientific databases (primary): PubMed, Scopus, and Web of Science Core Collection (Appendix 2);
- Full-text and interdisciplinary resources (additional): SpringerLink;
- Grey literature and institutional sources: World Health Organization (WHO) and WHO Regional Office for Europe; European Commission and the EU Cancer Mission; Organisation for Economic Co-operation and Development (OECD); European Observatory on Health Systems and Policies; national cancer institutes and Ministries of Health; professional associations (EONS, ESMO, ECCO); patient organisations and non-governmental organisations (NGOs).

In addition, a targeted search was conducted on the websites of international and European organisations, as well as within consortium partner countries, to identify actively implemented cancer literacy education and training programmes available in English.

Search Strategy

Search queries were iteratively refined during the review process in order to broaden the coverage of relevant sources. Structured search strategies were applied using combinations of the terms *cancer literacy*, *health literacy*, *education*, *training programmes*, *needs*, *tools*, *capacity building*, and *communication*, with a geographical focus on CURTAIN consortium countries.

To enhance search sensitivity, truncated terms were used for oncology-related concepts, and strict phrase searching was not applied in databases with limited indexing. In international bibliographic databases, structured combinations of keywords using Boolean operators were employed.

Core search concepts:

- “cancer literacy”, “oncology literacy”
- “health literacy AND cancer”

Sub-concepts:

- needs, barriers, facilitators
- tools, measurement, scale, questionnaire
- education, training, programme, intervention, capacity building
- communication, shared decision-making
- prevention, screening, cancer care
- Europe / European Union
- names of consortium countries (searched individually)

Source selection and screening process

All identified records were imported into Rayyan for deduplication and screening management. In total, 699 records were identified, of which 176 were removed as duplicates. 523 records underwent title and abstract screening, and 328 sources were excluded at this stage.

For assessment of full-text availability, 195 publications were retrieved; 39 were excluded due to the unavailability of full texts. A total of 156 sources were included in the final scoping review. The selection process was documented using the PRISMA 2020 flow diagram (Figure 1).

At the subsequent analytical stage, for the purposes of in-depth mapping within Task 2.3 (Optimised Mapping), 133 sources were selected from this dataset based on additional analytical relevance criteria.

Relevance assessment criteria

To ensure analytical alignment with the objectives of Deliverable T2.3, an additional relevance assessment was applied to the included sources.

Each source was assessed against the following criteria:

1. explicit focus on cancer literacy or health literacy within an oncology context;
2. clear identification of needs, capacities, or education and training interventions;
3. relevance to one or more stages of the cancer continuum (prevention, screening, diagnosis, treatment, survivorship);
4. analytical suitability for cross-country synthesis within consortium countries or the broader European context.

Based on these criteria, sources were classified as having high, medium, or low analytical relevance. Sources assessed as having high or medium relevance were retained for the in-depth Optimised Mapping analysis conducted under Task 2.3.

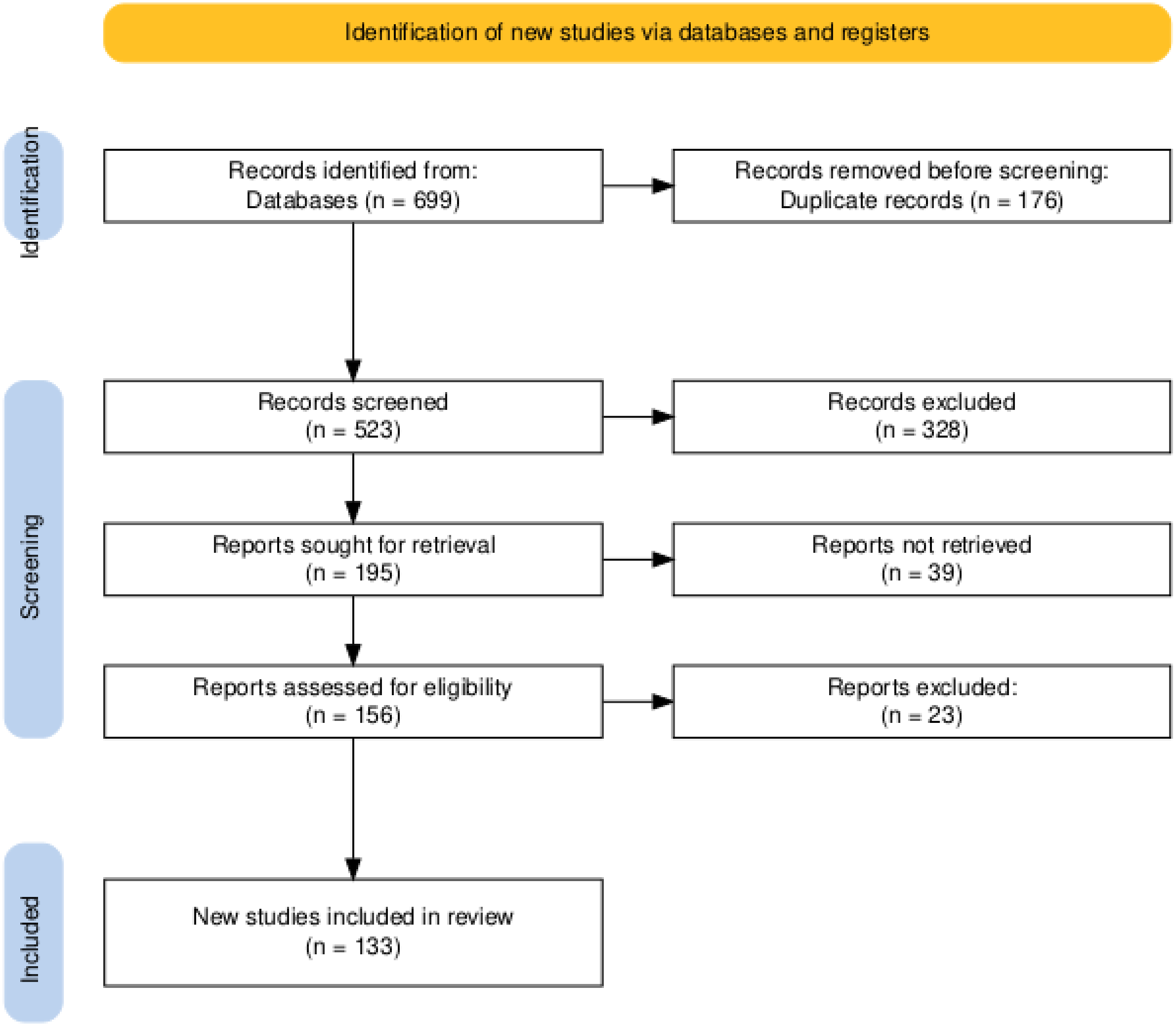

Figure 1. PRISMA 2020 flow diagram of the source selection process on cancer literacy needs, capacities, and education and training programmes

Data extraction and synthesis

Data extraction was performed using standardised data extraction sheets covering the following categories: source type; country/region; thematic domain (needs, tools, education or training programmes); target groups; implementation context; and level (national, regional, or European).

The results were synthesised descriptively, in line with the objectives of the scoping review.

Methodological limitations

The scoping review focused on peer-reviewed scientific literature indexed in international bibliographic databases. Policy documents, strategic reports and other grey literature were identified through a separate document analysis process and are reported in a dedicated analytical section.

The review was limited to English-language sources, which may have resulted in the underrepresentation of evidence published in national languages. As a result, some country-specific initiatives or programmes may not have been captured within the scoping review and were instead addressed through the separate national mapping component.

Policy and grey literature analysis (including international platforms)

The assessment of grey literature was expanded to include not only formal policy and strategic documents, but also selected international platforms that provide structured programmes, educational resources, or practical implementation tools relevant to cancer literacy. This approach was used because, at the international level, cancer literacy initiatives are often implemented as embedded components of broader policies, institutional knowledge hubs, or digital platforms, rather than as stand-alone, explicitly labelled programmes.

International websites and platforms were included in the review if they met at least one of the following criteria:

1. provision of structured educational or training content related to cancer prevention, cancer care, or the empowerment of patients and/or healthcare professionals;
2. support for system-level capacities related to cancer literacy, including through analytics, guidance documents, or workforce development;
3. functioning as implementation tools that facilitate the translation of policy priorities into practice.

In light of these considerations, such sources were analysed within a single integrated Policy, platforms & grey literature analysis, rather than as a separate mapping of educational interventions.

The aim of this analytical block was to situate the identified needs and training gaps within the broader context of European and global cancer control strategies, and to identify existing system-level capacities relevant to the development of cancer literacy.

National mapping of education and training programmes (country-level data collection)

As a second methodological step within Task 2.3, a country-level mapping exercise was conducted to identify cancer literacy–related education and training programmes implemented at national or local level in consortium countries.

Each consortium partner was requested to perform a structured desk review in the national language, focusing on programmes addressing cancer literacy needs, existing capacities and education/training initiatives implemented within their respective country. This step complemented the international scoping review and aimed to capture context-specific programmes and initiatives that are not consistently indexed in international bibliographic databases.

The national mapping followed a standardised Excel-based data collection template, ensuring comparability across countries. Partners were instructed to identify programmes implemented by public institutions, educational organisations, professional associations, healthcare providers, civil society organisations and other relevant stakeholders.

The methodological approach for this national-level mapping was informed by the Portuguese national protocol for mapping cancer literacy training programmes, which served as a reference model for defining search procedures, eligibility logic and data extraction structure

Data elements and analytical dimensions

For each identified programme or initiative, the following characteristics were recorded:

- Country;
- Organizer (e.g. Ministry of Health, Ministry of Education, university, public or private hospital, patient support association, NGO);
- Provider type, classified according to the Penta-Helix framework (Citizens & Civil Society; Health & Care; Business; Public Administration; Knowledge & Academia);
- Programme title, provided in English, with the original language indicated in brackets;
- Type of programme (e.g. CPD/CME, formal educational course, thematic training, workshop, e-learning, patient education, school education, public awareness campaign, voluntary training);
- Target groups (e.g. healthcare professionals, medical students, patients and cancer survivors, caregivers, general population, specific age or vulnerability groups);
- Mandatory status (yes/no), indicating whether participation is compulsory for specific groups;
- Accreditation or certification (yes/no), including reference to relevant regulatory or accreditation documents where available;
- Programme goals and main content, including competencies, skills and thematic focus;
- Delivery format (online, offline, blended);
- Duration and intensity, including total length, training hours or credits;
- Periodicity (one-off, recurring, on demand);
- Implementation period, indicating start and end dates;

- Number of participants or estimated reach, where available;
- Best practice assessment (yes/no), based on expert judgement by the national partner completing the table;
- Source or reference, including documents, official websites or publications.

National-language documents were explicitly included at this stage to ensure comprehensive coverage of programmes implemented in practice, particularly those disseminated through institutional websites, governmental portals or professional networks rather than through peer-reviewed publications. Validation of extracted information was performed by consortium partners with contextual and language expertise.

Integration with scoping review results

The outputs of the national mapping exercise were integrated with findings from the international scoping review to produce an Optimised Mapping dataset. This two-step approach combining an international scoping review with structured national mapping enabled the identification of both cross-country patterns and country-specific capacities and gaps in cancer literacy education and training, thereby strengthening the analytical basis for subsequent capacity-building activities within the project.

Statistical analysis

Statistical analysis was conducted using descriptive and inferential methods, with programmes treated as units of observation. For categorical variables, absolute frequencies (n) and relative proportions (%) were calculated, along with 95% confidence intervals for proportions using the Wilson method [18]. For quantitative variables, medians and means were calculated with corresponding 95% confidence intervals (means based on the t distribution; medians estimated using bootstrap resampling). Pearson's χ^2 test was applied to assess cross-country differences in categorical variables, while the Kruskal–Wallis test was used for quantitative variables. Analyses were performed using an available-case approach. Statistical analysis was performed using R (version 4.4.2) (R Core Team (2024). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/). Hypothesis testing was conducted at a significance level of $\alpha=0.05$ [19].

Results

1. Results of the scoping review

Overview of included sources

A total of 133 peer-reviewed scientific sources were included in the review and formed the analytical basis for the subsequent analysis.

The majority of the included sources demonstrated high or medium analytical relevance for mapping cancer literacy needs, capacities, and education and training programmes. Specifically, 61.7% of sources were classified as having high relevance, 33.1% as medium relevance, while 5.2% were assessed as having low analytical relevance.

The majority (Table 2) of the evidence base consisted of empirical studies (69.9%). A total of 28 review-type publications - systematic, scoping, narrative and other reviews (21.1%) were identified (Table 3). A small proportion of sources was classified as policy-, programme- or methodology-focused scientific publications, which reflect conceptual, normative or programme-oriented approaches to cancer literacy and meet scholarly standards; these sources did not include political, strategic or institutional grey literature documents, the analysis of which was conducted separately.

Population	n	%
Empirical studies	93	69.9
Review-type publications (systematic, scoping, narrative and other reviews)	28	21.1
Policy-, programme- and methodology-focused scientific sources	12	9.0
Total	**133**	**100.0**

Table 2. Characteristics of peer-reviewed scientific sources included in the review (n=133)

A total of **28 review-type publications** synthesizing existing scientific evidence on cancer literacy were identified (Table 3). This group included reviews applying different methodological approaches, including systematic, scoping and narrative reviews.

The review-type publications covered a broad range of thematic areas, including cancer literacy needs and barriers, communication and navigation within cancer care systems, as well as educational and intervention-related approaches.

№	Author(s), year	Title	Journal/ DOI	Review type	Main analytical focus	Main result
1	Saab MM, Reidy M, Hegarty J, O'Mahony M, Murphy M, Von Wagner C, et al., 2018 [20]	Men's information-seeking behavior regarding cancer risk and screening: A meta-narrative systematic review	Psychooncology doi: 10.1002/pon.4506	Meta-narrative systematic review	Information-seeking behaviour related to cancer risk and screening among men, including barriers and factors influencing access to, use of, and engagement with cancer-related information	Men’s engagement with cancer risk and screening information is shaped by distinct information-seeking patterns, with major barriers including limited awareness, sociocultural norms, and low accessibility of tailored information, resulting in unmet cancer literacy needs and insufficient capacity to actively seek, interpret, and use cancer-related information.
2	Reidy M, Saab MM, Hegarty J, Von Wagner C, O'Mahony M, Murphy M., et al., 2018 [21]	Promoting men's knowledge of cancer risk reduction: A systematic review of interventions	Patient education and counseling doi: 10.1016/j.pec.2018.03.002	Systematic review	Cancer literacy–related educational interventions aimed at addressing knowledge gaps on cancer risk reduction among men, with implications for identifying learning needs and individual capacity-building approaches	Educational interventions aimed at cancer risk reduction among men primarily improve knowledge, but are unevenly adapted to different literacy levels, indicating persistent gaps in addressing cancer literacy needs and building sustainable individual capacities.

3	Papadakos JK, Hasan SM, Barnsley J, Berta W, Fazelzad R, Papadakos CJ, et al., 2018 [22]	Health literacy and cancer self-management behaviors: A scoping review	Cancer doi: 10.1002/cncr.31733	Scoping review	Cancer literacy and health literacy factors influencing patients' understanding, communication, and engagement in cancer care	Health literacy is associated with key cancer self-management behaviours and outcomes, including participation in cancer screening, receipt of prescribed chemotherapy, and risk of postoperative complications
4	Fernández-González L, Bravo-Valenzuela P., 2019 [23]	Effective interventions to improve cancer health literacy	Ecancermedicalscience doi: 10.3332/ecancer.2019.966	Systematic review	Interventions aimed at improving health and cancer literacy among cancer patients, with analysis of their structure, content and effectiveness	Cancer health literacy interventions show potential to improve knowledge and selected skills among cancer patients, but evidence remains heterogeneous, with limited standardisation of approaches and insufficient consideration of diverse literacy needs
5	Sørensen K, Makaroff LE, Myers L, Robinson P, Henning GJ, Gunther CE, et al., 2020 [4]	The call for a strategic framework to improve cancer literacy in Europe	Archives of public health doi: 10.1186/s13690-020-00441-y	Narrative review	Strategic and policy-oriented approaches to advancing cancer literacy and improving communication in the European context	Cancer literacy in Europe remains fragmented and insufficiently integrated into health systems, with a lack of coordinated strategies to address population needs, strengthen capacities, and embed education and training across the cancer continuum

6	Housten AJ, Gunn CM, Paasche-Orlow MK, Basen-Engquist KM., 2021 [24]	Health Literacy Interventions in Cancer: a Systematic Review	Journal of cancer education doi: 10.1007/s13187-020-01915-x	Systematic Review	Analysis and characterization of existing health literacy interventions across the cancer care continuum, including types of interventions, outcomes assessed, and their impact on cancer patients' health literacy indicators from prevention to treatment	Health literacy interventions in cancer care are diverse and unevenly implemented across the cancer continuum, with limited alignment to patients' literacy needs and inconsistent integration of education and training components to build sustained capacities.
7	Holden CE, Wheelwright S, Harle A, Wagland R., 2021 [25]	The role of health literacy in cancer care: A mixed studies systematic review	PloS one doi: 10.1371/journal.pone.0259815	Systematic review	The relationship between cancer health literacy and patients' capacity to navigate information, interact with cancer care services, and effectively engage in treatment and decision-making processes	Cancer health literacy is closely associated with patients' ability to access information, navigate cancer services, and engage in decision-making, while gaps in literacy-related capacities limit effective participation across the cancer care pathway
8	Moore C, Hassett D, Dunne S., 2021 [26]	Health literacy in cancer caregivers: a systematic review	Journal of cancer survivorship:	Systematic review	Analysis of existing studies on health literacy (including eHealth	Cancer caregivers' health literacy varies widely and is associated with their ability to access information,

			research and practice doi: 10.1007/s11764-020-00975-8		literacy) among cancer caregivers, focusing on relationships between caregiver literacy levels, communication styles, information access and support capacities for patient care	communicate with health professionals, and provide effective support, while insufficient literacy capacities contribute to unmet informational and support needs.
9	Westerlinck P, Coucke P., 2021 [27]	Review of interactive digital solutions improving health literacy of personal cancer risks in the general public	International journal of medical informatics doi: 10.1016/j.ijmedinf.2021.104564	Systematic / narrative review of digital solutions	Cancer literacy needs and capacities addressed by interactive digital tools to improve understanding of personal cancer risk and support literacy-oriented learning	Interactive digital tools can support understanding of personal cancer risk and address selected cancer literacy needs, but their accessibility, usability, and alignment with users' literacy capacities remain uneven and insufficiently tailored
10	Bonetti L, Tolotti A, Anderson G, Nania T, Vignaduzzo C, Sari D, et al., 2022 [28]	Nursing interventions to promote patient engagement in cancer care: A systematic review	International journal of nursing studies doi: 10.1016/j.ijnurstu.2022.104289	Systematic review	Nurse-led educational and organisational interventions aimed at strengthening patients' capacity for informed participation, effective communication and navigation in cancer care	Nurse-led interventions contribute to strengthening patients' informational understanding, communication, and engagement in cancer care, yet their integration into structured education and training for sustained cancer literacy capacity remains inconsistent

11	Chang RC, Yen H, Heskett KM, Yen H., 2022 [29]	The Role of Health Literacy in Skin Cancer Preventative Behavior and Implications for Intervention: A Systematic Review	Journal of prevention doi: 10.1007/s10935-024-00795-x	Systematic review	Role of health literacy in shaping skin cancer preventative behaviours and the educational approaches that address literacy needs and capacities for effective prevention	Higher health literacy is generally associated with better skin cancer preventive behaviours (e.g., sun protection and reduced risk exposure), and educational interventions tailored to specific populations can enhance understanding and willingness to adopt prevention practices
12	Christiansen K, Buswell L, Fadelu T., 2023 [30]	A Systematic Review of Patient Education Strategies for Oncology Patients in Low- and Middle-Income Countries	The oncologist doi: 10.1093/oncolo/oyac206	Systematic review	Patient education strategies in oncology in low- and middle-income countries, focusing on teaching methods and delivery approaches that address cancer literacy needs and support capacity to understand and use cancer-related information	Oncology patient education relies on diverse teaching methods, often delivered by nurses and supported by visual and digital tools, but remains heterogeneous and inconsistently evaluated, limiting systematic development of cancer literacy capacities
13	Baccolini V, Isonne C, Salerno C, Giffi M, Migliara G, Mazzalai E, et al.,	The association between adherence to cancer screening	Preventive medicine doi: 10.1016/j.ypme	Systematic review and meta-analysis	The relationship between health literacy levels and participation in cancer screening programmes,	Lower health literacy is consistently associated with reduced participation in cancer screening programmes, with informational

	2022 [31]	programmes and health literacy: A systematic review and meta-analysis	d.2021.106927		with a focus on barriers and facilitators related to health literacy that influence adherence to screening for different types of cancer	barriers, limited understanding, and navigation difficulties contributing to unmet cancer literacy needs in prevention and early detection
14	Buyens G, van Balken M, Oliver K, Price R, Venegoni E, Lawler M, et al., 2023 [32]	Cancer literacy - Informing patients and implementing shared decision making	Journal of cancer policy doi: 10.1016/j.jcpo.2022.100375	Narrative / integrative review	Conceptual approaches to cancer literacy focusing on patient information, capacity for informed choice and engagement in shared decision-making within cancer care pathways	Cancer literacy is central to enabling informed patients and effective shared decision-making, yet gaps in accessible information and insufficient support for building patient capacities limit meaningful engagement across cancer care pathways
15	Zhang Y, Xu P, Sun Q, Baral S, Xi L, Wang D., 2023 [33]	Factors influencing the e-health literacy in cancer patients: a systematic review	Journal of cancer survivorship: research and practice doi: 10.1007/s11764-022-01260-6	Systematic review	Review of factors influencing e-health literacy among cancer patients, including demographic, behavioural and social determinants, and analysis of tools used to assess e-health literacy	eHealth literacy among cancer patients is influenced by multiple demographic, social, and behavioural factors, with limited digital skills and unequal access constraining patients' capacity to effectively use digital information and online educational resources.

16	Münstermann J, Hübner J, Büntzel J., 2023 [34]	Deaf and Hard of Hearing Patients: a Systematic Review	Journal of cancer education doi: 10.1007/s13187-022-02222-3	Systematic review	Effectiveness of cancer education programmes in improving cancer health literacy among deaf and hard of hearing adults, synthesising evidence on knowledge improvement, coping skills, and screening behaviours	Cancer education programmes for deaf and hard of hearing adults can improve cancer-related knowledge and understanding, but limited accessibility, adaptation, and consistency of educational approaches constrain the development of sustainable cancer literacy capacities
17	Ryman C, Warnicke C, Hugosson S, Zakrisson AB, Dahlberg K., 2024 [35]	Health literacy in cancer care: A systematic review	European journal of oncology nursing: the official journal of European Oncology Nursing Society doi: 10.1016/j.ejon.2024.102582	Systematic review	Assessment of health literacy levels among cancer patients and analysis of associations between health literacy and sociodemographic factors influencing access, comprehension and use of health information in the context of cancer care	Health literacy levels among cancer patients vary substantially and are shaped by sociodemographic factors, with lower literacy associated with difficulties in accessing, understanding, and using health information across cancer care
18	Aldin A, Baumeister A, Chakraverty D,	Gender differences in the context of interventions for	The Cochrane database of systematic	Systematic review	Qualitative evidence synthesis of interventions aimed at	Health literacy interventions for migrants reveal gender-specific differences in needs and capacities,

	Monsef I, Noyes J, Kalbe E, et al., 2024 [36]	improving health literacy in migrants: a qualitative evidence synthesis	reviews doi: 10.1002/14651858.CD013302.pub2		improving health literacy in migrants, highlighting literacy-related needs, capacities, and education-oriented strategies that can inform cancer literacy development and training frameworks	indicating that education and training approaches insufficiently tailored to gender and sociocultural contexts limit the effectiveness of cancer-relevant literacy support
19	Sulosaari V, Dodlek N, Brandl A, De Munter J, Eriksen JG, McInally W, et al., 2024 [37]	Interprofessional education in cancer care - a scoping review	BMC medical education doi: 10.1186/s12909-024-05669-8	Scoping review	Interprofessional education in cancer care, mapping the range of existing programmes, competencies and teaching methods, with emphasis on identifying cancer literacy-related educational needs and capacities of healthcare professionals and gaps in training across settings	Existing interprofessional education activities in cancer care are varied and lack consistent conceptual definitions, with considerable variation in competencies targeted and limited systematic focus on literacy-related needs, capacities and comprehensive training frameworks for collaborative practice
20	Olyani S, Peyman N., 2024 [38]	The Health Literacy Programmes and Colorectal Cancer	Journal of Health Literacy doi:	Systematic review	Health literacy education programmes targeting colorectal cancer	Health literacy programmes support colorectal cancer screening and preventive behaviours, particularly

		Prevention: A Systematic Review	10.22038/jhl.2024.76580.1507		prevention and screening, addressing cancer literacy needs and capacity building	when multi-component approaches are used, though gaps remain in systematically addressing broader cancer literacy skills
21	Jeitani C, Van den Broucke S, Leemans C., 2025 [39]	Interventions Addressing Health Literacy in Cancer Care: A Systematic Review of Reviews	International journal of environmental research and public health doi: 10.3390/ijerph22020212	Systematic review	Synthesis of existing systematic reviews on interventions aimed at improving health literacy in cancer care, focusing on key characteristics, effectiveness and gaps in current practice	Existing reviews show that interventions addressing health literacy in cancer care are heterogeneous and unevenly described, with limited standardisation and persistent gaps in aligning education and training approaches to identified cancer literacy needs and capacity-building goals
22	Isonne C, Sinopoli A, Pistollato A, Sciurti A, Iera J, Migliara G., 2025 [40]	Does cancer literacy predict cancer screening intention or uptake? A systematic review	Patient education and counselling doi: 10.1016/j.pec.2025.109346.	Systematic review	Systematic synthesis of evidence on the association between cancer literacy and cancer screening intentions or behaviours, with emphasis on CL-related determinants influencing uptake of screening	Higher levels of cancer literacy are associated with stronger intentions and greater likelihood of participation in cancer screening, while gaps in understanding, information processing, and navigation capacities remain key barriers to screening uptake

23	Sheehan S, Bernués-Caudillo L, de Brún A, Drury A., 2025 [41]	Health Literacy, Self-Management and Patient-Reported Outcomes in Prostate Cancer Survivors: A Mixed Methods Systematic Review	Seminars in oncology nursing doi: 10.1016/j.soncn.2025.152056	Systematic review	Cancer literacy–related needs and individual capacities for self-management among prostate cancer survivors, synthesising evidence on how health literacy influences patients' ability to understand, manage, and navigate post-diagnosis care, with implications for targeted education and training support	Cancer survivors' health literacy is closely linked to their capacity for self-management and navigation of post-diagnosis care, while unmet literacy needs and insufficient educational support constrain effective long-term management
24	Yilihamu G, Aierxiding S., 2025 [6]	Current status of cancer education in developing and developed countries: identifying the disparities and bridging the gap	Frontiers in public health doi: 10.3389/fpubh.2025.1608525	Systematic review	Cancer education practices addressing cancer literacy needs, available capacities, and training approaches across different country contexts, with attention to gaps and disparities in access to	Substantial disparities in cancer education across countries were identified, leading to uneven development of cancer literacy; key gaps include limited access to clear and understandable information, insufficient educational resources, and weakly developed training approaches, constraining both

					understandable, usable cancer information	individual and professional capacities
25	Watts T, Courtier N, Fry S, Gale N, Gillen E, McCutchan G, et al., 2025 [42]	Access, acceptance and adherence to cancer prehabilitation: a mixed-methods systematic review	Journal of cancer survivorship: research and practice doi: 10.1007/s11764-024-01605-3	Systematic review	Cancer literacy–related needs and capacities influencing access, acceptance, and adherence to cancer prehabilitation, highlighting individual and structural barriers and interpersonal support	Facilitators and barriers to engagement with cancer prehabilitation exist at both individual and structural levels, with interpersonal connections and support networks shaping access and acceptance, and limited research addressing health literacy as a specific barrier for socioeconomically deprived groups
26	Si G, Prue G, Craig S, Anderson T, Mitchell G., 2025 [43]	Digital Serious Games for Cancer Education and Behavioural Change: A Scoping Review of Evidence Across Patients, Professionals, and the Public	Cancers (Basel) doi: 10.3390/cancers17203368	Scoping review	Cancer literacy–related needs and capacities in cancer care and prevention, focusing on educational and information strategies to improve understanding and informed decision-making	Serious games can support cancer literacy, especially among younger digital populations, but evidence is limited by small-scale, heterogeneous studies and weak integration into formal education
27	Papadakos J, Durocher-Allen L, Devitt D, Krames L,	A Systematic Review on the Effective Teaching	Journal of cancer education	Systematic review	Educational approaches addressing cancer literacy needs and	Individual and group teaching, especially when combined in multi-modality approaches, improve

	Lawrie K, Pocrnic N, et al., 2025 [44]	Strategies and Methods for Cancer Patient Education	doi: 10.1007/s13187-025-02732-w		capacity development, with attention to how structured learning formats support understanding, engagement, and informed participation in cancer-related decisions	cancer-related knowledge and support learners' capacity to make informed health decisions; tailored materials and digital tools are effective across different contexts
28	Cerqueira F, Ferreira MC, Campos MJ, Fernandes CS., 2025 [45]	Empowering Cancer Patients: A Scoping Review on Gamified Approaches To Health Literacy for Self-Care	Journal of medical systems doi: 10.1007/s10916-025-02241-9	Scoping review	Digital health–related cancer literacy needs and capacities, with attention to how digital tools and systems support understanding, information use, and engagement in cancer-related health decisions	Gamified digital interventions in oncology most commonly use avatars, rewards, social interaction, quizzes, and personalized feedback, targeting health literacy, patient education, symptom monitoring, and adherence; while their use is expanding and promising for supporting self-care, evidence on effectiveness across populations and settings remains limited

Table 3. Review-type publications included in the analysis (systematic, scoping, narrative and other reviews; n=28)

Some reviews were conducted by authors based outside Europe and addressed broader geographical contexts; however, they were included as they synthesized global literature and covered evidence from European countries and consortium members.

Distribution of sources by country and geographical scope

The analysis of the geographical representation of peer-reviewed scientific sources showed (Table 4) that the majority of publications had a multi-country or pan-European focus (66.2%).

Among publications with a clearly defined single-country focus, Portugal - n=15 (11.3%), Romania - n=9 (6.8%), Italy - n=6 (4.5%) were the most frequently represented countries. Other consortium countries were represented in the English-language literature exclusively within multi-country studies, for example [46 - 58].

Geographical coverage	n	%
Multi-country (Europe / international)	88	66.2
Single-country publications	40	30.1
Other international or institutional scope*	5	3.8
Total	**133**	**100.0**

Table 4. Distribution of peer-reviewed scientific sources by geographical scope (n = 133)

** Includes international non-EU–specific, institutional, EU single-country framed, and not explicitly specified geographical scopes*

The number of publications with a clearly defined focus on a single country (identified in the scoping review single-country publications) amounted to 40 sources. The distribution of single-country publications by country is presented in Figure 2. These included studies focusing on Portugal [59 - 73]; Romania [74 - 81]; Italy [82 - 87]; Ireland [88 - 92]; Belgium [48, 93 - 95].

At the same time, the scoping review identified very limited English-language peer-reviewed evidence with an exclusively national focus for Bulgaria, Montenegro, Ukraine [96], and Moldova. Overall, these countries were predominantly represented within multi-country or pan-European studies, indicating a limited availability of English-language peer-reviewed publications addressing country-specific contexts of cancer literacy development.

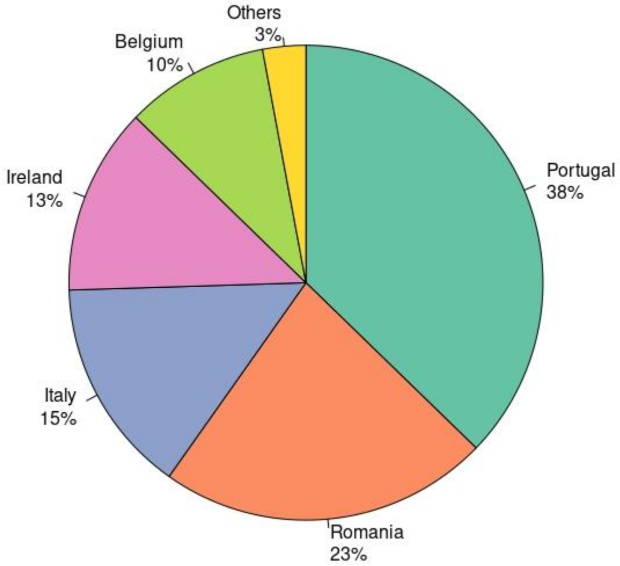

Figure 2. Distribution of English-language single-country publications identified in the scoping review, by country (n=39)

Target groups covered

The analysis of target groups addressed by the publications included in the review (Table 5) showed a predominant focus on the study of cancer literacy among the population: either among individuals who do not yet have oncological conditions namely the general population and healthcare system users (nearly 50%) or among populations that have already transitioned into the category of cancer patients (nearly 40%).

A positive aspect is the researchers' intention to cover broad population-based approaches to the development and assessment of cancer literacy, while a negative aspect is the shift of focus away from other tangential target groups.

Specific social and demographic population groups were reported separately, including migrants, older adults, adolescents, young adults, men, women at increased risk (including those aged 50 - 69 years and under-screened women in this age group), people from racial minority groups, outdoor workers, and university students. This fragmented representation may indicate that existing studies tend to address selected dimensions of inequalities in cancer literacy coverage particularly those related to age, sex/gender, socioeconomic status, and race/ethnicity. Overall, HL/CL levels vary and are associated with sociodemographic factors, and culturally and gender-sensitive approaches are needed for migrants and other vulnerable groups. An assessment of publications by equity focus showed that equity-related aspects of cancer literacy were addressed in the majority (67.7%) of publications [35, 36].

№	Aggregated target group	Included codes (aggregation)	Count (n)	Share, %
1	General population and healthcare system users	general population; general population adults; healthcare system users	63	47.4
2	Cancer patients and cancer survivors	cancer patients; cancer survivors; pediatric cancer patients; older cancer patients; skin cancer patients; prostate cancer patients; HNSCC patients and caregivers (patients)	52	39.1
3	Socially and demographically specific population groups	migrants; older adults; adolescents; young adults; adult men; women at risk; women 50 - 69; underserved women 50 - 69; black men; outdoor workers; university students	14	10.5
4	Patients and caregivers (mixed groups)	patients and caregivers; multiple population subgroups; HNSCC* patients and caregivers (caregivers)	3	2.3
5	Healthcare professionals and healthcare workforce	healthcare professionals; physicians; healthcare workforce	3	2.3
	Total		**133**	**100.0**

Table 5. Aggregated target groups of included publications (n=133)

** HNSCC (Head and Neck Squamous Cell Carcinoma)*

Healthcare professionals (HCPs) and patient caregivers, as distinct target groups, were represented to a much lesser extent. This may indicate limited attention to professional communities and informal caregivers, despite their potentially key role in improving cancer literacy and reducing inequalities in access to information and educational services.

A detailed assessment of the reviews included in the study (Table 3) showed that the existing educational activities for HCPs are uneven and highly variable, with a lack of agreed definitions and substantial differences in the scope and content of competencies (Sulosaari et al., 2024). At the same time, gaps in structured training approaches for HCPs were identified, which makes it difficult to develop consistent and reproducible training models [37].

Programmes aimed at improving patients' cancer literacy are often delivered by nurses (30). The systematic review of nurse-led educational and organisational interventions

(Bonetti et al., 2022) indicates the potential of these interventions to improve patient knowledge, communication, and engagement, while also highlighting the inconsistent integration of such approaches into existing education and training pathways [38].

Overall, the target-group descriptions reported in the literature indicate a predominance of population- and patient-oriented approaches, alongside gaps in research focused on healthcare professionals.

Identified cancer literacy needs

The most frequently identified cancer literacy needs (Table 6) are related to prevention/risk factors and behavioural determinants (16.5%), screening and testing (11.3%), as well as navigation of the cancer care system and digital cancer literacy (10.5% in both domains). A distinct cluster comprised needs associated with early detection (9.8%) and with treatment/follow-up, overall low HL/CL, and decision-making and risk interpretation (each 9.0%).

Thematic group (Illustrative sources)	Expanded description of cancer literacy needs	n	%
Prevention, risk factors & lifestyle (20) (39) (54) (55) (62) (79) (81) (97) (98) (99)	Limited prevention knowledge; low awareness of modifiable risk factors; misconceptions about prevention; insufficient knowledge of preventive behaviours (e.g., sun/UV exposure); low lifestyle literacy; low risk awareness linked to behaviour change gaps.	22	16.5
Screening & testing literacy [31, 75, 82–85, 100–103]	Low awareness of screening/testing; misunderstanding screening purpose, invitations, and follow-up steps; limited understanding of screening benefits and harms; misconceptions about screening effectiveness; low uptake related to limited literacy and decisional conflict.	15	11.3
Health-system navigation & care pathways [23, 64, 71, 77, 104–108]	Difficulties navigating services and pathways; uncertainty about where to go and what happens next; poor understanding of referral routes and access points; barriers in moving through cancer care pathways; system navigation challenges across stages.	14	10.5
Digital cancer literacy & online information [57,	Low digital cancer literacy; limited ability to find, appraise, and use online cancer information; insufficient accessible online health	14	10.5

109–111]	information; information-related digital barriers that reduce empowerment and engagement.		
Early signs, symptoms & early detection [112–115]	Limited knowledge/recognition of early warning signs and symptoms; uneven awareness of early cancer signs; delayed presentation linked to low symptom recognition; low awareness of early signs contributing to delayed diagnosis.	13	9.8
Diagnosis, treatment, prognosis & follow-up (self-management) [49, 76, 92, 116–117]	Limited understanding of diagnostic and treatment information; difficulties understanding treatment options; misunderstanding prognosis and follow-up; low comprehension of treatment risks/benefits; gaps in long-term self-management, adherence, and follow-up literacy.	12	9.0
General low health/cancer literacy & inequalities [31, 65, 92, 109, 118]	High prevalence of limited health literacy; broad difficulties understanding cancer information; links to poorer quality of life and care experience; socioeconomic gradients and vulnerable groups; basic cancer knowledge gaps beyond a single stage.	12	9.0
Decision-making, numeracy & risk–benefit interpretation [85, 89, 119–120]	Challenges engaging in shared decision-making; difficulty interpreting risks and benefits; numeracy/risk interpretation issues; preference-sensitive decisions; limited understanding of benefits and harms driving decisional conflict.	12	9.0
Information overload & processing difficulties [53, 121–124]	Information overload; difficulty processing complex cancer information; emotional overload/distress affecting comprehension; difficulties interpreting messages under stress; barriers to making sense of complex care information.	9	6.8
Communication, language & cultural barriers [45, 64, 125]	Language and cultural barriers to cancer information; limited patient-centred communication skills/training; communication barriers that reduce comprehension, engagement, and decision-making; inconsistent messaging between sources/providers.	6	4.5
Measurement	Lack of validated tools to assess cancer	2	1.5

tools & integration into outcomes [52, 63]	literacy; limited integration of health literacy considerations into PROM use and routine outcome measurement (measurement gaps affecting implementation).		
Misinformation, vaccine literacy & trust-related gaps [51, 87]	Misinformation affecting prevention/screening; low vaccine literacy and hesitancy; misunderstanding driven by unreliable information; trust-related barriers that limit uptake of preventive measures.	2	1.5

Table 6. Cancer literacy needs across included sources: thematic clusters and expanded description (n=133)

Notes: HL – health literacy; CL – cancer literacy; PROM(s) – patient-reported outcome measure(s); QoL – quality of life; CPD – continuing professional development; HCP(s) – healthcare professional(s); SDM – shared decision-making; UV – ultraviolet

At the prevention and risk-reduction stage, the most important needs are related to increasing awareness and providing accessible, tailored messages that take sociocultural barriers into account [20, 21]. There are also needs for a better understanding of screening procedures and their implications, for overcoming barriers to processing information, and for strengthening navigation skills, as lower HL/CL is associated with reduced participation/adherence to screening programmes and weaker screening intentions [31, 40]. Within diagnosis and treatment, key needs include access to understandable information and patient support to enable meaningful participation in shared decision-making related to cancer literacy [49]. Limited digital skills reduce the ability to use online resources effectively; digital tools and gamified approaches are expected to enhance understanding and motivation related to CL, although their impact and integration are uneven [33]. In the long-term follow-up context, needs to self-management and navigation-related needs are important, as unmet literacy needs constrain effective long-term condition management [41].

In the study by Nicoară D., Cristescu C., Pop I.C., et al. (2025) [79], family physicians reported moderate familiarity with personalized cancer prevention and highlighted a strong need for further training, preferably delivered in flexible, interactive formats.

At the system level, the literature highlights the need for more coherent, standardised, and multi-level approaches to HL/CL (including professional training and interprofessional education), as existing interventions and educational practices are described inconsistently and cancer literacy remains only fragmentarily integrated into health systems [4, 37, 39].

Jeitani C., Van den Broucke S. & Leemans C. (2025) [39] emphasize the need to shift the view of HL as solely a patient responsibility, since effective interventions often require the active involvement of healthcare professionals. They also highlight that effective health/cancer literacy interventions should apply multi-level, mixed-method approaches that simultaneously address patients, the environment, healthcare professionals, and organizations.

The reviewed literature conceptualizes cancer literacy as a multidimensional construct encompassing four core information-processing dimensions: accessing, understanding, appraising, and applying health information across different analytical levels [126]. Within the cancer prevention and disease-related contexts, unmet needs are consistently identified in relation to limited access to information on risk factors, difficulties in understanding and interpreting cancer-related information, and constrained ability to make informed decisions [126].

At the individual level, inadequate cancer literacy and ineffective communication are associated with increased risks of errors, reduced quality of care, and threats to patient safety [127].

Across studies, cancer literacy needs are further shaped by enabling and constraining factors clustered around emotional (e.g. fear, motivation), social and individual beliefs, stigma, financial barriers, and levels of trust in the health system, which influence engagement with prevention, care, and navigation across the cancer continuum [128].

Identified cancer literacy capacities

When mapping capacities for HL and CL, different analytical approaches are applied. Within the European cancer literacy framework, improvement is conceptualised as a multi-level process, encompassing the system level, organisational level, healthcare professional level, and patient level [4, 39]. At the level of patients and the general population, local communities often play a substantial role [129 - 130].

Organisational health literacy has been particularly actively addressed in the United States, notably within the existing Healthy People 2030 programme, where overall health literacy is defined as the combined result of personal and organisational health literacy [131 - 132]. Ten core attributes of a health literate health care organization are commonly identified:

- leadership, which makes health literacy integral to mission, structure, and operations;
- planning and evaluation, integrating health literacy into planning processes, performance measures, patient safety, and quality improvement;
- workforce development, including training and monitoring progress;
- co-design, involving served populations in the design, implementation, and evaluation of services;
- inclusivity, addressing diverse literacy needs without stigmatization;
- communication, applying health literacy strategies and confirming understanding at all points of contact;

- access and navigation, ensuring easy access to information and navigation support; content development, producing clear print, audiovisual, and social media materials;
- management of high-risk situations, including care transitions and medication communication;
- and coverage and costs, clearly explaining service coverage and out-of-pocket payments [133 - 135].

The implementation of health literacy at the system level requires its prioritisation as a managerial mission and strategic direction, supported by clearly defined coordination mechanisms and expected quality standards. Central to this process is the systematic removal of barriers along patient pathways and the integration of health literacy as a core component of health equity, taking into account cultural, social, and group-specific differences associated with inequality. The development of evidence-based health literacy policies, alignment of research with policy needs, and regular evaluation of policy initiatives are essential. Particular importance is attached to targeted incentives and funding for relevant system-level solutions. The integration of health literacy into education and training programmes at all levels should be regarded as a long-term investment in the population-level capacities of the health system [136 - 138].

A common approach is to group capacities into capacity-building domains: knowledge development, workforce development, organizational/institutional capacity, partnerships, resources, and leadership/governance [139].

Sørensen K. et al. (2021) describe health system capacity using an eight-domain framework across micro-, meso-, and macro-levels: health literate workforce; health literate organization; health literacy data governance; people-centred services/environments (user engagement); health literacy leadership; investments/financial resources; technology & innovation informed by HL; partnerships & inter-sectoral collaboration [140].

We used this approach to structure the data generated in the study (Table 7).

At the micro level, capacities related to interaction practices and decision support in clinical communication predominate (18.8%), reflecting the presence of individual professional practices and approaches to shared medical decision-making. At the meso level, such capacities are recorded much less frequently, which may indicate limited institutional formalisation of workforce training. At the macro level, this domain is almost not represented in the form of policies or programmes [80, 112, 141].

The most prominent domain, with the main share concentrated at the meso level, is Service delivery & environments (27.8%), reflecting the presence of organisational/service mechanisms (navigation, support services, and structured elements of care pathways). At the micro level, fewer practices are observed (5.3%), mainly related to navigation support and patient interaction. At the macro level, some system-level elements are present, but they constitute a small share compared with the organisational level [41, 51, 142].

Action area	**System level,** (n)			**Total**	
	Micro, (interaction level practices)	**Meso** (organisations, services, programmes)	**Macro** (policy, strategy, population level)	n	%
Workforce	25	1	0	26	19.5
Service delivery & navigation	7	37	3	47	35.3
Outreach & campaigns	1	0	26	27	20.3
Technology (digital/eHealth)	0	18	0	18	13.5
Partnerships	0	2	1	3	2.3
Governance & leadership	0	1	3	4	3.0
Data & measurement	1	3	0	4	3.0
Resources	0	2	1	3	2.3
Not specified	1	0	0	1	0.8
Total, (n)	**35**	**64**	**34**	**133**	**100,0**
%	**26.3**	**48.1**	**25.6**		

Table 7. Distribution of identified cancer literacy capacities by system level and action area (n=133)

Communication-related capacity in the sample is described predominantly at the macro level (19.5%) through campaigns, media communication, and public information initiatives. Such elements are scarcely represented at the micro level and are absent at the meso level, indicating that public communication is concentrated more at the level of programmes/policies than within organisational practices [39–40, 143].

Digital platforms and tools are almost entirely concentrated at the meso level (13.5%), i.e., they are described as organisational solutions/services (online platforms, tools, and digital components of programmes). At the micro and macro levels, this domain is not reflected in our sample, suggesting that digital capacities are more often documented as infrastructural/programmatic elements rather than as individual practices or policy frameworks [111, 144–145].

Partnerships & collaboration are represented to a limited extent and mainly at the meso level, reflecting collaboration with patient and community organisations or inter-organisational interactions. At the macro level, only an isolated system-level component of partnerships is mentioned, while at the micro level they are not presented. Overall, this domain appears less elaborated than service delivery or communication capacities [110, 122, 146].

Governance and leadership elements are more strongly reflected at the macro level (2.3%) as policy/strategic frameworks and system-level approaches. Only isolated organisational manifestations are recorded at the meso level, and this domain is absent at the micro level, which is consistent with governance being a structural system capacity [28, 66, 77].

Measurement and assessment tools are described predominantly at the meso level (2.3%), corresponding to the implementation and use of instruments within organisational processes (questionnaires, PROM frameworks, and assessment tools). Only isolated mentions occur at the micro level, and this domain is not represented at the macro level [35, 52, 112].

Resources & investment capacity appears rarely and mainly at the meso level (1.5%), reflecting organisational aspects of resources (time, administrative workload, and availability/access) [25, 124, 142].

As discrete elements, capacities identified most frequently included: awareness campaigns [100, 143], clinician-led decision support [80, 141], primary care coordination [94, 108], clinician–patient communication practices [112, 147], online health information platforms [144–145], and organised screening programmes [148–149]. This highlights that digital channels and screening infrastructure are most frequently described in the reviewed literature as key capacity elements.

Identified cancer literacy education / training programmes, cancer literacy gaps and best practices

Among the 133 sources included in the scoping review, 15 (11.3%) were initially identified as programme-based. Following additional verification and full-text assessment, 9 sources (6.8% of the total) met the predefined search and inclusion criteria and were exclusively focused on education or training programmes in the field of cancer literacy (Table 8).

The scoping review demonstrated that the number of English-language scientific publications explicitly devoted to implemented education or training programmes in the field of cancer literacy is extremely limited. Despite the wide availability of studies focusing on needs assessments, barriers, literacy levels, or the development of conceptual frameworks and protocols for future interventions, only a small proportion of the literature describes actually implemented and structured education or training programmes. In addition, the analysis showed that publications addressing education or training programmes in cancer literacy are often concentrated around a limited number of authors or research groups that consistently develop and report on related approaches and interventions [48, 62, 150, 151].

Nº	Author(s), title	Year	Country	Source type	Target group	Type of training	Cancer continuum stage
1	Barros A, Santos H, Moreira L, Ribeiro N, Silva L, Santos-Silva F. The Cancer, Educate to Prevent Model-the Potential of School Environment for Primary Prevention of Cancer [112]	2016	Portugal	Empirical programme / intervention study with educational implementation	School teachers, school students	School-based cancer education and teacher training programme (Cancer, Educate to Prevent Model)	Primary prevention
2	Li M, Devane D, Beecher C, et al. Prioritising Key Concepts for informed health choices in cancer: An evidence-based online educational programme [150]	2024	Ireland	Empirical programme development	People impacted by cancer (patients, survivors, caregivers)	Online evidence-based cancer literacy education programme (Informed Health Choices-Cancer, IHC-C)	Information/critical appraisal across the cancer continuum
3	Li M, Devane D, Beecher C, et al. Developing critical thinking and decision-making skills for cancer information: the Informed Health Choice-Cancer online learning resource [151]	2025	Ireland	Programme development study	People impacted by cancer (patients, survivors, caregivers)	Online evidence-based cancer literacy education programme (Informed Health Choices-Cancer, IHC-C)	Across the continuum (information appraisal and informed decision-making)
4	Ferreira RB, Simões J, Ferreira ME. Effectiveness of Educational Practices in University Students' Knowledge about Sun Protection	2020	Portugal	Empirical study (educational intervention / exploratory	University students	Educational intervention / curricular educational practices	Primary prevention (skin cancer risk reduction)

	and Its Relation to Sunlight Exposure: An Exploratory Study in a Portuguese Higher Education Institution [62]			evaluation)			
5	Ferrari A, Van Bos L, Talboom S, et al. From barriers to participation: co-creating an effective reminder letter for breast cancer screening among underserved women in Flanders [48]	2022	Belgium, Italy	Empirical co-creation intervention (communication development study)	Underserved women aged 50–69	Programme-based tailored reminder letter development (educational/communication intervention)	Screening
6	Cerqueira F, Ferreira RB, Simões J, Ferreira ME. PocketOnco®: Prototyping a mobile app for health literacy and self-management of oncological diseases [66]	2021	Portugal	Empirical development & pilot evaluation study of a mobile health literacy app	Patients with oncological diseases (with healthcare professional input)	Digital educational intervention (PocketOnco® mobile app for health literacy & self-management)	Treatment / survivorship / self-management focus
7	Passardi A, Rizzo M, Maines F, Tondini C, Zambelli A, Vespignani R, et al. Optimisation and validation of a remote monitoring system (Onco-TreC) for home-based management of oral anticancer therapies: an Italian multicentre feasibility study [116]	2022	Italy	Empirical feasibility intervention study	Cancer patients on oral anticancer therapy	Programme-based eHealth intervention (Onco-TreC remote monitoring system with training/validation)	Treatment / self-management support.

8	Westerlinck P, Coucke P, Albert A. Development of a cancer risk model and mobile health application to inform the public about cancer risks and risk factors [108]	2024	Belgium	Empirical development & evaluation study	General public (users of mobile app)	Mobile health educational intervention	Prevention / cancer risk literacy
9	Westerlinck P, Maes N, Coucke P. Assessing the Effect of a Mobile Application on Cancer Risk Health Literacy: A Cross-Sectional Study Design [100]	2025	Belgium	Empirical evaluation study	Oncology patients/family members (users of CRC app)	Mobile health educational intervention (impact evaluation)	Prevention / cancer risk literacy

Table 8. Identified programme-based education and training interventions addressing cancer literature (n=133)

Notes: CRC – colorectal cancer; HL – health literacy; IHC-C – Informed Health Choices-Cancer; mHealth – mobile health

The majority of the identified programmes are concentrated in a small number of countries and are implemented within isolated research initiatives, indicating a lack of systematic and scalable approaches to the implementation and scientific reporting of cancer literacy programmes.

For the vast majority of sources included in the scoping review, the type of training or educational intervention was not clearly defined or formalised (88.7%), reflecting the predominance of publications that cannot be assigned to a specific training or education format. Among the sources in which a training type was identified, campaign-based approaches were the most frequently reported (2 sources; 1.5%). All other training formats were represented only by single instances and included continuing professional development (CPD), formal education, patient-oriented interventions (including decision aids and digital tools), psychosocial education, tailored communication, educational initiatives for specific professional groups, as well as assessment tools and digital training for healthcare professionals.

The analysis of the focus of education and training programmes and the overall pool of publications included in the scoping review showed (Figure 3) that interventions targeting prevention and early stages of care – namely prevention, screening, and their combination predominate across the cancer continuum (51.9%). Programmes focused on the treatment stage are moderately represented (32.3%), while interventions addressing survivorship account for 12.0%, and programmes covering the entire cancer continuum remain rare (1.5%).

The following groups of gaps in cancer literacy education and training programmes can be identified.

1. Gaps related to the availability and scale of programmes:

- An extremely limited number of education and training programmes that have been actually implemented and reported in the scientific literature, despite the large volume of studies addressing needs, barriers, and conceptual frameworks [23–24, 39];
- The predominance of fragmented, one time, or pilot interventions, with little evidence of scaling up or long-term implementation [6, 140];
- The concentration of programmes within a narrow group of authors or research teams, without broader institutional or system-level integration [140, 150–151];

2. Gaps related to programme design and training formats:

- The lack of clearly formalised training types and standardised educational formats, limiting comparability across programmes and the accumulation of robust evidence [24, 37, 39];
- Insufficient evaluation of programme effectiveness and the absence of harmonised outcome measures linked to cancer literacy capacities [23, 30, 39];

3. Gaps related to the substantive focus of programmes:

- A predominant focus on prevention and screening, with limited coverage of survivorship, self-management, and transitional navigation across care pathways [25, 41, 44];
- Limited integration of education and training programmes across the full cancer continuum, with emphasis on discrete stages rather than coherent care trajectories [24, 49, 140];
- A limited number of programmes explicitly targeting skills for critical assessment of information and informed decision-making, beyond general awareness-raising [21, 49, 150];

4. Gaps related to target groups and the equity dimension:

- Insufficient adaptation of programmes to different literacy levels, digital skills, and sociocultural contexts, constraining effectiveness for vulnerable and specific population groups [26, 33–34, 36];
- Uneven involvement of healthcare professionals in structured, literacy-oriented training programmes, despite their recognised central role and the importance of multidisciplinary teams [28, 35, 37].

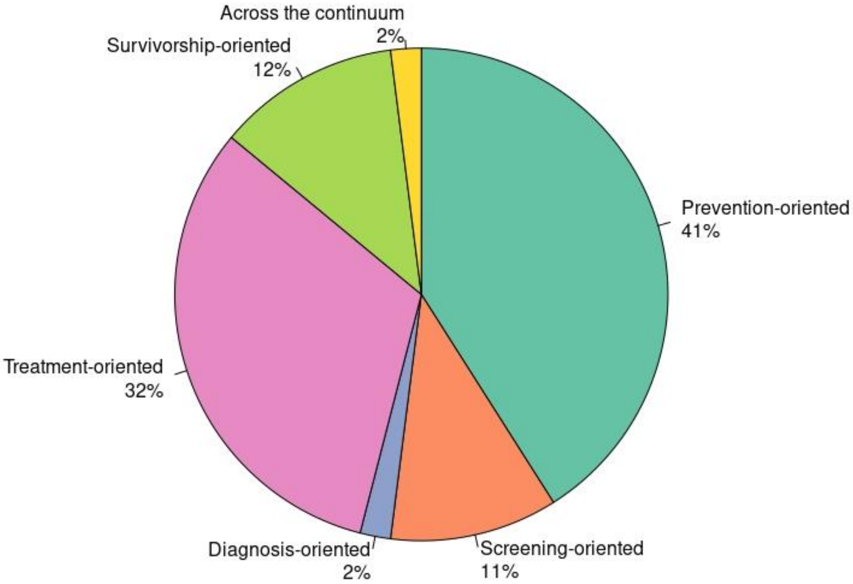

Figure 3. Distribution of education and training programmes across the cancer continuum (n=133)

At the level of reviews, interventions addressing health literacy in cancer care are characterised by substantial heterogeneity and a low level of standardisation, alongside persistent gaps in aligning educational approaches with identified needs and capacity-building objectives [39]. Analytical findings consistently point to deficits in knowledge, skills, and access to education and training, particularly among primary care physicians, oncologists, nurses, pharmacists, medical students, as well as patients and informal caregivers.

Evidence related to HCPs remains fragmented. Most training initiatives focus on communication skills and basic patient education, while systematic, institutionally embedded approaches to cancer literacy development are rare [49]. Studies frequently prioritise tools and delivery formats rather than clearly defined profession-specific competencies or educational pathways for distinct professional groups [124].

Some empirical programmes, particularly online resources targeting critical thinking and informed decision-making in relation to cancer information, demonstrate the potential of human-centred design and pilot testing approaches [151]. However, these initiatives largely remain local or experimental and are not integrated into formal education, continuing professional development, or broader system-level strategies.

In addition, cancer literacy education programmes are commonly described through their tools and formats rather than a focus on specific professional groups, with healthcare professionals treated as one of several target audiences. For example, a scoping review on digital serious games highlights the potential of game-based solutions to support cancer literacy across patients, professionals, and the general public, while also emphasising the limited strength of the evidence and the insufficient integration of such tools into structured education and training approaches [43].

Within the scoping review of the scientific literature, a limited number of programmes demonstrating characteristics of best practices share several key features:

- they are clearly structured and based on well-defined training formats, enabling comparison across approaches and assessment of effectiveness [112, 150];
- they focus on the development of practical skills, including critical thinking, information appraisal, and informed decision-making, rather than solely on awareness-raising [150, 151];
- they integrate digital and online formats, enhancing accessibility and supporting sustained learning [66, 108];
- they incorporate co-creation with target groups and multidisciplinary teams, strengthening the relevance and impact of interventions [48];
- they demonstrate integration with clinical and social contexts, supporting education for patients, caregivers, and professional groups across the cancer care continuum [62, 116].

A systematic review of effective teaching strategies and methods for cancer patient education indicates that best practices in cancer literacy are based on the combination of individual and group learning formats, the use of multimodal educational approaches (verbal explanations, written materials, audiovisual and digital resources), and the adaptation of educational content to the needs, context, and literacy levels of target groups. Such approaches are associated not only with improved knowledge outcomes but also with greater engagement, self-efficacy, and psychological well-being among patients, underscoring the importance of people-centred, flexible, and integrated educational strategies as key components of effective cancer literacy programmes [44].

The effectiveness of cancer literacy programmes increases when a multiplier (train-the-trainer) approach is applied, which involves training key professional and societal groups capable of disseminating knowledge and practical skills within their professional environments and communities. In reviews on health literacy and cancer literacy, this approach is conceptualised as a mechanism for enhancing scalability, sustainability, and the integration of educational interventions into routine healthcare and educational practice by leveraging existing institutional structures and roles [4, 24, 39, 152].

The integration of multiplier training into national and regional cancer literacy strategies is primarily envisaged through continuing professional development systems for healthcare professionals and through the formal education system, thereby ensuring both sustainability and broad coverage of preventive interventions [39, 152].

Review evidence indicates that the level of cancer literacy among healthcare professionals plays a mediating role between patients' socio-demographic characteristics and their behaviours related to prevention, screening, and healthcare utilisation. Training clinicians in risk communication, information provision on screening programmes, and patient navigation within healthcare systems is associated with higher levels of patient cancer literacy and increased participation in early detection programmes. In this context, continuing education of healthcare professionals is regarded not only as professional development, but also as a population-level lever influencing behavioural outcomes and the effectiveness of preventive interventions [24, 35, 39].

In parallel, educational interventions targeting teachers demonstrate considerable potential for long-term primary prevention. School-based and teacher-oriented cancer awareness programmes described in the literature are associated with increased cancer literacy among educators and enhanced capacity to deliver preventive and educational activities to students. The use of formal educational infrastructure is therefore considered an effective pathway for systematically integrating cancer literacy elements into the formation of health-promoting behaviours from an early age [152, 153].

Digital and blended learning formats, including gamified interventions, also play a distinct role. Findings from scoping and systematic reviews point to positive effects of such approaches on awareness, self-care, and patient engagement, including among individuals with lower levels of digital health literacy. At the same time, the effectiveness of digital solutions is strongly influenced by usability, cultural adaptation, and their combination with support from trained professionals, which is consistent with the logic of multiplier-based training models [44, 45].

The limited number of scientific publications addressing education and training programmes in cancer literacy may be partly explained by the specific characteristics of scientific and educational–methodological practices in Eastern European countries. In these settings, the development and implementation of training programmes have traditionally been conducted within the framework of educational–methodological activities, which focus on the creation of educational products and their practical piloting, including post-implementation effectiveness assessment, rather than on publishing results in international English-language scientific journals.

Such materials are typically produced in national languages, as education and training programmes are primarily designed to address the internal needs of national health systems and workforce development. Consequently, their visibility in international bibliographic databases remains limited, which contributes to the relatively small number of English-language sources identified during the scoping review.

This context justifies the need for subsequent stages of the analysis, focusing on policy documents, grey literature, and national programmes, in order to more comprehensively capture education and training initiatives related to cancer literacy across consortium countries.

Summary Box 1. Key findings from the scoping review

- A total of 133 peer-reviewed scientific sources were included in the scoping review, the majority of which demonstrated a high or moderate level of analytical relevance. The evidence base predominantly consists of empirical studies and review publications focused on the identification of cancer literacy needs, barriers, and conceptual approaches.
- The majority of studies focus on the general population and patients, whereas healthcare professionals and informal caregivers are represented to a much lesser extent. This indicates limited attention to professional communities as key carriers and providers of cancer literacy.
- The most frequently identified cancer literacy needs related to prevention and risk factors, screening, navigation within healthcare systems, digital cancer literacy, early detection, decision-making, and risk interpretation, confirming the multimodal nature of cancer literacy across the entire cancer continuum.
- The capacities described in the literature are predominantly represented at the micro- and meso-levels and relate to clinical communication, navigational support, organisational services, and digital tools. In contrast, macro-level capacities including governance, leadership, policies, and resources are addressed only fragmentarily.

- The number of scientific publications describing actually implemented and structured cancer literacy education programmes is extremely limited. Most identified programmes have a pilot or project-based nature, are concentrated in a limited number of countries, and do not demonstrate systemic scalability or institutional integration.
- Overall, the results of the scoping review indicate a substantial imbalance between well-documented cancer literacy needs and the limited availability of formalised educational responses. This creates an analytical basis for further examination of programmes, capacities, and contextual factors beyond the scope of peer-reviewed scientific literature.

2. Results of the assessment of grey literature, international strategic documents and platforms relevant to cancer literacy (Policy, platforms & grey literature analysis)

In addition to peer-reviewed scientific literature, a targeted analysis of international policy documents, institutional reports and official online platforms related to cancer literacy and health literacy, as well as capacity-building initiatives in primary cancer prevention systems, was conducted.

Global policy frameworks on cancer literacy

At the global level, cancer literacy is institutionally embedded within the policies and programme frameworks of the WHO, primarily in the context of health literacy development, people-centred care and non-communicable disease (NCD) control. WHO defines health literacy as the ability to access, understand, appraise and apply information necessary to make decisions concerning health, which also serves as the conceptual foundation for cancer literacy [3].

WHO integrates health literacy approaches into broader NCD control strategies, emphasising their role in prevention, timely health-seeking behaviour and the reduction of inequalities in access to health services [154 - 157].

Several global cancer-specific WHO strategies, including the Global Strategy to Accelerate the Elimination of Cervical Cancer, explicitly incorporate components related to public information, population education and patient participation in decision-making as essential conditions for the effective implementation of vaccination, screening and treatment programmes [158].

Overall, at the global level, cancer literacy is systematically integrated into WHO frameworks on cancer control, NCD prevention and health literacy, functioning as a key operational tool for implementing people-centred and equity-oriented approaches in public health.

At the European level, cancer literacy is embedded within major strategic frameworks, notably Europe’s Beating Cancer Plan [159] and the EU Cancer Mission [160]. A key normative and educational foundation of these initiatives is the European Code Against Cancer 5-th edition (ECAC-5) [161, 162], which serves as a consolidated evidence-based instrument for informing the population about cancer risk factors, prevention and early detection. Within these policies and programmes, particular emphasis is placed on raising public awareness, supporting informed decision-making, empowering patients and strengthening effective communication across all stages of the cancer continuum. Although the term cancer literacy is not always explicitly formalised, educational, communication-oriented and workforce-related approaches are consistently recognised as essential prerequisites for effective cancer prevention [161 - 164].

Within the World Code Against Cancer Framework, developed under the auspices of the International Agency for Research on Cancer and the World Health Organization, cancer literacy is defined as an integrated concept encompassing knowledge of cancer risk factors and prevention, awareness of individual risk, health-related attitudes, motivation and self-efficacy required to understand and practically apply health system recommendations. Within this framework, cancer literacy is understood not merely as a level of awareness, but as a set of cognitive and behavioural components that support informed decision-making and facilitate behavioural change, particularly in the domains of cancer prevention and early detection [1].

International platforms and institutional capacity-building initiatives

Within the same World Code Against Cancer Framework, coordinated by the International Agency for Research on Cancer in collaboration with the World Health Organization, the multimodal online resource Cancer Prevention Europe (CPE) Learning Programme was launched (Table 9). The platform is hosted on the IARC Learning portal and is designed to support the systematic dissemination of knowledge on cancer prevention and early detection in line with the recommendations of the European Code Against Cancer [165].

The training programme follows a self-paced online learning format and targets a broad professional audience, including public health professionals, healthcare workers, health promoters, managers of prevention programmes, researchers, as well as students in medical and social-health disciplines. The resource can also be used as a capacity-building instrument in the field of cancer literacy at national and regional levels.

The programme comprises two main learning blocks:

European Code Against Cancer (4th edition) – a certified course consisting of 13 modules covering the 12 recommendations of the Code, as well as a dedicated module addressing the scientific and methodological foundations of its development. The modules focus on key risk factors, prevention and participation in screening.

Latest evidence on cancer prevention, myths and controversies – a 12-module course presenting up-to-date evidence, addressing common misconceptions and discussing debated issues in cancer prevention.

Resource / Platform	Type	Level	Main focus related to cancer

Link			literacy
Cancer Prevention Europe (IARC Learning Centre) (https://learning.iarc.fr/edp/courses/cpe/)	Training platform	European	Online modular training linked to the European Code Against Cancer: cancer prevention, risk factors, screening, risk communication
WHO Academy (https://whoacademy.org/coursewares)	Training platform	International	Courses on cancer control planning and NCD prevention; system-level and workforce capacities supporting literacy-oriented interventions
EU Knowledge Centre on Cancer (Knowledge4Policy) (https://knowledge4policy.ec.europa.eu/cancer_en)	Capacity & learning hub	EU	Evidence-based educational resources, indicators and policy-relevant knowledge supporting informed decision-making and prevention
ICCP Portal (International Cancer Control Partnership) Portal (https://www.iccp-portal.org/resources)	Capacity / planning resource	International	Training materials and tools for national cancer control planning, including prevention, communication and system navigation
WHO Europe – Health Literacy & Cancer (publications & learning resources) (https://www.who.int/europe/publications)	Guidance & educational resources	International / Europe	Health literacy, people-centred care, equity, navigation across cancer pathways
World Code Against Cancer Learning resources (https://cancer-code-world.iarc.who.int/lit	Educational resource	Global	Literacy-oriented educational materials supporting understanding and application of cancer prevention recommendations across populations

eracy/)			
City Cancer Challenge Academy (https://citycancerchallenge.org/learning/)	Training platform	International	Practical training for health professionals and planners on integrated cancer care, early diagnosis and service navigation in urban health systems
European School of Oncology e-learning (https://www.eso.net/en/education)	Training platform	European	Continuing education for health professionals on cancer prevention, early detection, patient communication and multidisciplinary care
UNderstand CANcer (UNCAN.eu) (https://uncan.eu/)	Knowledge & coordination platform	European	Strategic knowledge infrastructure supporting cancer literacy through data integration, research coordination and policy alignment
Association of Community Cancer Centers (ACCC) – Health Literacy Resources (https://www.accc-cancer.org/home/learn/comprehensive-cancer-care-services/health-literacy)	Professional resource platform	International	Practical guidance and tools for integrating health literacy into comprehensive cancer care, including patient communication, navigation, and organisational health literacy
WHO S.A.R.A.H. (Smart AI Resource Assistant for Health) (https://www.who.int/campaigns/s-a-r-a-h)	Digital AI-based tool	Global	Use of AI-driven digital tools to support health literacy, healthy lifestyles, and informed decision-making, with relevance for prevention-oriented cancer literacy
WHO National Health Literacy Demonstration Projects (NHLDPs)	Policy & system demonstration projects	Europe	System-level implementation of health literacy across governance and services, providing structural

(https://bci-hub.org/documents/acting-together-who-national-health-literacy-demonstration-projects-nhldps-address-health)			foundations for cancer literacy integration
OBS-PACE (Progress in Addressing Cancer in Europe (https://eurohealthobservatory.who.int/monitors/pace)	Policy learning platform / case studies	Europe	System enablers of cancer literacy through organisation of care, navigation, awareness strategies and governance mechanisms
BUMPER – Digital Health Literacy training materials (WP5) (https://bumper.cancer.eu/wp-content/uploads/2024/10/BUMPER_WP5_DHL_training-material_FINAL.pdf)	Training resource	Europe	Structured digital health literacy training modules supporting cancer prevention, information appraisal and navigation of cancer-related digital services
DigiCanTrain – Digital Skills Training for Healthcare Professionals in Oncology (https://digicantrain.turkuamk.fi/)	Training programme	Europe	Structured digital skills training for healthcare professionals supporting effective use of eHealth tools, digital communication with patients, navigation of cancer care pathways, and integration of digital solutions across cancer prevention, early detection and care.

Table 9. International educational and training platforms relevant to cancer literacy

Note. Inclusion of programmes reflects relevance to cancer literacy capacity-building and does not imply formal effectiveness evaluation.

The learning materials are delivered in a multimodal format (videos, interactive components, assessments), are freely accessible, and may be used either as standalone educational modules or as part of broader national and transnational cancer literacy programmes. Some courses are accredited for continuing professional development, enhancing their practical relevance for healthcare and public health professionals [165].

Thus, the Cancer Prevention Europe multilingual online programme on primary and secondary cancer prevention for cancer prevention advocates and health promoters (https://learning.iarc.fr/edp/courses/cpe/) represents an example of an institutionalised, evidence-based educational platform that links policy recommendations with practical capacity-building tools in the field of cancer literacy and may be regarded as a best practice in the design and implementation of training programmes at the European level.

At the global level, the WHO Academy platform (https://whoacademy.org/) offers online courses related to NCD prevention and cancer control planning, such as Cancer control planning and NCD strategies and Cervical cancer elimination: planning and implementation [166]. Although these courses are not explicitly labelled as cancer literacy training, they contribute to the development of system-level and workforce capacities necessary for implementing literacy-oriented interventions in cancer prevention, early detection and screening. The courses primarily target healthcare professionals, programme managers and policymakers and support the translation of World Health Organization recommendations into national cancer control strategies.

A number of international and European institutional platforms further provide resources that strengthen health system capacities relevant to cancer literacy. The EU Knowledge Centre on Cancer (Knowledge4Policy; https://knowledge4policy.ec.europa.eu/cancer_en) functions as a central hub for evidence-based information, offering analytical outputs, indicators and synthesised data to support policy decision-making and planning [167]. The UNCAN.eu initiative (https://uncan.eu/), developed within the EU Cancer Mission, has a predominantly research and coordination focus, but also incorporates components aimed at patient engagement and improved access to cancer-related information [168].

Digital approaches and cross-country system-level implications

Digital technologies and artificial intelligence (AI) tools are increasingly recognised as system-level conditions and support instruments for the development of cancer literacy, particularly in relation to access to information, navigation of the healthcare system, and informed decision-making. WHO policy documents emphasise that user-centred digital solutions can enhance understanding of health information and support the adoption of health-promoting behaviours, provided that they are aligned with health literacy principles and with ethical approaches to the use of AI. An example of such an approach is the WHO digital AI tool S.A.R.A.H., which is positioned as a supportive resource for explaining health information and facilitating decision-making and is potentially relevant for prevention-oriented cancer literacy [169].

Review studies further indicate that digital and blended learning formats including e-learning, online platforms, and digital educational modules are associated with improved levels of cancer literacy, user engagement, and self-care outcomes, including among populations with lower levels of digital health literacy. At the same time, the effectiveness of these approaches is shown to depend on usability, cultural adaptation, and integration with support from trained professionals, rather than on the isolated deployment of digital tools alone [43, 146].

European initiatives increasingly focus on the development of digital health literacy as a component of cancer literacy. Materials from the BUMPER project illustrate a structured approach to digital literacy training in oncology, with an emphasis on critical appraisal of online information, use of digital services for prevention and care navigation, and strengthening the capacity of both healthcare professionals and the general population to interact effectively with digital health systems [170, 171]. Similarly, publications from the DigiCanTrain initiative highlight the need to develop digital competencies among professionals as a prerequisite for the effective integration of innovative technologies into cancer care practice and educational programmes [172, 173].

Overall, AI and digital technologies are best conceptualised as integrated support instruments, whose implementation is most effective when combined with multiplier-based training approaches, the development of organisational health literacy, and alignment with WHO and European Union strategic frameworks, rather than as standalone or isolated solutions [3, 8].

Among advanced European practices in cancer literacy education, comprehensive cancer centres participating in the Cancer Core Europe network can be highlighted, as they implement a broad range of educational, informational and navigation-oriented initiatives [174]. These include, among others, the German Cancer Research Center, the National Center for Tumor Diseases, the Fondazione Istituto Nazionale dei Tumori, and the Netherlands Cancer Institute. These centres operate as reference institutions within European research and innovation alliances in oncology [174]. It should be noted that, with the exception of the Fondazione Istituto Nazionale dei Tumori, the other institutions mentioned – the German Cancer Research Center, the National Center for Tumor Diseases, and the Netherlands Cancer Institute are located outside the consortium countries. Consequently, their cancer literacy education programmes are primarily delivered in national languages and are mainly tailored to domestic healthcare contexts. The practices implemented by these centres address a wide range of target groups, spanning school-age populations and the general public, as well as cancer patients, informal caregivers and healthcare professionals. Interventions are delivered through multiple formats, including school-based education, patient education programmes, public awareness campaigns, information and navigation services, thematic events and professional training courses [175 - 177].

Despite institutional diversity, these initiatives share several common features: a strong people- and patient-centred orientation; institutional integration of cancer literacy within the organisational structures of oncology centres through patient information centres, help-desks and dedicated patient spaces; targeted interventions for vulnerable groups, including individuals with low health literacy and migrant populations; strengthening patient capacities for participation in decision-making and research activities (patient empowerment, patient experts); and the integration of informational, educational and practical components aligned with the World Health Organization's health literacy domains of access, understanding, appraisal and application [3].

At the same time, most identified initiatives remain local or institution-specific, are not consistently supported by formal outcome evaluation, and are rarely standardised or scaled at a cross-national level. This highlights substantial potential for further transferability, adaptation and alignment of best practices within broader European policy and programme frameworks [178].

The systematisation of policy and analytical sources from the European Observatory on Health Systems and Policies [179], the Organisation for Economic Co-operation and Development [180], and the WHO Regional Office for Europe [181] demonstrated a clear regional differentiation in cancer literacy needs.

Using the State of Health in the EU (SoHEU) monitoring tools of the European Observatory [182] as a source of information on the specific patterns of cancer literacy needs in the consortium countries (including indicators related to risk factors, screening participation, and service accessibility), and Progress in Addressing Cancer in Europe (OBS-PACE) as a source of qualitative evidence on instruments and practices that indirectly enhance cancer literacy, we assessed both the needs and the implementation mechanisms of the ECAC-5 measures (Table 10).

For countries of Western and Southern Europe (Portugal, Italy, Belgium, Ireland), a shift can be observed from basic awareness-raising towards more advanced forms of cancer literacy, including navigational, organisational and digital literacy. This shift is associated with the increasing complexity of healthcare systems and the high level of care specialisation [25, 46].

In Eastern European countries, namely Romania and Bulgaria, cancer literacy needs are primarily concentrated on basic preventive literacy in line with ECAC-5, increasing participation in screening programmes, and the development of digital skills in the context of the introduction of new technological solutions [45, 183].

For partner countries outside the European Union (Ukraine, Moldova, Montenegro), cancer literacy is closely linked to issues of health system resilience, crisis response, and addressing inequalities in preventive care access [184].

For partner countries, particularly Ukraine and Moldova, WHO evidence indicates a clear need to integrate cancer literacy programmes into broader NCD strategies and health system recovery efforts, with a specific focus on information resilience, trust in the health system, and patient navigation under crisis conditions [185].

In 2018, the Health Evidence Network (HEN) of the World Health Organization Regional Office for Europe published a scoping review summarising effective policy-related health literacy activities, predominantly within the health and education sectors, and outlining areas for further development to be considered by national policy makers [186].

Country	EU member	SoHEU 2025 available	OBS-PACE coverage	Dominant cancer literacy challenge
Belgium	Yes	Yes	Partial	System complexity and secondary prevention
Bulgaria	Yes	Yes	Yes	Digital literacy and prevention gaps
Ireland	Yes	Yes	Partial	Prevention, transparency and system trust
Italy	Yes	Yes	Yes	Navigation and organisational literacy
Moldova	No	No	No	Continuity of care in crisis context
Montenegro	No	No	No	Basic NCD prevention literacy
Portugal	Yes	Yes	Partial	Transition from awareness to applied prevention skills
Romania	Yes	Yes	No	Basic prevention and screening literacy
Ukraine	No	No	No	Information resilience and trust in the system

Table 10. Key cancer literacy challenges across target countries (based on WHO Europe, OECD and European Observatory on Health Systems and Policies data)

A core principle of the WHO European Roadmap for the implementation of health literacy initiatives across the life course is the promotion of patient empowerment, understood as a process through which individuals gain greater understanding and control over their own health. Increased health literacy is identified as a key prerequisite for achieving patient empowerment, with potential downstream effects including reduced use of health services and lower healthcare costs [187].

At the EU level, several organisations who are active in cancer care information and patient advocacy, including the European Patients Forum, the European Cancer Patient Coalition, and the Association of European Cancer Leagues, have demonstrated substantial potential to support cancer literacy advocacy. In their joint statement «Europe Let's Do More for Health #EU4HEALTH», empowering citizens and patients is highlighted as a central priority. Patient empowerment is framed as a multidimensional concept encompassing health literacy, self-management, and shared decision-making between patients and healthcare providers, which are currently addressed mainly through stand-alone projects and initiatives [188].

Strategic EU-level documents further outline priority actions to strengthen cancer literacy in Europe, including improving health literacy education of health professionals through integration into clinical and public health curricula; enhancing patient health literacy by providing timely support and promoting active involvement in disease management and self-care; and monitoring of the implementation of cancer literacy in European healthcare settings in order to capture and summarise practical experience, including through dedicated cancer literacy projects [4].

The overall analysis of grey literature, strategic documents, and international platforms indicates that cancer literacy is increasingly positioned as a systemic policy category, rather than solely an individual patient attribute. In WHO and European regional policy and analytical sources, health/cancer literacy is conceptualised as a cross-cutting determinant influencing the effectiveness of prevention, early detection, patient navigation within healthcare systems, and the reduction of inequalities in access to care (Rowlands et al., 2018; Diviani et al., 2020).

The review of existing capacities suggests that the most promising mechanisms for implementing cancer literacy include institutional integration within national cancer control strategies, the development of organisational health literacy, and the application of multiplier approaches through continuing professional development systems for healthcare workers and the formal education system. These approaches enhance scalability and sustainability and exert an indirect impact on population-level behavioural outcomes, including screening participation and adherence to preventive recommendations (Housten et al., 2020; Jeitani et al., 2025). Recommendations are made for further action to improve cancer literacy in Europe through coordinated efforts among providers, organizations, patients, and research [4].

At the same time, the analysis of programmes and platforms reveals substantial heterogeneity of approaches and limited standardisation of effectiveness indicators. A significant proportion of initiatives focus on informational or educational components without systematic assessment of their impact on cancer literacy levels or related behavioural outcomes. This underscores the need for more harmonised methodological approaches and for a clearer distinction between awareness campaigns, skills-building programmes, and structural tools aimed at simplifying interaction with healthcare systems (Ryman et al., 2024; EuroHealth Observatory/WHO PACE, 2025).

Achieving the objectives of Europe’s Beating Cancer Plan, the EU Mission on Cancer 2023–2030, and the WHO health/cancer literacy frameworks requires moving beyond fragmented national initiatives towards the development of a transnational cancer literacy training system. In strategic documents of the European Union and the World Health Organization, improving literacy among populations and professionals is recognised as a necessary condition for effective prevention, early detection, patient navigation, and the reduction of inequalities in access to cancer care [8, 186, 189].

At the same time, review studies point to pronounced cross-country differences in capacities, the absence of harmonised training standards, and limited standardisation of outcome indicators for cancer literacy programmes, which constrain the scaling of effective approaches [24, 35, 39].

In this context, a transnational training system based on shared competency frameworks, train-the-trainer models, digital and blended learning formats, and opportunities for national adaptation is increasingly viewed as a key instrument for harmonising knowledge and practice and for supporting the achievement of EU and WHO strategic objectives in cancer literacy up to 2030 [8, 189, 190].

Summary Box 2. Key findings from the policy, platforms and grey literature analysis

- The analysis of international and European policy and strategic documents indicates that cancer literacy is increasingly positioned as a systemic policy category, integrated into approaches to cancer control, non-communicable disease prevention, people-centred care, and the reduction of inequalities, primarily within the frameworks of the World Health Organization and the European Union.
- The systematisation of data from the World Health Organization, the Organisation for Economic Co-operation and Development, and the European Observatory on Health Systems and Policies revealed substantial cross-country variability in cancer literacy needs, ranging from basic preventive and screening literacy to navigational, organisational, and digital literacy. This variability reflects different stages of health system development and diverse contextual challenges across consortium countries.
- At the global and European levels, a number of institutionalised education and training platforms and programmes have been identified (including Cancer Prevention Europe, WHO Academy, the EU Knowledge Centre on Cancer, and

the ICCP Portal). These initiatives link policy recommendations with practical capacity-building tools in the field of cancer literacy and may be regarded as examples of promising practices.

- The analysis of practices implemented by leading European cancer centres and international initiatives demonstrates the existence of comprehensive, patient-centred models for the development of cancer literacy. However, the majority of these initiatives remain local or institution-specific, with limited standardisation and rare scaling at the cross-country level.
- Digital technologies and artificial intelligence tools are addressed in policy and analytical sources as important system-level enablers of cancer literacy, particularly with regard to access to information, navigation within healthcare systems, and informed decision-making. At the same time, their effectiveness is contingent upon integration with workforce training, organisational health literacy, and ethical principles governing the use of digital solutions.
- Despite the growing political recognition of cancer literacy, the analysis of grey literature and programmes highlights fragmented approaches, limited standardisation of effectiveness indicators, and the absence of coordinated transnational training models. This constrains the scaling of effective practices and underscores the need for a coordinated European cancer literacy training system.

Integrated conclusions from the scoping review and policy, platforms and grey literature analysis

- The conducted scoping review demonstrates that the existing evidence base in the field of cancer literacy in the European region is predominantly empirical and nationally oriented, with a predominance of descriptive studies focused on identifying needs, barriers, and conceptual frameworks. At the same time, structured education and training programmes in cancer literacy are only sparsely represented in the scientific literature, while intervention studies constitute a relatively small proportion of the overall body of publications.
- Despite the detailed documentation of cancer literacy needs across different population groups and stages of the cancer continuum, existing capacities and formalised educational responses remain uneven, fragmented, and weakly integrated into healthcare system structures. Approaches oriented towards system-level change, intersectoral collaboration, and equity principles, although articulated in strategic documents, are comparatively rare in the scientific and programme-related literature.
- The analysis of international policy and grey literature indicates a growing recognition of cancer literacy as a strategic priority in global and European approaches to cancer control. Nevertheless, a clear gap persists between strategic declarations and the actual availability of systemic, institutionally embedded, and scalable education and training programmes, underscoring the need for a coordinated European approach to cancer literacy training.
- Most identified education and training programmes are implemented within isolated research-driven or project-based initiatives, often linked to a limited number of authors or specific research groups. Systematic reviews at both European and global levels consistently point to the absence of sustainable, institutionally integrated models of cancer literacy education that are capable of scaling and long-term implementation.
- This represents one of the main conclusions of the present report and identifies the development of sustainable, institutionally integrated and scalable cancer literacy education models as a priority area for future policy implementation at the European level.
- Despite the existence of selected examples of educational interventions targeting specific groups (including migrants, people with hearing impairments, men, or informal caregivers), the majority of programmes do not demonstrate

systematic adaptation to sociocultural, gender-related, digital, or cognitive differences. This substantially limits their effectiveness and their potential impact on reducing inequalities in cancer care.

- An important methodological finding is that a substantial proportion of national cancer literacy programmes are documented in national languages and are not indexed in international English-language bibliographic databases. This constrains their identification through conventional scoping review approaches and confirms the relevance of combining international bibliographic searches with national-level mapping conducted by project partners, in order to achieve more comprehensive coverage of education and training initiatives actually implemented across consortium countries.
- Overall, the analysis revealed considerable cross-country variability in terms of the availability, systemic integration, and institutional maturity of cancer literacy programmes. In most countries, educational initiatives remain fragmented, limited to specific professional or population groups, and predominantly project-based in nature, highlighting a persistent gap between articulated needs and existing organisational responses.

Limitations of the scoping review and policy, platforms and grey literature analysis

1. The review included English-language sources only, focusing on consortium countries or sources in which these countries were represented within systematic or other review-type publications.
2. Searches were conducted in international bibliographic databases (PubMed, Scopus, Web of Science Core Collection), with additional use of SpringerLink and targeted web searches via Google on official institutional websites; sources outside these channels may not have been captured.
3. Restricting publications to the period from 1 January 2015 onwards means that earlier approaches, programmes, and formative stages in the development of cancer/health literacy in oncology may be under-represented.
4. This scoping review did not include formal appraisal of methodological quality or risk of bias; therefore, the findings reflect the scope and structure of the available evidence rather than the comparative effectiveness of educational programmes.
5. As definitions and measurement approaches to cancer literacy and related domains (needs, tools, programmes) varied across included sources, synthesis was conducted at the level of thematic clusters.
6. Given the supranational nature of policy and strategic documents, these sources were analysed separately, and only provisions relevant to consortium countries were extracted.

7. Cancer literacy programmes were identified primarily through targeted web searches of publicly available English-language sources, as such programmes are frequently not reported in the peer-reviewed scientific literature. As with any scoping review, the completeness of programme identification cannot be fully guaranteed, and some relevant initiatives may not have been captured.

3. Results of mapping cancer literacy programmes delivered in national languages across consortium countries

Data preparation, cleaning and validation

Information on national programmes related to cancer literacy was collected at the level of consortium countries. Data collection was carried out by national experts in each country using a standardised Excel-based template developed within Task 2.3 (see Appendix 1).

The completed country-level datasets were submitted to the Deliverable T2.3 team for further processing and analysis. At the next stage, a primary quality review of the submitted data was conducted, focusing on completeness, internal consistency, and compliance with predefined methodological criteria. Where necessary, selected entries and descriptive sections were clarified or refined in collaboration with national partners.

Following quality validation, a primary analysis of additional data identified through the national mapping exercise was performed. At this stage, selected qualitative information was structured and converted into quantitative variables to enable further analysis. These data were subsequently used to calculate aggregated indicators and to generate consolidated analytical outputs at the consortium level.

Primary screening of national-level education and training programmes related to cancer literacy was conducted to ensure methodological consistency with the requirements of Deliverable T2.3 and to clearly distinguish national programmes, international initiatives, and hybrid formats.

At the first stage, each programme included in the country-level dataset underwent individual screening using a standardised procedure, which assessed the following elements:

- country of actual implementation;
- organising and implementing institutions (according to Penta-Helix model) ;
- governance and funding level (national vs. international);
- type of programme (formal education, CPD/CME, training, awareness campaign, project);
- target groups;
- language and nature of the primary information source (official websites, policy documents).

The central criterion of primary screening was the classification of programmes as national-level initiatives. Programmes were retained in the national mapping when they:

- were implemented at national or subnational level;
- were organised or administered by national institutions (ministries, national educational institutions, professional associations, national NGOs);
- demonstrated a clear linkage to the national health system, policies, or locally defined target groups.

Such programmes were classified as «retain».

Programmes were classified as “exclude” when they:

- represented purely international or multi-country initiatives;
- were administered by international organisations or European platforms;
- relied primarily on English-language international websites as their main source of information;
- were research or framework projects without implemented national education or training activities.

A separate category was assigned to hybrid or borderline programmes with international funding or partnerships but with clear national-level implementation (e.g. delivery through national institutions or services). These programmes were marked as «under consideration» and retained for further expert discussion within the consortium.

Primary screening was carried out in close collaboration with national partners, who provided contextual and language-specific validation of the extracted information.

To process and analyse qualitative information contained in programme descriptions, ChatGPT was used as a supportive analytical tool. AI-assisted methods were applied for initial structuring of textual data, identification of recurring thematic elements, and transformation of qualitative descriptions into a standardised quantitative format, followed by grouping into thematic categories.

All outputs were subsequently reviewed, refined and finalised by the research team, ensuring content validity of the grouping and minimising the risk of automated misinterpretation.

General characteristics and geographical distribution of national programmes

The mapping of programmes delivered in national languages identified a total of 90 national cancer literacy programmes across consortium countries. The largest shares were observed in Moldova and Ukraine, with 20 programmes identified in each country, jointly accounting for 44.4% of all programmes. Italy contributed 12 programmes (13.3%), while in the remaining countries the number of programmes ranged from 4 to 9, together constituting the complete set of identified national programmes (Table 11).

Country	n (%)
Belgium	4 (4.4)
Bulgaria	9 (10.0)
Italy	12 (13.3)
Ireland	8 (8.9)
Montenegro	6 (6.7)
Moldova	20 (22.2)
Portugal	5 (5.6)
Romania	6 (6.7)
Ukraine	20 (22.2)
Total	**90 (100.0)**

Table 11. Number of literature sources in national languages

The higher number of education and training programmes on cancer literacy identified in countries of the former Soviet Union may be associated with ongoing transformation processes within health, education, and public health systems. In particular, the establishment of new institutional structures and organisations responsible for cancer prevention, awareness raising, and capacity building is often implemented in parallel with the continued functioning of established institutions. This transitional context may contribute to the coexistence of multiple programmes and initiatives in the field of cancer literacy, which in turn is reflected in a relatively higher number of identified activities.

The analysis of programmes implemented in national languages identified a relatively limited number of initiatives, with a mean of 10.0 (95% CI 6.0-14.0) programmes per country and a median of 8.0 (95%CI 5.0-20.0) programmes. This may indicate an underrepresentation of cancer-related topics within the broader landscape of health literacy programmes.

Programme organisers and providers (Penta-Helix model)

The organisation of national cancer literacy programmes has a pronounced intersectoral character: in most countries, programmes were implemented with the simultaneous involvement of several organiser types (Table 12). On average, 5 organiser types of cancer literacy programmes were identified per consortium country (95% CI 3,6–6,4).

Frequency analysis showed that the most widespread organiser types of national cancer literacy programmes were public authorities in the health sector, academic institutions, and patient and civil society organisations, each of which was represented in 8 of the 9 consortium countries – 88.9% (95% CI 68.4–100.0). Healthcare institutions, professional associations, and international organisations were involved in more than half of the countries – 55.6% (95% CI 23.1–88.1). The least represented were education authorities, whose involvement was identified in only two countries – 22.2% (95% CI 0.0–49.3).

Organiser type	Countries where identified	n (%)	95% CI
Ministry of Health / public authorities	Belgium, Bulgaria, Italy, Ireland, Montenegro, Moldova, Romania, Ukraine	8 (88.9%)	68.4 – 100.0
University / academic institution	Belgium, Bulgaria, Italy, Ireland, Moldova, Portugal, Romania, Ukraine	8 (88.9%)	68.4 – 100.0
Patient support association / NGO / charity	Belgium, Bulgaria, Italy, Ireland, Montenegro, Moldova, Romania, Ukraine	8 (88.9%)	68.4 – 100.0
Public or private hospital / oncology centre	Belgium, Ireland, Montenegro, Moldova, Ukraine	5 (55.6%)	23.1 – 88.1
Professional association / scientific society	Bulgaria, Italy, Moldova, Romania, Ukraine	5 (55.6%)	23.1 – 88.1
International organisation / international partnership	Bulgaria, Italy, Montenegro, Moldova, Ukraine	5 (55.6%)	23.1 – 88.1
Ministry of Education / education authorities	Moldova, Ukraine	2 (22.2%)	0.0 – 49.3

Table 12. Types of organisers of national cancer literacy programmes across consortium countries (n=9)
Note: n (%) indicates the number and proportion of countries (n=9) in which a given organiser type was identified; a single programme could involve multiple organiser types. Ninety-five per cent confidence intervals (95% CI) were calculated for country-level binomial proportions

Overall, the analysis demonstrated the intersectoral nature of the organisation of national cancer literacy programmes. In most countries, programmes were implemented with the simultaneous involvement of several organiser types, reflecting a combination of public, academic, healthcare, and civil society sectors. The broad involvement of health authorities and academic institutions indicates the institutional embedding of this area within the healthcare system, while the active participation of patient and civil society organisations highlights the orientation of programmes towards the needs of patients and the population. The limited involvement of ministries of education may indicate insufficient integration of cancer literacy into formal education policy.

Overall, data were obtained for 90 programmes, within which 160 providers were identified, corresponding to a mean of 1.78 providers per programme (95% CI 1.53–2.06). The distribution of programmes by the number of involved providers showed that 48 out of 90 programmes (53.3%) reported a single provider, whereas the remaining 42 programmes (46.7%) involved two or more providers, indicating the widespread use of intersectoral approaches in programme implementation.

Among multi-sectoral programmes, the most common configuration involved two providers, observed in 22 programmes (24.4%). A smaller proportion of programmes involved three providers (14 programmes; 15.6%), while four providers were reported in 5 programmes (5.6%).

Highly multi-sectoral models were rare: only one programme (1.1%) involved five providers. This programme was implemented in Italy within a fully multi-sectoral configuration, encompassing Health & Care, Business, Citizens & Civil Society, Public Administration, and Knowledge & Academia.

Among multi-sectoral programmes involving two providers, the most frequent combination was Health & Care and Knowledge & Academia (27.3% of two-provider programmes). For programmes involving three providers, the most typical configurations combined Health & Care, Knowledge & Academia, and Public Administration (21.4% of three-provider programmes). This pattern reflects the predominance of models based on the integration of healthcare delivery, the education sector, and administrative support.

In addition to the classical providers defined by the Penta-Helix model (Table 13), international organisations were reported in 7 programmes (7.8%). These included the European Cancer Organisation, European School of Oncology, IOM, UNFPA, the EU-TOPIA-EAST Consortium, St. Jude Global, as well as selected international humanitarian and professional organisations, which primarily contributed through partnership-based or expert support roles.

In terms of the programme-level frequency of provider involvement across consortium countries, Knowledge & Academia were most frequently involved (47.8% of programmes), followed by Health & Care (43.3%), Public Administration sector and Citizens & Civil Society sectors (both 36.7%). The Business sector was reported infrequently (5.6% of programmes), while International organisations were involved in 7.8% of programmes.

Provider type	Belgium (n=4)	Bulgaria (n=9)	Ireland (n=8)	Italy (n=12)	Moldova (n=20)	Monte-Negro (n=6)	Portugal (n=5)	Romania (n=6)	Ukraine (n=20)	All countries (n=90)
Public administration	n=2; 50.0% (15.0–85.0%)	n=2; 22.2% (6.3–54.7%)	n=2; 25.0% (7.1–59.1%)	n=6; 50.0% (25.4–74.6%)	n=6; 30.0% (15.0–51.9%)	n=6; 100.0% (61.0–100.0%)	n=1; 20.0% (3.6–62.4%)	n=1; 16.7% (3.0–56.4%)	n=7; 35.0% (18.1–56.7%)	**n=33; 36.7% (27.3–47.1%)**
Knowledge & academia	n=2; 50.0% (15.0–85.0%)	n=3; 33.3% (12.1–64.6%)	n=3; 37.5% (13.7–69.4%)	n=4; 33.3% (14.6–58.9%)	n=12; 60.0% (38.7–78.1%)	n=4; 66.7% (30.0–90.3%)	n=5; 100.0% (56.6–100.0%)	n=5; 83.3% (43.6–97.0%)	n=5; 25.0% (11.2–46.9%)	**n=43; 47.8% (37.7–58.1%)**
Health & care	n=3; 75.0% (30.1–95.4%)	n=0; 0.0% (0.0–29.9%)	n=1; 12.5% (2.3–47.1%)	n=11; 91.7% (61.5–99.0%)	n=9; 45.0% (25.8–65.8%)	n=5; 83.3% (43.6–97.0%)	n=4; 80.0% (37.6–96.4%)	n=0; 0.0% (0.0–39.0%)	n=6; 30.0% (15.0–51.9%)	**n=39; 43.3% (33.3–53.9%)**
Citizens & Civil Society	n=2; 50.0% (15.0–85.0%)	n=5; 55.6% (26.7–81.1%)	n=4; 50.0% (21.5–78.5%)	n=2; 16.7% (4.7–44.8%)	n=6; 30.0% (15.0–51.9%)	n=3; 50.0% (18.8–81.2%)	n=1; 20.0% (3.6–62.4%)	n=0; 0.0% (0.0–39.0%)	n=10; 50.0% (29.9–70.1%)	**n=33; 36.7% (27.3–47.1%)**
Business	n=0; 0.0% (0.0–49.0%)	n=1; 11.1% (2.0–43.5%)	n=0; 0.0% (0.0–32.4%)	n=1; 8.3% (1.5–35.4%)	n=0; 0.0% (0.0–16.8%)	n=2; 33.3% (9.7–70.0%)	n=0; 0.0% (0.0–43.4%)	n=0; 0.0% (0.0–39.0%)	n=1; 5.0% (0.9–23.6%)	**n=5; 5.6% (2.4–12.3%)**
International organisations	n=0; 0.0% (0.0–49.0%)	n=0; 0.0% (0.0–29.9%)	n=0; 0.0% (0.0–32.4%)	n=2; 16.7% (4.7–44.8%)	n=3; 15.0% (5.2–36.0%)	n=0; 0.0% (0.0–39.0%)	n=0; 0.0% (0.0–43.4%)	n=0; 0.0% (0.0–39.0%)	n=2; 10.0% (2.8–30.1%)	**n=7; 7.8% (3.8–15.2%)**

Table 13. Frequency of provider involvement based on the Penta-Helix model at programme level in consortium countries (n, %, 95% CI)
Note: The unit of analysis is the programme. n denotes the number of programmes involving a given provider type; % represents programme-level frequency. 95% confidence intervals were calculated using the Wilson method (18)

Country-level estimates of provider involvement demonstrate pronounced cross-country variability, reflecting differences in national institutional models of programme implementation (p<0.001).

In Portugal, Romania, and Moldova programmes were most frequently implemented with the involvement of Knowledge & Academia, indicating the leading role of universities and research institutions in the development and dissemination of cancer literacy programmes.

In Italy and Montenegro, configurations with active involvement of Health & Care and Public Administration predominated, reflecting a more institutionalised approach in which programmes are integrated into national or regional health systems. These countries also exhibited a higher proportion of multi-sectoral programmes, including those involving three or more provider types.

In Belgium and Ireland, a more balanced distribution across CItizens & Civil Society, Health & Care, and Knowledge & Academia was observed, reflecting partnership-based models in which patient and community organisations play an important role alongside clinical and academic structures.

In Bulgaria and Ukraine, a relatively higher involvement of the Citizens & Civil Society sector was observed, which may indicate a compensatory role of the Citizens & Civil Society sector in contexts with more limited institutional or systemic resources. At the same time, participation of the Business sector remained limited and episodic across most countries.

The involvement of international organisations was observed selectively and predominantly in countries with programmes oriented towards intersectoral or donor-supported collaboration, underscoring their role as complementary rather than system-forming providers.

The structural distribution of providers involved in cancer literacy programmes according to the Penta-Helix model (Figure 4) showed that Knowledge & Academia accounted for the largest share of the overall structure, representing 28.1% of all providers, highlighting their leading role in the development and implementation of programmes.

Comparable proportions were observed for Health & Care, Public Administration, and Citizens & Civil Society, indicating a relatively balanced involvement of medical, governance, and community-based sectors. The share of the Business sector remained limited, accounting for 3.3%, which suggests an episodic rather than systemic involvement of private actors.

Overall, the distribution of provider shares confirms the absence of dominance of any single sector and reflects the multi-sectoral structure of programmes, characterised by relatively even contributions from the key sectors.

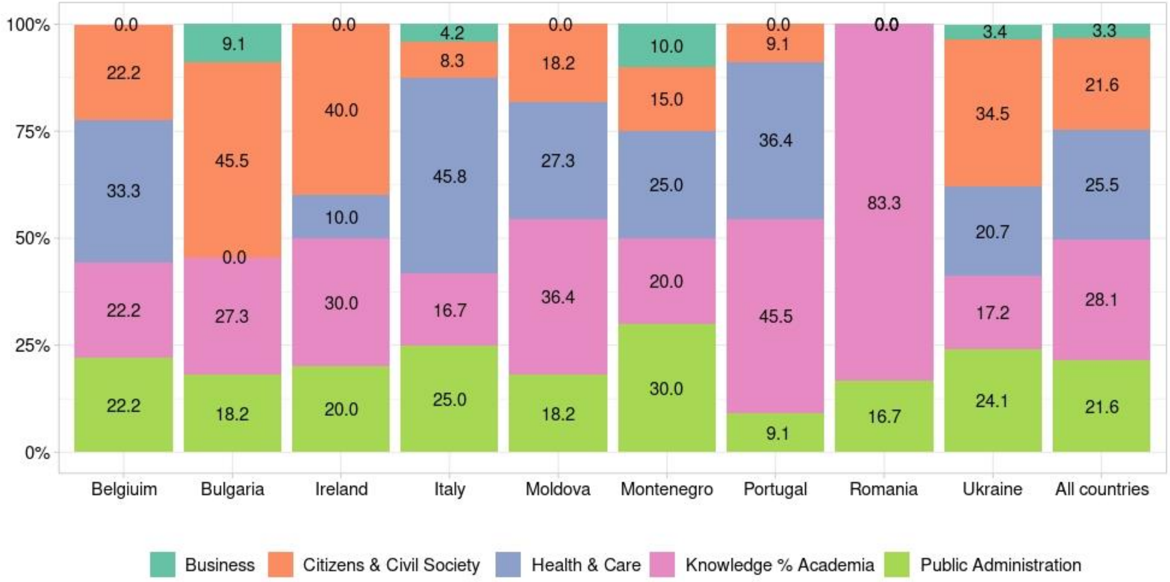

Figure 4. Structure of programme providers based on the Penta-Helix model in consortium countries (% of the total number of providers)

Target groups

The most frequent target audience of cancer literacy programmes (Table 14) were healthcare and pharmaceutical professionals, who were identified as a target group in 64.4% of programmes overall across the consortium. High levels of coverage of this group were observed in most countries, particularly in Romania, Moldova, Montenegro, and Italy, indicating a predominant orientation of national programmes towards professional audiences within the healthcare system.

Overall, the results indicate a dominance of a professionally oriented approach to cancer literacy development in national programmes, alongside limited and uneven coverage of specific population groups, which may warrant further, more detailed analysis.

The high proportion of programmes targeting healthcare and pharmaceutical professionals is partly explained by characteristics of the information landscape and data availability. For this audience, structured educational and training programmes are most frequently developed, typically featuring formalised descriptions, institutional support, and stable dissemination channels (official websites, professional platforms, accreditation resources). Within the national mapping exercise, such programmes were more easily identifiable through desk review, which may have contributed to their relatively higher representation in the analysed dataset.

In addition, in many countries cancer literacy is traditionally conceptualised as a component of the professional development of healthcare workers, particularly physicians, which drives programme focus towards this group as key intermediaries between the healthcare system and patients. This approach is consistent with the institutional logic of healthcare systems, where responsibility for cancer-related information provision and counselling is primarily assigned to clinical professionals.

Among non-professional target groups, programmes most frequently addressed the general population (37.8%), as well as caregivers and family members of patients (33.3%). The share of programmes directly targeting patients and cancer survivors remained lower, accounting for approximately one seventh of the total number of programmes.

Specific population groups, including children and adolescents, school-aged populations, older adults, as well as teachers and educators, were represented in a relatively small proportion of programmes and exhibited substantial cross-country variability. Programmes targeting social workers and psychosocial support professionals, as well as policy makers and decision-makers, were sporadic.

The highest levels of coverage of healthcare professionals were observed in Romania (100%), Moldova (85.0%), Montenegro (83.3%), and Italy (75.0%), reflecting clearly professional-centred programme models in these countries (p=0.004). In these contexts, the proportion of programmes targeting the general population or patients and their families was noticeably lower or characterised by limited representation.

By contrast, several countries demonstrated a more balanced coverage of professional and population-based audiences. In Ireland, programmes targeted both healthcare professionals (62.5%) and caregivers and family members (50.0%), as well as the general population (25.0%). A similar pattern was observed in Ukraine, where 55.0% of programmes targeted healthcare professionals, while substantial shares addressed the general population (35.0%) and caregivers and family members (40.0%).

A distinct profile was observed in Portugal, where no programmes targeting healthcare professionals were identified (0%), while the majority of programmes focused on the general population (80.0%) and patients' families (40.0%). This distribution indicates the predominance of population-oriented approaches in national cancer literacy initiatives. A comparable, though less pronounced, profile was also evident in Ireland, where professional and population-based approaches coexisted. Overall, in countries where a stronger role of the civil sector and local initiatives was observed, programmes more frequently targeted non-professional groups, including the general population, patients, and their families.

With regard to specific population categories, cancer literacy programmes most often targeted women, accounting for approximately 10.5% of all analysed programmes, primarily in the context of breast and cervical cancer prevention and early detection. Older adults (predominantly aged 50+ or 65+) were targeted in approximately 7.0% of programmes, mainly within screening and patient support initiatives.

Target group	Belgium (n=4)	Bulgaria (n=9)	Ireland (n=8)	Italy (n=12)	Moldova (n=20)	Monte-Negro (n=6)	Portugal (n=5)	Romania (n=6)	Ukraine (n=20)	All countries (n=90)
Healthcare professionals	n=1; 25.0% (4.6–69.9)	n=4; 44.4% (18.9–73.3)	n=5; 62.5% (30.6–86.3)	n=9; 75.0% (46.8–91.1)	n=17; 85.0% (64.0–94.8)	n=5; 83.3% (43.6–97.0)	n=0; 0.0% (0.0–43.4)	n=6; 100.0% (61.0–100.0)	n=11; 55.0% (34.2–74.2)	**n=58; 64.4% (54.2–73.6)**
Medical students / trainees	n=1; 25.0% (4.6–69.9)	n=2; 22.2% (6.3–54.7)	n=1; 12.5% (2.3–47.1)	n=0; 0.0% (0.0–25.9)	n=4; 20.0% (8.1–41.6)	n=1; 16.7% (3.0–56.4)	n=0; 0.0% (0.0–43.4)	n=1; 16.7% (3.0–56.4)	n=3; 15.0% (5.2–36.0)	**n=13; 14.4% (8.6–23.2)**
Patients / cancer survivors	n=3; 75.0% (30.1–95.4)	n=3; 33.3% (12.1–64.6)	n=2; 25.0% (7.1–59.1)	n=1; 8.3% (1.5–35.4)	n=3; 15.0% (5.2–36.0)	n=0; 0.0% (0.0–39.0)	n=2; 40.0% (11.8–76.9)	n=0; 0.0% (0.0–39.0)	n=3; 15.0% (5.2–36.0)	**n=13; 14.4% (8.6–23.2)**
Caregivers / family members	n=3; 75.0% (30.1–95.4)	n=3; 33.3% (12.1–64.6)	n=4; 50.0% (21.5–78.5)	n=0; 0.0% (0.0–25.9)	n=8; 40.0% (21.9–61.3)	n=0; 0.0% (0.0–39.0)	n=2; 40.0% (11.8–76.9)	n=0; 0.0% (0.0–39.0)	n=8; 40.0% (21.9–61.3)	**n=30; 33.3% (24.5–43.6)**
General population	n=3; 75.0% (30.1–95.4)	n=4; 44.4% (18.9–73.3)	n=2; 25.0% (7.1–59.1)	n=3; 25.0% (7.1–59.1)	n=7; 35.0% (18.1–56.7)	n=3; 50.0% (18.8–81.2)	n=4; 80.0% (37.6–96.4)	n=0; 0.0% (0.0–39.0)	n=7; 35.0% (18.1–56.7)	**n=34; 37.8% (28.5–48.1)**
Children / adolescents	n=0; 0.0% (0.0–49.0)	n=0; 0.0% (0.0–29.9)	n=1; 12.5% (2.3–47.1)	n=0; 0.0% (0.0–25.9)	n=1; 5.0% (0.9–23.6)	n=0; 0.0% (0.0–39.0)	n=0; 0.0% (0.0–43.4)	n=0; 0.0% (0.0–39.0)	n=5; 25.0% (11.2–46.9)	**n=7; 7.8% (3.8–15.2)**
School students	n=1; 25.0% (4.6–69.9)	n=0; 0.0% (0.0–29.9)	n=1; 12.5% (2.3–47.1)	n=1; 8.3% (1.5–35.4)	n=1; 5.0% (0.9–23.6)	n=0; 0.0% (0.0–39.0)	n=0; 0.0% (0.0–43.4)	n=0; 0.0% (0.0–39.0)	n=1; 5.0% (0.9–23.6)	**n=5; 5.6% (2.4–12.4)**
Teachers /	n=2; 50.0%	n=0; 0.0%	n=0; 0.0%	n=0; 0.0%	n=0; 0.0%	n=0; 0.0%	n=0; 0.0%	n=0; 0.0%	n=4; 20.0%	**n=6; 6.7%**

educators	(15.0–85.0)	(0.0–29.9)	(0.0–32.4)	(0.0–25.9)	(0.0–16.1)	(0.0–39.0)	(0.0–43.4)	(0.0–39.0)	(8.1–41.6)	**(3.1–13.8)**
Older adults	n=0; 0.0% (0.0–49.0)	n=0; 0.0% (0.0–29.9)	n=0; 0.0% (0.0–32.4)	n=1; 8.3% (1.5–35.4)	n=3; 15.0% (5.2–36.0)	n=0; 0.0% (0.0–39.0)	n=0; 0.0% (0.0–43.4)	n=0; 0.0% (0.0–39.0)	n=3; 15.0% (5.2–36.0)	**n=7; 7.8% (3.8–15.2)**
Social & psychological support professionals	n=0; 0.0% (0.0–49.0)	n=0; 0.0% (0.0–29.9)	n=0; 0.0% (0.0–32.4)	n=1; 8.3% (1.5–35.4)	n=1; 5.0% (0.9–23.6)	n=0; 0.0% (0.0–39.0)	n=0; 0.0% (0.0–43.4)	n=0; 0.0% (0.0–39.0)	n=2; 10.0% (2.8–30.1)	**n=4; 4.4% (1.7–10.9)**
Policy makers	n=0; 0.0% (0.0–49.0)	n=0; 0.0% (0.0–29.9)	n=0; 0.0% (0.0–32.4)	n=0; 0.0% (0.0–25.9)	n=0; 0.0% (0.0–16.1)	n=0; 0.0% (0.0–39.0)	n=0; 0.0% (0.0–43.4)	n=0; 0.0% (0.0–39.0)	n=1; 5.0% (0.9–23.6)	**n=1; 1.1% (0.2–6.0)**

Table 14. Frequency of coverage of individual target groups in national cancer literacy programmes across consortium countries (n, %, 95% CI)

Note: The unit of analysis is the programme. n denotes the number of programmes in which a given target group was identified; % represents programme-level frequency. Ninety-five per cent confidence intervals (95% CI) were calculated using the Wilson method (18)

Children and adolescents (including school-aged populations) constituted the target group in approximately 5.3% of programmes, predominantly through preventive and educational activities. Programmes explicitly targeting men were rare, representing approximately 1.8% of the total, indicating limited use of gender-specific approaches for male populations.

The structure of healthcare professional categories among the target groups of cancer literacy programmes (Figure 5) is characterised by a predominance of clinically oriented professions. The largest shares were represented by doctors (22.2%) and oncologists (21.1%), which together accounted for more than two fifths of all healthcare-related mentions. Nurses and primary care providers were represented at comparable levels (15.6% each), while medical students accounted for 14.4%.

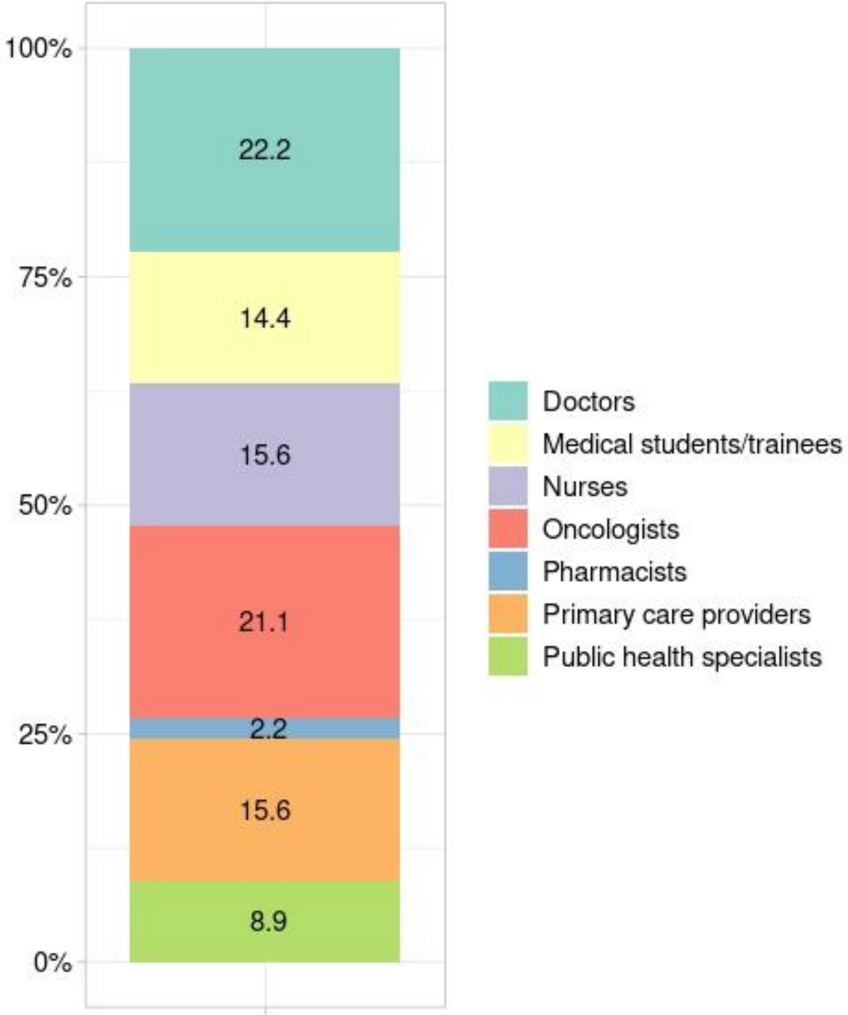

Figure 5. Structure of healthcare professional categories among target groups of cancer literacy programmes (all countries, %)

At the same time, public health specialists represented 8.9% of all healthcare-related mentions, and pharmacists were the least represented category (2.2%). Overall, this structure reflects a strong focus of cancer literacy programmes on clinical professions, with comparatively limited involvement of specialists oriented towards population-level prevention (public health professionals, primary care) and pharmacists.

Based on the available data on target groups of cancer literacy programmes, it is possible to indirectly identify which professional and population groups are considered to have needs for education and training programmes, as well as the nature of these needs (professional, preventive, informational). At the same time, this approach does not substitute for a direct needs assessment but rather reflects the existing programme priorities across consortium countries.

The findings indicate the presence of training needs among healthcare professionals, particularly primary care physicians, pharmacists, and nurses. This points to needs related to continuing professional development and the strengthening of communication competencies required for effective patient counselling in the context of primary cancer prevention.

Furthermore, the fact that a substantial proportion of programmes targets the general population, caregivers, and family members of patients, indirectly highlights prevailing informational and navigational needs, including understanding cancer risks, participation in screening programmes, and navigating healthcare systems.

Specific population groups – children and adolescents, older adults, and men—were represented in a relatively small proportion of programmes, which indirectly suggests that age- and gender-specific needs are not yet systematically addressed within cancer literacy programmes.

Thematic areas of cancer literacy programmes

Grouping programme titles by their dominant thematic focus showed (Table 15) that they most frequently address cancer prevention and early detection (screening, vaccination, preventive and awareness campaigns, early diagnosis), accounting for 31 programmes (34.4%). This category includes, in particular, programmes focused on breast, cervical and colorectal cancer screening, initiatives related to HPV prevention and vaccination, population-based awareness campaigns, and prevention programmes implemented at the primary health care level. This distribution indicates the predominance of preventive themes in the formulation of cancer literacy programme titles.

The second most frequent group comprises programmes oriented towards professional education and continuing professional development in oncology, with 29 programmes (32.2%). This category includes titles related to undergraduate and postgraduate education, residency training, CME/CPD programmes, training of nurses and primary care professionals, as well as professional courses and specialised educational pathways in oncology and haematology.

Thematic area (based on programme titles)	Number of programmes (n)	%
Cancer prevention and early detection	31	34.4
Professional education and continuing professional development in oncology	29	32.2
Patient education, support and survivorship	13	14.4
Communication and health literacy	7	7.8
Digital technologies, innovation and telemedicine	6	6.7
Public health, governance and policy-oriented programmes	4	4.4
Total	**90**	**100.0**

Table 15. Thematic areas of cancer literacy programmes (grouping based on programme titles only; n=90)

Programmes aimed at patient education, support and survivorship account for 13 programmes (14.4%). This group includes titles referring to patient schools, educational workshops for patients, psychosocial support programmes, initiatives to improve quality of life, and family support activities, particularly in paediatric oncology. Overall, this thematic area is represented by a smaller number of programmes compared with professional and prevention-oriented initiatives.

A separate group consists of programmes whose titles emphasise communication, health literacy and patient navigation, comprising 7 programmes (7.8%). These include formulations related to effective communication between health care professionals and patients, decision-support approaches, provision of validated patient information, and the use of health literacy frameworks and guidance.

Programme titles related to digital technologies, innovation and telemedicine account for 6 programmes (6.7%). This category includes courses and initiatives focusing on digital health, the use of telemedicine in prevention, genomic and precision oncology literacy, as well as online educational platforms.

The smallest group comprises programmes oriented towards public health, governance and policy, with 4 programmes (4.4%). This group includes titles related to public health education, management and policy-oriented programmes, as well as strategic or research initiatives.

Overall, the distribution of thematic areas based on programme titles demonstrates the predominance of prevention-oriented and professional education initiatives (together 66.6%), alongside a relatively lower representation of programmes focusing on patient education, health literacy as a distinct domain, and digital as well as governance- and policy-related aspects of cancer literacy.

Further analysis of programme goals and main content (Table 16) confirmed a predominant focus on primary and secondary cancer prevention (32.2%).

Thematic content category	Content focus	n	%
Cancer prevention and early detection	Cancer prevention, screening, vaccination (incl. HPV), early detection, risk factors, healthy lifestyle, population-based and targeted awareness activities	29	32.2
Professional oncology education and clinical competencies	Undergraduate and postgraduate oncology education, residency, CME/CPD, clinical competencies (diagnosis, treatment, multidisciplinary care, evidence-based practice)	24	26.7
Patient education, support and navigation	Patient and family education, healthcare system navigation, patients' rights, psychosocial support, quality of life, survivorship	14	15.6
Communication skills and health literacy	Communication skills, health-literacy-friendly communication, shared decision-making, reducing information barriers	8	8.9
Screening implementation and PHC capacity building	Organisation of screening programmes, PHC team training, risk communication, referral pathways, quality standards	6	6.7
Digital health, genomics and innovation	Digital health, telemedicine, eHealth, genomics, precision oncology, digital learning and innovation	5	5.6
Palliative care and supportive oncology	Palliative care, symptom and pain management, multidisciplinary support, home-based care, patient–family communication	4	4.4
Public health, health systems and policy	Public health, health policy, management, epidemiology, health systems research, system-level health literacy	3	3.3
Total		**90**	**100.0**

Table 16. Program goals and main content: dominant thematic focus (n=90)

Note: Grouping was performed based on the dominant program goals and main content (competencies, skills, and thematic focus), as described in the program summaries. Each programme was assigned to one primary content category

These findings are consistent with the thematic content ranking, in which cancer prevention and early detection, professional oncology education and clinical competencies, and patient education, support and navigation were the most frequently represented domains. In contrast, digital health, genomics and innovation, palliative care and supportive oncology, and public health, health systems and policy showed limited representation, indicating an uneven distribution of thematic emphasis across cancer literacy programmes (Table 17).

Capacity domain	Capacities
Workforce capacity (oncology & PHC)	Development of clinical competencies of healthcare professionals in cancer prevention, early detection, diagnosis and treatment
	Strengthening primary health care teams' capacity to organise and implement cancer screening programmes
	Development of oncology and palliative care nursing competencies
	Enhancement of professional qualifications through CME/CPD, residency and specialised educational pathways
Health literacy & communication capacity	Development of health-literacy-friendly communication skills among healthcare professionals
	Ability to communicate complex medical information and support shared decision-making
	Development of sensitive communication skills (breaking bad news, managing conflict and crisis situations)
Patient empowerment & navigation capacity	Strengthening patients' capacity to navigate the healthcare system and cancer care pathways
	Development of knowledge and skills related to patients' rights, access to treatment and support
	Development of self-management, psychological adaptation and survivorship skills
Screening & prevention system capacity	Health system capacity to organise population-based screening programmes (invitation, recall, referral, quality assurance)
	Development of capacities for risk communication and preventive counselling
Digital & innovation capacity	Development of competencies in digital health, telemedicine and eHealth
	Development of genomic and precision oncology literacy among healthcare professionals
	Capacity to use digital learning platforms and innovative technologies in oncology care

Palliative & supportive care capacity	Development of capacities for symptom control, pain management and comprehensive palliative care
	Development of multidisciplinary collaboration and patient–family support skills
Public health & system-level capacity	Capacity to assess population health literacy and use data for policy planning
	Development of management and research capacities in public health and oncology

Table 17. Identified capacities derived from program goals and content (n=90)

The assessment of capacity domains developed in line with WHO approaches to health system capacity building and health literacy development at the individual, organisational and system levels [140, 191, 192]
showed (Table 18) that the leading positions among cancer literacy programmes have workforce development, prevention & screening system capacity, and patient empowerment & navigation, whereas the least attention is devoted to palliative & supportive care capacity and public health, leadership & governance capacity.

WHO-aligned capacity domain	n	%	95% CI
Workforce development (clinical, nursing, PHC, CME/CPD)	32	35.6	26.4–45.8
Prevention & screening system capacity	28	31.1	22.5–41.3
Patient empowerment & navigation	17	18.9	12.1–28.2
Health literacy & communication capacity	15	16.7	10.4–25.7
Digital health & innovation capacity	11	12.2	7.0–20.6
Palliative & supportive care capacity	9	10.0	5.4–17.9
Public health, leadership & governance capacity	7	7.8	3.8–15.2

Table 18. Aggregated capacity domains identified across programmes (n=90, %, 95% CI)
Note. Percentages are reported with 95% confidence intervals calculated using the Wilson method (18)

Analysis of the identified capacities across micro, meso and macro levels of the health system (140) indicates their predominant concentration at the meso level, which encompasses organisational and professional capacities of healthcare providers. This is reflected in the high representation of domains related to workforce development (35.6%), prevention & screening system capacity (31.1%), as well as digital health & innovation capacity (12.2%) and palliative & supportive care capacity (10.0%). The micro level, focused on patient interaction and individual capacities, is represented by patient empowerment & navigation (18.9%) and health literacy & communication capacity (16.7%). In contrast, the macro level, reflecting system-level governance and policy-oriented capacities, shows the lowest representation, particularly public health, leadership & governance capacity (7.8%), indicating a limited focus of cancer literacy programmes on strategic management and policy dimensions.

The assessment of the matrix mapping the distribution of identified capacity domains across cancer literacy programmes by participating countries (Table 19) showed that, in most countries, capacities related to workforce development and the organisation of prevention and screening are most systematically represented (notably in Italy, Ukraine, Portugal and Ireland), whereas health literacy–oriented, patient-centred and system-level governance capacities display a more fragmented representation. At the same time, patient-centred capacities are more consistently observed in Italy, Ireland and Portugal, while in some countries (Bulgaria and Montenegro) they are only modestly represented. Digital and innovation-related capacities are most pronounced in Italy and Belgium, whereas in several countries they remain fragmented. The least represented capacities across most countries are system-level and policy-oriented capacities, particularly in Bulgaria, Ireland and Montenegro, indicating a limited focus of cancer literacy programmes at the level of strategic governance and policy.

Country	Workforce development	Prevention & screening system capacity	Patient empowerment & navigation	Health literacy & communication capacity	Digital health & innovation capacity	Palliative & supportive care capacity	Public health, leadership & governance capacity
Belgium	✓	✓	◐	✓	✓	◐	◐
Bulgaria	✓	✓	◐	◐	◐	◐	–
Ireland	✓	✓	✓	✓	◐	◐	–
Italy	✓	✓	✓	✓	✓	◐	✓
Moldova	✓	✓	✓	◐	–	–	✓
Montenegro	◐	–	◐	◐	◐	–	–
Portugal	✓	✓	✓	✓	◐	–	✓
Romania	✓	–	◐	◐	◐	✓	◐
Ukraine	✓	✓	✓	◐	◐	◐	✓

Table 19. Mapping matrix of identified capacities by country based on programme goals and main content (aggregation was performed at country level without assessing programme effectiveness)

Notes:

✓ indicates that the capacity domain is clearly represented in the country dataset (identified in two or more programmes);

◐ indicates limited representation of the capacity domain (identified in one programme);

– indicates that the capacity domain was not identified in the available programme data

Types of programmes and delivery formats: accessibility, intensity and sustainability

The analysis of programme types (Table 20) indicates that training- and workshop-oriented programmes were the most frequently represented across consortium countries, accounting for 43.3% of all identified programmes. The predominance of this format was observed in the majority of countries and is likely associated with the relative ease of organising short-term educational activities, their flexibility, and their capacity for rapid adaptation to different target groups and thematic priorities, particularly in the areas of cancer prevention, screening, and patient communication.

The second most prevalent group comprised patient education programmes (32.2%), reflecting the increasing emphasis on improving patient awareness, strengthening self-navigation skills within the healthcare system, and supporting informed decision-making, in line with people-centred approaches to cancer care.

Programmes of continuous professional development were also widely represented, accounting for 27.8%. This finding indicates a systematic focus on enhancing the competencies of healthcare professionals, particularly in relation to cancer literacy, interprofessional communication, and the integration of preventive practices into clinical activities.

In contrast, formal education programmes (13.3%), thematic improvement programmes (12.2%), programmes targeting children and young people (7.8%), and project- or research-based programmes (7.8%) were the least represented. The limited share of these formats may be explained by their higher resource requirements, the need for institutional accreditation or longer implementation cycles, as well as the fact that many cancer literacy initiatives are implemented as discrete educational components within broader programmes rather than as standalone, formalised educational pathways.

Training- and workshop-oriented programmes were the most prevalent format in the majority of countries; however, their frequency varied substantially (p=0,006), ranging from 22.2% in Bulgaria and 30.0% in Ukraine to 83.3% in Montenegro, 80.0% in Portugal, and 66.7% in Italy. Patient education programmes demonstrated a relatively high but uneven prevalence, ranging from 16.7% in Romania and 20.0% in Portugal to 50.0% in Belgium and Montenegro. In Italy (41.7%) and Ireland (37.5%), such programmes were also identified with notable frequency (p<0,001).

Continuous professional development programmes exhibited pronounced cross-country differences: they were frequently identified in Italy (58.3%), Montenegro (50.0%), and Moldova (30.0%), whereas in Belgium, Romania, and Ireland such programmes were either not identified or occurred only sporadically (p=0,037).

Programme type	Belgium (n=4)	Bulgaria (n=9)	Ireland (n=8)	Italy (n=12)	Moldova (n=20)	Monte-Negro (n=6)	Portugal (n=5)	Romania (n=6)	Ukraine (n=20)	All countries (n=90)
Formal education	n=0; 0.0% (0.0–49.0%)	n=0; 0.0% (0.0–29.9%)	n=0; 0.0% (0.0–32.4%)	n=1; 8.3% (1.5–35.4%)	n=4; 20.0% (8.1–41.6%)	n=0; 0.0% (0.0–39.0%)	n=0; 0.0% (0.0–43.4%)	n=2; 33.3% (9.7–70.0%)	n=5; 25.0% (11.2–46.9%)	**n=12; 13.3% (7.8–21.9%)**
Continuous professional development (CPD)	n=0; 0.0% (0.0–49.0%)	n=2; 22.2% (6.3–54.7%)	n=0; 0.0% (0.0–32.4%)	n=7; 58.3% (32.0–80.7%)	n=6; 30.0% (15.0–51.9%)	n=3; 50.0% (18.8–81.2%)	n=1; 20.0% (3.6–62.4%)	n=0; 0.0% (0.0–39.0%)	n=6; 30.0% (14.5–51.9%)	**n=25; 27.8% (19.6–37.8%)**
Thematic improvement	n=1; 25.0% (4.6–69.9%)	n=1; 11.1% (2.0–43.5%)	n=0; 0.0% (0.0–32.4%)	n=4; 33.3% (14.6–58.9%)	n=2; 10.0% (2.8–30.1%)	n=2; 33.3% (9.7–70.0%)	n=0; 0.0% (0.0–43.4%)	n=0; 0.0% (0.0–39.0%)	n=1; 5.0% (0.9–23.6%)	**n=11; 12.2% (6.9–20.7%)**
Training / workshop	n=2; 50.0% (15.0–85.0%)	n=2; 22.2% (6.3–54.7%)	n=3; 37.5% (13.7–69.4%)	n=8; 66.7% (39.1–86.2%)	n=9; 45.0% (25.8–65.8%)	n=5; 83.3% (43.6–97.0%)	n=4; 80.0% (37.6–96.4%)	n=0; 0.0% (0.0–39.0%)	n=6; 30.0% (15.0–51.9%)	**n=39; 43.3% (33.3–53.9%)**
E-learning	n=1; 25.0% (4.6–69.9%)	n=1; 11.1% (2.0–43.5%)	n=2; 25.0% (7.1–59.1%)	n=4; 33.3% (14.6–58.9%)	n=3; 15.0% (5.2–36.0%)	n=2; 33.3% (9.7–70.0%)	n=1; 20.0% (3.6–62.4%)	n=1; 16.7% (3.0–56.4%)	n=3; 15.0% (5.2–36.0%)	**n=18; 20.0% (13.1–29.2%)**

Patient education	n=2; 50.0% (15.0–85.0%)	n=3; 33.3% (12.1–64.6%)	n=3; 37.5% (13.7–69.4%)	n=5; 41.7% (18.0–69.3%)	n=6; 30.0% (15.0–51.9%)	n=3; 50.0% (18.8–81.2%)	n=1; 20.0% (3.6–62.4%)	n=1; 16.7% (3.0–56.4%)	n=5; 25.0% (11.2–46.9%)	**n=29; 32.2% (23.4–42.4%)**
School / youth education	n=0; 0.0% (0.0–49.0%)	n=1; 11.1% (2.0–43.5%)	n=1; 12.5% (2.2–47.1%)	n=2; 16.7% (4.7–44.8%)	n=1; 5.0% (0.9–23.6%)	n=1; 16.7% (3.0–56.4%)	n=0; 0.0% (0.0–43.4%)	n=0; 0.0% (0.0–39.0%)	n=1; 5.0% (0.9–23.6%)	**n=7; 7.8% (3.8–15.2%)**
Public awareness campaigns	n=1; 25.0% (4.6–69.9%)	n=4; 44.4% (18.9–73.3%)	n=2; 25.0% (7.1–59.1%)	n=6; 50.0% (25.4–74.6%)	n=5; 25.0% (11.2–46.9%)	n=3; 50.0% (18.8–81.2%)	n=1; 20.0% (3.6–62.4%)	n=0; 0.0% (0.0–39.0%)	n=4; 20.0% (8.1–41.6%)	**n=26; 28.9% (20.4–39.2%)**
Project / research-based programmes	n=1; 25.0% (4.6–69.9%)	n=0; 0.0% (0.0–29.9%)	n=1; 12.5% (2.2–47.1%)	n=3; 25.0% (8.9–53.2%)	n=0; 0.0% (0.0–16.1%)	n=2; 33.3% (9.7–70.0%)	n=0; 0.0% (0.0–43.4%)	n=0; 0.0% (0.0–39.0%)	n=0; 0.0% (0.0–16.1%)	**n=7; 7.8% (3.8–15.2%)**

Table 20. Distribution of programme types across consortium countries (n, %, 95% CI)

Note: The unit of analysis is the programme. n denotes the number of programmes classified under a given programme type; percentages represent programme-level frequencies. One programme may be classified under more than one programme type.

95% confidence intervals were calculated using the Wilson method (1).

This reflects differing levels of engagement with CPD formats in the context of cancer literacy development.

Formal education was a relatively infrequent format and was identified only in selected countries, with the highest frequencies observed in Romania (33.3%), Ukraine (25.0%), and Moldova (20.0%), while in most other countries such programmes were not identified (p=0,239). This may indicate both limited integration of cancer literacy into formal educational pathways and potential incompleteness in the identification of programmes of this type within national mapping exercises.

Overall, the findings indicate a predominance of operationally oriented and practice-based learning formats, while long-term, institutionally integrated educational approaches remain less widespread, suggesting a potential area for further development of cancer literacy programmes across consortium countries.

Formal education programmes, programmes targeting children and young people, and public information and awareness campaigns did not demonstrate statistically significant differences between countries (p>0.05), indicating their relatively uniform or overall low prevalence across consortium countries.

The analysis of programme content demonstrated a predominance of mixed formats: 62 of the 90 identified programmes (68.9%) combined two or more educational or awareness-raising components, whereas mono-format initiatives accounted for 31.1%. This indicates the predominance of multi-component programme designs aimed at simultaneously addressing multiple levels of cancer literacy.

Among mixed programmes (n=62), combinations targeting patients, the general population, and healthcare professionals were most frequently observed.

The most common combination was patient education & public awareness campaigns, which was identified in 22 programmes, representing 35.5% of all mixed programmes and 24.4% of the total number of programmes. In several cases, this combination was further complemented by community-based activities or digital components.

The second most frequent combination consisted of CPD formats combined with training activities, thematic courses, or scientific and practical events. Such combinations were identified in 19 programmes, corresponding to 30.6% of mixed programmes and 21.1% of the overall programme pool. This reflects the predominance of modular models of professional education.

Combinations of patient education with e-learning and face-to-face activities (workshops, consultations) were identified in 11 programmes, accounting for 17.7% of mixed programmes and 12.2% of the total number, indicating active use of digital channels to reinforce traditional educational formats.

Other multi-component combinations, particularly those simultaneously involving education for the general population, children and young people, and healthcare professionals, were rare and together accounted for less than 15% of mixed programmes, predominantly within EU-funded or project-based initiatives

The analysis of the structural characteristics of the identified programmes (Table 21) indicates that the majority of cancer literacy initiatives are implemented outside mandatory regulatory frameworks: only 17.8% of programmes had a mandatory status, whereas 82.2% operated on a voluntary basis. This points to a predominantly initiative-driven and project-oriented nature of programmes, rather than their systematic integration into mandatory educational or professional pathways.

Characteristic	Category	n	%
Mandatory status	Mandatory	16	17.8
	Non-mandatory	74	82.2
Accreditation status	Accredited	46	51.1
	Not accredited	36	40.0
	Not specified	8	8.9
Delivery format	Face-to-face (offline)	30	33.3
	Online	27	30.0
	Blended	33	36.7
Periodicity	Regular	30	33.3
	Irregular	14	15.6
	On demand	46	51.1
Best practice identification	Identified as best practice	59	65.6
	Not identified as best practice	31	34.4

Table 21. Structural characteristics of identified programmes (n=90)
Note. Best practice status reflects expert assessment provided during national data collection

More than half of the programmes were accredited (51.1%), indicating the presence of institutional mechanisms for quality recognition at least for a part of initiatives. At the same time, 40.0% of programmes were not accredited, and for 8.9% the accreditation status was not specified, which may reflect heterogeneity in approaches to programme formalisation and external quality assessment across different countries and sectors.

The distribution by delivery format demonstrates a relatively balanced use of different modes of delivery: blended formats were most frequently applied (36.7%), followed by face-to-face (offline) programmes (33.3%) and online formats (30.0%). This distribution reflects the integration of various digital solutions alongside traditional approaches and the adaptation of programmes to different access conditions for target audiences.

More than half of the programmes (51.1%) operated in an on-demand format, indicating an orientation towards flexibility and continuous availability of educational content. At the same time, 33.3% of programmes had a defined regular periodicity, while 15.6%

were implemented as one-off or irregular initiatives, collectively highlighting the predominance of flexible and adaptive implementation models over rigid, fixed-cycle approaches.

An important finding is that 65.6% of programmes were identified as best practices based on expert assessments provided during national-level data collection. While this suggests a high perceived relevance of a substantial proportion of programmes, this indicator requires cautious interpretation, given the expert-based rather than standardised nature of the assessment.

Statistically significant differences between countries were observed with regard to the mandatory status of programmes - due to a relatively high frequency in Ukraine (40.0%) ($p=0.034$); accreditation status, due to a relatively high frequency in Moldova (65.0%) ($p<0.001$) and delivery format, reflecting the predominant use of blended formats in Belgium and online formats in Italy (75.0%) ($p=0.003$).

Differences were also observed for programme periodicity ($p<0.001$), driven by the predominance of exclusively on-demand formats in Moldova, regular programmes in Ireland (75.0%), and irregular programmes in Bulgaria (44.0%).

Finally, statistically significant differences were identified with respect to best practice identification ($p<0.001$), driven by the data from Moldova, where programmes were more frequently identified as best practices, and by the data from Portugal and Ukraine, where programmes were more often not identified as best practice (95%, 0%, and 35% best practice identification, respectively) (Figure 6).

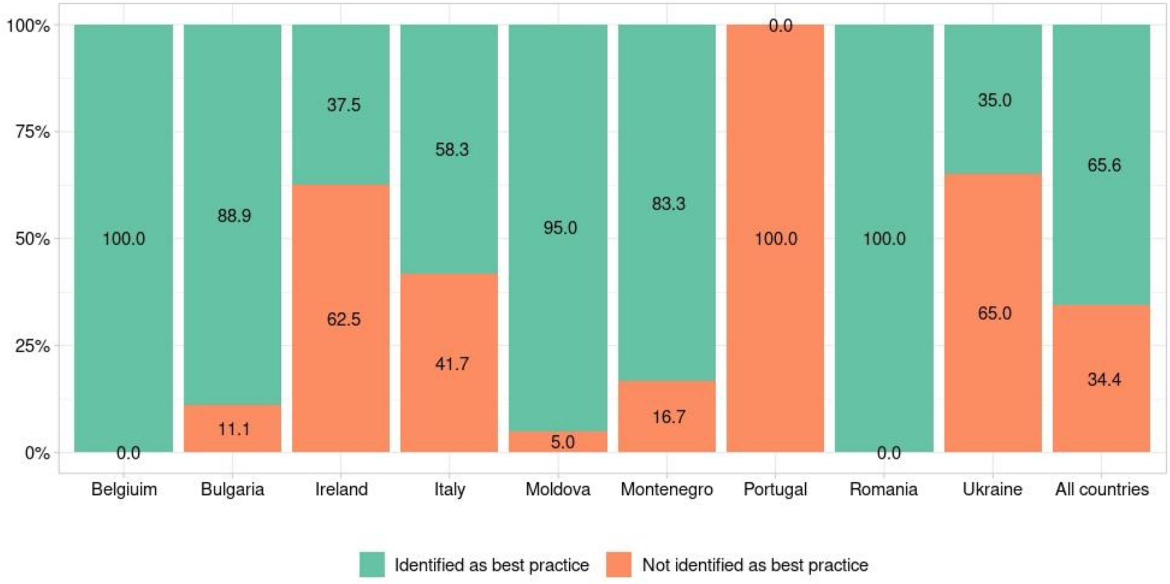

Figure 6. Percentage distribution of programmes by best practice status based on national expert assessment (% of total programmes)

Data on the number of participants were available for 37 programmes. The median number of participants was 400 individuals (95% CI 144–1,000), whereas the mean value was substantially higher at 14,239.8 individuals (95% CI 961.4–29,441.0), indicating a pronounced right-skewed distribution and the presence of individual programmes with very large reach (up to 200,000 participants).

Information on total programme duration was available for 21 programmes. The median duration was 10 hours (95% CI 6 – 60), while the mean duration was 94.0 hours (95% CI -0.5 – 188.4), with a range from 2 to 800 hours, indicating substantial heterogeneity in programme duration.

Data on credits were limited (8 programmes). The median number of credits was 11 (95% CI 3 – 50), and the mean value was 25.8 (95% CI -2.4 – 53.9), with a range from 3 to 100 credits.

No statistically significant cross-country differences were identified for the number of participants, programme duration, or the volume of credits (p>0.05).

The start year was identified for 68 programmes, and end-year data were available for 65 programmes.

The most frequent start year was 2024, and the most frequent end year was 2025, indicating a predominant concentration of programmes in recent years, alongside the presence of a limited number of long-term initiatives.

Cross-country synthesis and analytical conclusions

- Within the national mapping exercise, a total of 90 cancer literacy programmes delivered in national languages were identified. The analysis of programme organisers and providers demonstrated a pronounced intersectoral character of cancer literacy implementation across all consortium countries. Nearly half of the programmes were implemented within multi-sectoral configurations. Knowledge & Academia and Health & Care played a leading role in programme development and delivery, indicating the predominance of professional-educational and clinical logics in the development of cancer literacy.
- At the same time, the role of Civil society was substantial in several countries, which could be a compensation for possible limitations of institutional resources. More active involvement of Public Administration in several countries could have been related to institutionalised approaches to integrating programmes into national or regional health systems. By contrast, the Business sector remained marginally represented in most countries, pointing to the absence of sustainable mechanisms for engaging private actors in cancer literacy development.
- Cross-country analysis of target groups showed that healthcare and pharmaceutical professionals were most frequently identified as requiring education and training interventions in the field of cancer literacy: in nearly two thirds of programmes, they were defined as the primary target audience. Needs

for enhanced cancer literacy were most consistently articulated for physicians, oncologists, nurses, and primary care professionals. This distribution reflects existing gaps in initial training and continuing professional development for these groups, particularly with regard to cancer prevention, early detection, patient communication, and navigation across the cancer care continuum, as well as the perception of cancer literacy as an area of insufficiently developed professional competence within health systems.

- At the same time, programmes targeting the general population, patients, caregivers, and family members were not represented in a sufficiently systematic manner and showed substantial cross-country variability. In countries with a stronger role of the civil sector and local initiatives, a more balanced combination of professional- and population-oriented approaches was observed. Specific population groups (children and adolescents, older adults, and men) remained insufficiently covered, indicating limited consideration of age- and gender-specific needs within existing programmes.
- The synthesis of thematic areas demonstrated a predominance of programmes oriented towards primary and secondary cancer prevention, including screening, vaccination, and awareness-raising activities. The second dominant cluster consisted of programmes focused on professional education and continuing professional development in oncology. Together, these two thematic directions accounted for more than two thirds of all identified programmes.
- By contrast, programmes addressing patient education, navigation, survivorship, communication skills, and health literacy as a distinct domain were represented by a substantially smaller number of initiatives. The least developed areas included digital health and innovation, palliative care, as well as public health and system-level governance aspects of cancer literacy. This pattern indicates fragmentation in thematic approaches and uneven development of different components of cancer literacy at the national level.
- Overall, the results of the cross-country mapping indicate that cancer literacy across consortium countries is situated at different stages of institutionalisation and development. Professionally and prevention-oriented models remain dominant, while patient-centred, system-level, and digital components are developed unevenly. The high degree of cross-country variability in structures, target groups, and thematic focuses highlights the absence of harmonised frameworks and standards for cancer literacy development at the European level.

Limitations of the cross-country synthesis

1. The study is based on a desk-based scoping approach using publicly available sources and national expert searches. Accordingly, the identified set of programmes

reflects the availability and level of formalisation of information rather than the full scope of all initiatives implemented across consortium countries.

2. The number and structure of identified programmes should not be interpreted as indicators of the level of cancer literacy development in individual countries, as they depend on national documentation practices, language-specific characteristics, and approaches to public programme description.
3. Thematic areas, capacity domains, and target groups were defined through analytical grouping of descriptive data, which involves an element of subjective interpretation, despite the application of standardised criteria and expert validation.
4. The study did not include an assessment of programme effectiveness, outcomes, or population coverage, nor did it involve a direct analysis of needs. The results reflect declared objectives and programme content rather than actual impact.
5. The mapping does not fully capture the dynamic nature of the programme landscape; some initiatives may have been completed, temporary, or at different stages of implementation at the time of data collection.
6. In light of the above, the findings should be interpreted as an analytical basis for subsequent stages of the project, rather than as a comparative assessment of countries or an exhaustive inventory of national programmes.

Conclusions / Analytical synthesis

The integrated analysis of the international scoping review and the national mapping of education and training programmes made possible to develop a comprehensive understanding of how cancer literacy is conceptualised, operationalised, and practically implemented across consortium countries. Taken together, the findings indicate that cancer literacy is increasingly positioned within the scientific and policy domains as a multidimensional construct that extends beyond individual knowledge to encompass healthcare professionals' competencies, organisational practices, and system-level capacities across the entire cancer continuum. At the same time, this conceptual expansion has not yet been accompanied by coherent, standardised, and sustainable educational responses.

The results of the scoping review demonstrate that existing cancer literacy interventions remain fragmented, heterogeneous in content, and unevenly aligned with identified needs. Education and training initiatives are predominantly focused on prevention, screening, and communication at early stages of care, while the stages of treatment, patient navigation within the health system, survivorship, and long-term support are addressed less systematically. In addition, persistent limitations were identified, including the lack of standardisation of programme content, insufficient use of needs-based approaches, and weak integration of cancer literacy into formal professional education and continuing professional development pathways.

The national mapping of programmes complemented these findings by providing empirical evidence on the actual implementation of educational initiatives across consortium countries. The analysis revealed pronounced cross-country variability, reflecting differences in institutional development, health system governance, and resource availability. Although most programmes are implemented through intersectoral arrangements, their institutional core is predominantly formed by the health sector, academia, and civil society, while the involvement of education authorities and the private sector remains limited. This suggests that cancer literacy is currently developing more as a discrete or project-based activity rather than as a systematically integrated, cross-sectoral component of public health.

The synthesis of findings from both analytical components revealed a structural gap between the growing recognition of cancer literacy as a strategic priority at the level of European policies and the limited availability of scalable, accredited, and institutionally embedded education and training programmes at the national level. Despite the clearly articulated role of cancer literacy in reducing inequalities, improving access to care, and advancing people-centred cancer care, these priorities have not yet been consistently reflected in workforce education and development strategies.

Overall, the findings underscore the need for a more coordinated and forward-looking approach to capacity building in the field of cancer literacy in Europe. The evidence base generated through this study clearly delineates key gaps (including the fragmentation and uneven distribution of educational interventions, limited coverage of the full cancer continuum, the absence of aligned competency frameworks, and insufficient integration of cancer literacy into formal professional education and continuing professional development) as well as potential directions for development. Together, these findings provide a well-founded basis for the development of a flagship European cancer literacy training programme for healthcare professionals, with the prospect of its subsequent integration into national health systems, professional education structures, and policy frameworks.

Main recommendations

Develop a European Framework for Cancer Literacy

A harmonised European Framework for Cancer Literacy should be developed to:

- define minimum standards and core competencies across the entire cancer continuum;
- ensure comparability of approaches and outcomes across countries;
- provide guidance for the design, implementation and evaluation of education and training initiatives.

The European Framework should be aligned with the priorities of the EU Beating Cancer Plan and with health equity principles.

Strengthen the Health Workforce Education and Training System

Cancer literacy should be systematically integrated into:

- undergraduate and postgraduate education of healthcare professionals (priority groups: primary care physicians, oncologists, nurses, pharmacists, and public health professionals);
- continuing professional development (CPD) systems and lifelong learning;
- training of non-clinical professionals involved in cancer care and patient support (including health managers and administrators, leaders of patient and civil society organisations, educators, social workers, patient navigators and caregivers).

Priority should be given to the development of communication skills, risk communication, shared decision-making, and health literacy-sensitive practice.

Ensure a Multimodal and Professionally Differentiated Training Design

Cancer literacy training programmes should be designed to:

- provide differentiated learning content according to core professional functions, levels of oncology-related responsibility, and the educational roles of relevant professional groups;
- be based on a matrix-based multimodal architecture combining content modules (key cancer literacy domains across the cancer continuum) with their differentiated targeting to relevant professional groups within the healthcare system.

Training formats should combine online tools with face-to-face modules, interactive seminars, simulation-based and case-oriented methods, as well as interprofessional learning.
Such an architecture enables flexible adaptation of training programmes to national contexts and diverse professional roles, thereby enhancing their practical relevance and effectiveness.

Ensure Training Scale-up and Sustainability through a Cascade (Train-the-Trainer) Model

To ensure scalability and sustainable implementation of cancer literacy training, a cascade model using a train-the-trainer approach should be applied, enabling the sequential transfer of knowledge and skills according to the following logic:
public health professionals → healthcare professionals → the population.

A central element of this model should be the preparation of "multipliers" - professional and community leaders capable of scaling educational interventions within their institutions and communities. This approach strengthens sustainability and supports the integration of cancer literacy training into routine practice within healthcare and public health systems.

Address Inequalities through Targeted Cancer Literacy Interventions

Policies should prioritise population groups that are disproportionately affected by low levels of cancer literacy, including:

- people with lower socioeconomic status;
- migrants and linguistic minorities;
- older adults and individuals with low digital skills;
- residents of rural and underserved areas.

Interventions should be culturally sensitive, linguistically appropriate and co-designed with communities.

Foster Multi-Sectoral Collaboration

Effective cancer literacy strategies require coordination between:

- healthcare and public health systems;
- the education sector;
- civil society and patient organisations;
- digital and media stakeholders.

Multi-sectoral collaboration should be embedded in policy design and funding mechanisms.

Ensure Sustainability and Policy Integration

Cancer literacy initiatives should move beyond short-term projects by:

- being embedded in national cancer control plans and EU funding mechanisms;
- aligning with broader European strategies (EU Beating Cancer Plan, EU4Health, Digital Europe);
- ensuring long-term political and financial commitment.

Cancer literacy training programmes should be regarded as a long-term investment in health system capacity, supported by appropriate regulatory, organisational and financial mechanisms, and enabling sustainable impact on reducing inequalities, improving access to information and strengthening cancer prevention.

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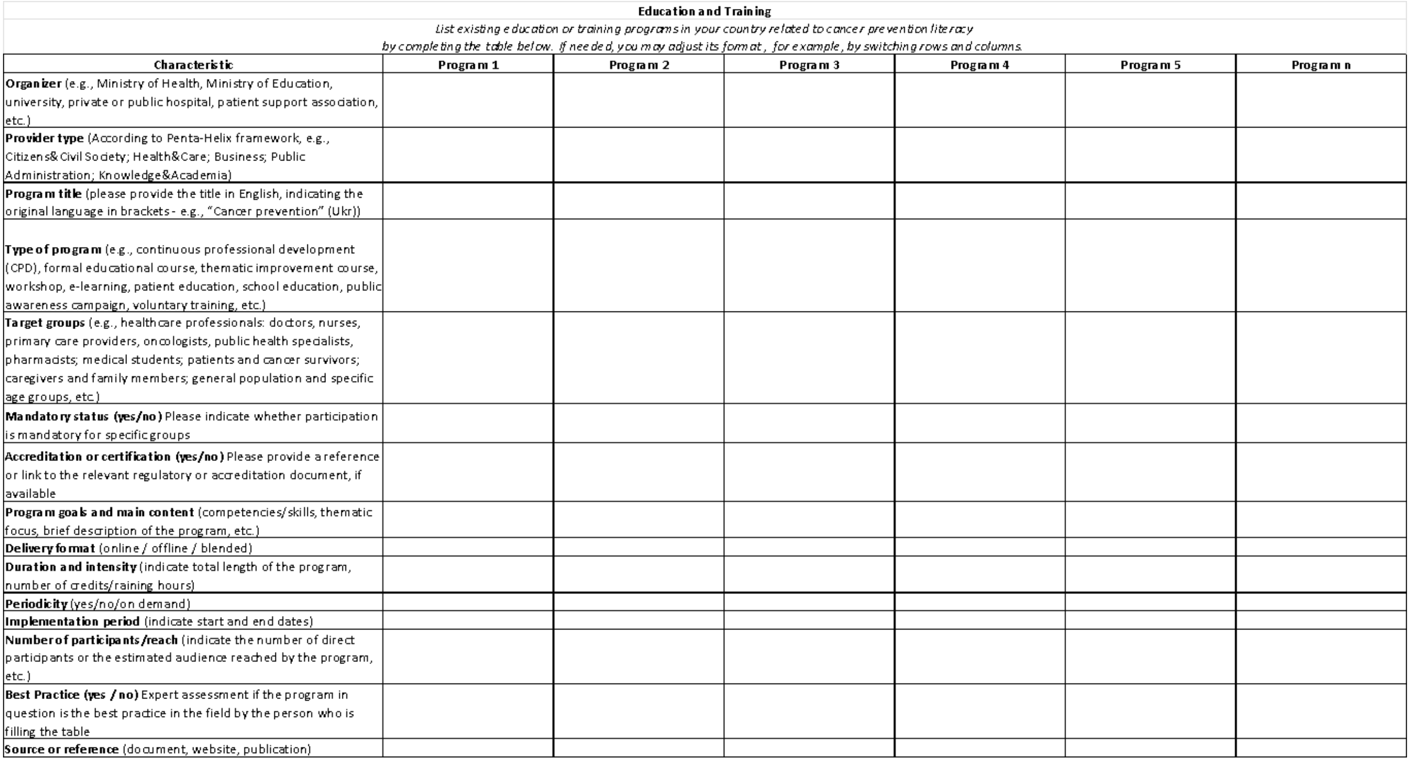
Appendix

Appendix 1

National mapping methodology



Education and Training

List existing education or training programs in your country related to cancer prevention literacy by completing the table below. If needed, you may adjust its format, for example, by switching rows and columns.

Characteristic	Program 1	Program 2	Program 3	Program 4	Program 5	Program n
Organizer (e.g., Ministry of Health, Ministry of Education, university, private or public hospital, patient support association, etc.)						
Provider type (According to Penta-Helix framework, e.g., Citizens& Civil Society; Health&Care; Business; Public Administration; Knowledge&Academia)						
Program title (please provide the title in English, indicating the original language in brackets - e.g., "Cancer prevention" (Ukr))						
Type of program (e.g., continuous professional development (CPD), formal educational course, thematic improvement course, workshop, e-learning, patient education, school education, public awareness campaign, voluntary training, etc.)						
Target groups (e.g., healthcare professionals: doctors, nurses, primary care providers, oncologists, public health specialists, pharmacists; medical students; patients and cancer survivors; caregivers and family members; general population and specific age groups, etc.)						
Mandatory status (yes/no) Please indicate whether participation is mandatory for specific groups						
Accreditation or certification (yes/no) Please provide a reference or link to the relevant regulatory or accreditation document, if available						
Program goals and main content (competencies/skills, thematic focus, brief description of the program, etc.)						
Delivery format (online / offline / blended)						
Duration and intensity (indicate total length of the program, number of credits/raining hours)						
Periodicity (yes/no/on demand)						
Implementation period (indicate start and end dates)						
Number of participants/reach (indicate the number of direct participants or the estimated audience reached by the program, etc.)						
Best Practice (yes / no) Expert assessment if the program in question is the best practice in the field by the person who is filling the table						
Source or reference (document, website, publication)						

Figure 7. National mapping methodology

Appendix 2

Summary table of information sources and search results

Database / Source	Main focus of search	Number of records identified	Inclusion status
PubMed / MEDLINE	Cancer literacy and health literacy in oncology; needs, barriers and facilitators; education and training programmes; European and consortium country context	228	Included after deduplication and screening
Scopus	Education and training programmes; interdisciplinary and public health perspectives on cancer literacy	227	Included after deduplication and screening
Web of Science Core Collection	Educational, policy-related and communication aspects of cancer literacy	306	Included after deduplication and screening
SpringerLink	Full-text and interdisciplinary literature on cancer literacy, education and training programmes not fully indexed in biomedical databases	Targeted search	Selectively included
Institutional and organisational websites (WHO, WHO Europe, European Commission, European Observatory on Health Systems and Policies, national cancer institutes and ministries of health)	Policy documents, reports and directly implemented education and training programmes relevant to cancer literacy in consortium countries	Targeted search	Selectively included

Table 22. Summary table of information sources and search results