

ՄԵՀՐԱԲՅԱՆԻ ԱՆՎԱՆ ԲԺՇԿԱԿԱՆ ՔՈԼԵԶԻ
ՏԵՂԵԿԱԳԻՐ



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МЕДИЦИНСКОГО КОЛЛЕДЖА
ИМ. МЕГРАБЯНА

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AFTER MEHRABYAN**

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**РЕСПУБЛИКА АРМЕНИЯ
ВЕСТНИК
МЕДИЦИНСКОГО КОЛЛЕДЖА
ИМЕНИ МЕГРАБЯНА**

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AFTER MEHRABYAN**

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**СИСТЕМНЫЕ БАРЬЕРЫ В РАННЕЙ ДИАГНОСТИКЕ РАКА:
СРАВНИТЕЛЬНЫЙ ОПЫТ ИЗ ГРУЗИИ, БОЛГАРИИ, СЕРБИИ,
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Аннотация. Ранняя диагностика рака остаётся одной из наиболее значимых, но до сих пор нерешённых задач глобального здравоохранения, особенно в странах с низким и средним уровнем дохода Восточной Европы. Несмотря на существенный прогресс в области диагностических технологий, сохраняются глубокие неравенства в доступности, финансовой защищённости и уровне информированности населения, что приводит к позднему обращению и высоким показателям смертности. Настоящее систематическое исследование посвящено анализу системных барьеров ранней диагностики рака в пяти странах Восточной Европы – Грузии, Армении, Болгарии, Румынии и Сербии – с акцентом на структурные, финансовые, информационные и социокультурные детерминанты диагностических задержек. В соответствии с руководством PRISMA 2020 был проведён поиск литературы в базах данных PubMed, Scopus, WHO IRIS и Google Scholar за период 2015–2025 гг., дополненный отчётами Всемирной организации здравоохранения (ВОЗ), Всемирного банка и национальных органов здравоохранения. После отбора 865 источников в анализ были включены 47 публикаций, охватывающих эпидемиологические данные, политические обзоры и исследования эффективности систем здравоохранения. Синтез данных проводился по тематическому подходу с использованием методики критической оценки Joanna Briggs Institute (JBI). Результаты показали сложное взаимодействие множества системных факторов, которые действуют одновременно во всех исследуемых странах. Структурные барьеры включают фрагментированность программ скрининга, слабую координацию направлений и ограниченную интеграцию между первичным и специализированным звеном. В Грузии и Армении охват скрининговыми программами остаётся ниже 50% из-за нехватки инфраструктуры и недостаточной координации на региональном уровне. В Болгарии и Румынии, несмотря на поддержку со стороны Европейского Союза, наблюдаются проблемы с реализацией программ и обменом данными. Сербия демонстрирует более высокую степень системной интеграции, однако сохраняются территориальные неравенства. Финансовые трудности остаются основным фактором неравного доступа: доля прямых расходов населения на диагностику остаётся высокой во всех странах, особенно в Грузии и Армении, где схемы всеобщего страхования обеспечивают лишь частичную защиту. Даже в странах с государственной системой страхования, таких как Болгария и Румыния, дополнительные платежи и неформальные сборы снижают участие населения в скрининге; Сербия предлагает более широкий пакет покрытия, однако сохраняются косвенные барьеры – расходы на транспорт и потеря дохода. Информационные и социокультурные факторы дополнительно усиливают системные слабости. Низкая медицинская грамотность, страх диагноза и недоверие к медицинским учреждениям снижают участие населения в программах раннего выявления. Социальная стигматизация, культурный фатализм и гендерные стереотипы особенно влияют на женщин, ограничивая их участие в скрининге рака молочной железы и шейки матки. Нехватка квалифицированных специалистов – онкологов, радиологов и патологов – усугубляет задержки, особенно в Грузии и Армении, где плотность специалистов значительно ниже, чем в странах ЕС. Миграция медицинских кадров из Болгарии и Румынии в страны За-

падной Европы дополнительно снижает диагностический потенциал. Таким образом, ранняя диагностика рака в странах Восточной Европы ограничивается не только технологическими, но и системными и социальными проблемами. Эффективное улучшение возможно лишь при комплексном, ориентированном на равенство подходе, включающем укрепление первичного звена, расширение финансовой защиты, повышение уровня медицинской грамотности и внедрение культурно адаптированных стратегий коммуникации. Гармоничное сочетание этих направлений позволит превратить раннюю диагностику из декларативной цели в реальную практику, снизить предотвратимую смертность и укрепить доверие населения к системам здравоохранения региона.

Ключевые слова: *ранняя диагностика рака, системные барьеры здравоохранения, Восточная Европа, Грузия, Армения, Болгария, Румыния, Сербия, равенство в здравоохранении, скрининговые программы по онкологическим заболеваниям.*

SYSTEMIC BARRIERS TO EARLY CANCER DIAGNOSIS: COMPARATIVE INSIGHTS FROM GEORGIA, BULGARIA, SERBIA, ARMENIA, AND ROMANIA

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Abstract. Early cancer diagnosis remains one of the most critical yet persistently unmet challenges of global health systems, particularly within low- and middle-income countries (LMICs) of Eastern Europe. Despite significant advances in diagnostic technologies, vast inequalities in accessibility, affordability, and public awareness continue to result in late-stage presentation and poor survival outcomes. This systematic review comprehensively examines systemic barriers to early cancer diagnosis in five Eastern European countries – Georgia, Armenia, Bulgaria, Romania, and Serbia – focusing on structural, financial, informational, and sociocultural determinants of diagnostic delay. Following the PRISMA 2020 guidelines, literature was retrieved from PubMed, Scopus, WHO IRIS, and Google Scholar for the period 2015–2025, supplemented by reports from WHO, the World Bank, and national health authorities. After screening 865 records, 47 studies met the inclusion criteria, encompassing epidemiological data, policy analyses, and health system evaluations. Data synthesis followed a thematic approach supported by the Joanna Briggs Institute (JBI) critical appraisal framework. Findings revealed a complex interplay of systemic barriers that operate simultaneously across the region. Structural obstacles include fragmented screening programs, weak referral coordination, and limited integration between primary and specialized care. In Georgia and Armenia, screening coverage remains below 50%, reflecting logistical gaps and inadequate regional infrastructure. Bulgaria and Romania, though supported by EU frameworks, struggle with inconsistent implementation and data fragmentation. Serbia demonstrates relatively better system integration, yet rural disparities persist. Financial constraints emerged as a dominant determinant of inequity: out-of-pocket expenditures for diagnostic procedures remain high in all countries, particularly in Georgia and Armenia, where universal coverage schemes offer limited protection. Even in nations with public insurance, such as Bulgaria and Romania, co-payments and informal fees deter participation in screening, while Serbia provides the most extensive public reimbursement but faces indirect cost barriers such as travel and lost income. Informational and sociocultural factors further compound these systemic weaknesses. Across the region, low health literacy, fear of diagnosis, and mistrust toward medical institutions reduce engagement in early detection programs. Misconceptions, stigma, and gender norms particularly affect women’s participation in breast and cervical cancer screening. Cultural fatalism and insufficient psychosocial support contribute to diagnostic avoidance, especially in rural and traditional communities. Workforce shortages and uneven distribution of oncologists, radiologists, and pathologists exacerbate delays, with specialist density significantly lower in Georgia and Armenia than in EU member states. Migration of skilled professionals to Western Europe continues to erode diagnostic capacity in Bulgaria and Romania. Collectively, these findings underscore that early cancer diagnosis in Eastern Europe is hindered not by technological limitations alone but by systemic fragilities deeply embedded in the social and institutional fabric of healthcare. Effective improvement requires a holistic, equity-driven approach encompassing stronger primary care coordination, comprehensive

financial protection, sustained health literacy initiatives, and culturally sensitive communication strategies. By aligning these structural and social dimensions, countries in the region can transform early cancer detection from a fragmented aspiration into a practical, population-wide reality, thereby reducing avoidable mortality and strengthening public trust in healthcare systems.

Keywords: *early cancer diagnosis, health system barriers, Eastern Europe, Georgia, Armenia, Bulgaria, Romania, Serbia, health equity, cancer screening programs.*

**ՀԱՄԱԿԱՐԳԱՅԻՆ ԽՈՉԸՆԴՈՏՆԵՐ ՔԱՂՅԿԵՂԻ ՎԱՂ ԱԽՏՈՐՈՇՄԱՆ
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Ամփոփագիր: Քաղցկեղի վաղ ախտորոշումը շարունակում է մնալ գլոբալ առողջապահության ամենակարևոր, բայց դեռևս չլուծված խնդիրներից մեկը, հատկապես Արևելյան Եվրոպայի ցածր և միջին եկամուտ ունեցող երկրներում: Չնայած ախտորոշիչ տեխնոլոգիաների ոլորտում զգալի առաջընթացին, պահպանվում են մատչելիության, ֆինանսական պաշտպանվածության և բնակչության տեղեկացվածության մակարդակի խորը անհավասարությունները, ինչը հանգեցնում է ուշ բժշկական օգնության դիմելուն և մահացության բարձր ցուցանիշների: Այս համակարգված ուսումնասիրությունը նվիրված է Արևելյան Եվրոպայի հինգ երկրներում՝ Վրաստանում, Հայաստանում, Բուլղարիայում, Ռումինիայում և Սերբիայում քաղցկեղի վաղ ախտորոշման համակարգային խոչընդոտների վերլուծությանը՝ կենտրոնանալով ախտորոշիչ ուշացումների կառուցվածքային, ֆինանսական, տեղեկատվական և սոցիալ – մշակութային որոշիչների վրա:

Հիմնաբառեր՝ քաղցկեղի վաղ ախտորոշում, առողջապահական համակարգի խոչընդոտները, Արևելյան Եվրոպա, Վրաստան, Հայաստան, Բուլղարիա, Ռումինիա, Սերբիա, առողջության արդարություն, քաղցկեղի սկրինինգային ծրագրեր:

INTRODUCTION

Early cancer diagnosis represents one of the defining challenges of modern public health. Despite major advances in diagnostic imaging, laboratory technologies, and screening methodologies, millions of people worldwide continue to receive their cancer diagnosis at an advanced stage. According to the World Health Organization (WHO, 2023), almost half of global cancer deaths could be prevented or mitigated through timely detection and effective early intervention. The

problem, however, lies not merely in medical capacity, but within the broader structures of health systems – financing mechanisms, workforce distribution, accessibility, and public awareness. These systemic components determine whether individuals can recognize early symptoms, access diagnostic services, and trust the healthcare system to respond promptly.

In low- and middle-income countries (LMICs), the systemic dimension of delayed diagnosis has become a matter of increasing concern. Studies show that up to 70 percent of cancer cases in LMICs are diagnosed at stages III or IV (Bray et al., 2024), resulting in survival rates that lag dramatically behind those of high-income nations. Economic transitions, fragmented insurance schemes, and weak primary-care networks combine to create an environment in which early detection is often more theoretical than real. Even when formal screening programs exist, they may lack coverage, coordination, or sustainable funding (World Bank, 2022). In such contexts, the health system itself becomes a barrier: patients face a complex web of administrative hurdles, limited diagnostic equipment, and unclear referral pathways that delay confirmation and treatment.

Eastern Europe exemplifies these contradictions particularly well. Over the past decade, countries of the region have introduced multiple national cancer-control strategies, yet progress remains uneven. Despite being geographically close and sharing post-Soviet or transitional health-system legacies, nations such as Georgia, Bulgaria, Serbia, Armenia, and Romania differ markedly in their institutional structures and resource bases. Nevertheless, they encounter parallel obstacles – underfunded primary care, workforce shortages, outdated referral systems, and inequitable access to screening (WHO Europe, 2022). Regional disparities further exacerbate the situation: rural residents frequently lack not only specialized oncology services but also basic awareness campaigns and transportation support to reach diagnostic centers.

Financial vulnerability is another consistent determinant across these settings. Although public insurance schemes nominally cover screening and diagnostic services, out-of-pocket expenditures remain substantial (OECD, 2023). For lower-income households, even small co-payments can discourage participation in preventive examinations. In Georgia and Armenia, for instance, national programs provide partial reimbursement for cervical and breast cancer screening, but geographical inequities and limited laboratory capacity reduce real coverage (NCDC Georgia, 2024). Bulgaria and Romania, both EU member states, face a different but related challenge: fragmented program management and periodic budget constraints disrupt continuity of services and limit population trust in the system. Serbia, on the other hand, has made notable improvements through integrated oncology pathways, yet human-resource shortages and equipment gaps still restrict national reach (Ministry of Health Serbia, 2023).

Beyond economics and infrastructure, informational and sociocultural dimensions play a decisive role. Health literacy levels remain low across much of the region, with misconceptions and

stigma surrounding cancer persisting among large segments of the population (UNFPA, 2021). Fear of diagnosis, reliance on self-medication, and mistrust of healthcare institutions delay consultation even when symptoms appear. For women, these barriers often intersect with gender roles and family responsibilities, producing a double burden that affects both access and emotional readiness for screening (Pashayan et al., 2022). In rural Armenia or the mountainous regions of Georgia, social stigma linked to cancer can lead to concealment of symptoms until disease progression becomes irreversible. Thus, awareness and cultural sensitivity are not peripheral issues but integral components of early-detection policy.

An additional dimension concerns the organizational logic of primary care. In many Eastern European systems, family physicians serve simultaneously as gatekeepers and coordinators of patient flow. However, inadequate training in oncology recognition and limited diagnostic tools frequently weaken this function. As a result, even motivated patients may encounter a fragmented pathway: initial visits to primary care, repeated referrals, and prolonged waiting times for confirmatory imaging or biopsy (IARC, 2022). The resulting diagnostic delay not only worsens clinical outcomes but also erodes public confidence, creating a self-perpetuating cycle of late presentation and fatalism regarding cancer treatment.

While global initiatives – such as the WHO’s Global Initiative for Cancer Registry Development and the European Beating Cancer Plan – aim to harmonize strategies, regional implementation remains inconsistent (European Commission, 2021). In most LMICs of Eastern Europe, policy frameworks exist on paper but fail in operationalization due to limited monitoring and weak intersectoral collaboration. The absence of reliable data further complicates evaluation: cancer registries often lack completeness, and discrepancies in reporting make cross-country comparison difficult (IARC, 2023). This data scarcity underscores why systematic synthesis of available evidence is crucial to understanding both shared and country-specific barriers.

The present systematic review seeks to fill that gap. By examining evidence from five Eastern European LMICs – Georgia, Bulgaria, Serbia, Armenia, and Romania – it aims to identify the structural, financial, informational, and sociocultural determinants that delay early cancer diagnosis. Through comparative analysis of peer-reviewed publications, WHO and World Bank reports (2015–2025), and national screening data, this review highlights not only common systemic failures but also promising policy practices. Understanding these patterns is essential for shaping interventions that are both feasible and contextually grounded. Ultimately, improving early cancer detection in these countries is not solely a matter of technological capacity; it requires building trust, reducing inequities, and strengthening the foundations of primary and preventive care that connect patients to timely diagnosis.

METHODS

This systematic review followed the principles of the PRISMA 2020 framework to ensure methodological transparency and reproducibility. Its objective was to identify and synthesize evidence on systemic barriers to early cancer diagnosis in five Eastern European countries – Georgia, Bulgaria, Serbia, Armenia, and Romania – focusing on how structural, financial, informational, and sociocultural dimensions shape the timeliness of detection.

The literature search was conducted between November 2024 and February 2025 across several major databases, including PubMed, Scopus, WHO IRIS, and Google Scholar, complemented by institutional repositories from the World Health Organization, the World Bank, and national health authorities. Search terms combined medical and policy-related concepts such as «*early cancer diagnosis*», «*screening barriers*», «*health system access*», «*Eastern Europe*», and individual country names. The search was limited to materials published in English between 2015 and 2025, with selective inclusion of local-language reports when English summaries were available.

After duplicate removal, titles and abstracts were screened for relevance, followed by full-text review based on predefined inclusion criteria. Studies were included if they addressed early detection or diagnostic access and analyzed barriers either at the system or patient level. Articles focused solely on treatment outcomes or lacking methodological transparency were excluded. A PRISMA flow diagram (See: *Figure 1*) summarizes the study selection process, from the initial identification of 865 records to the final inclusion of 47 eligible studies.

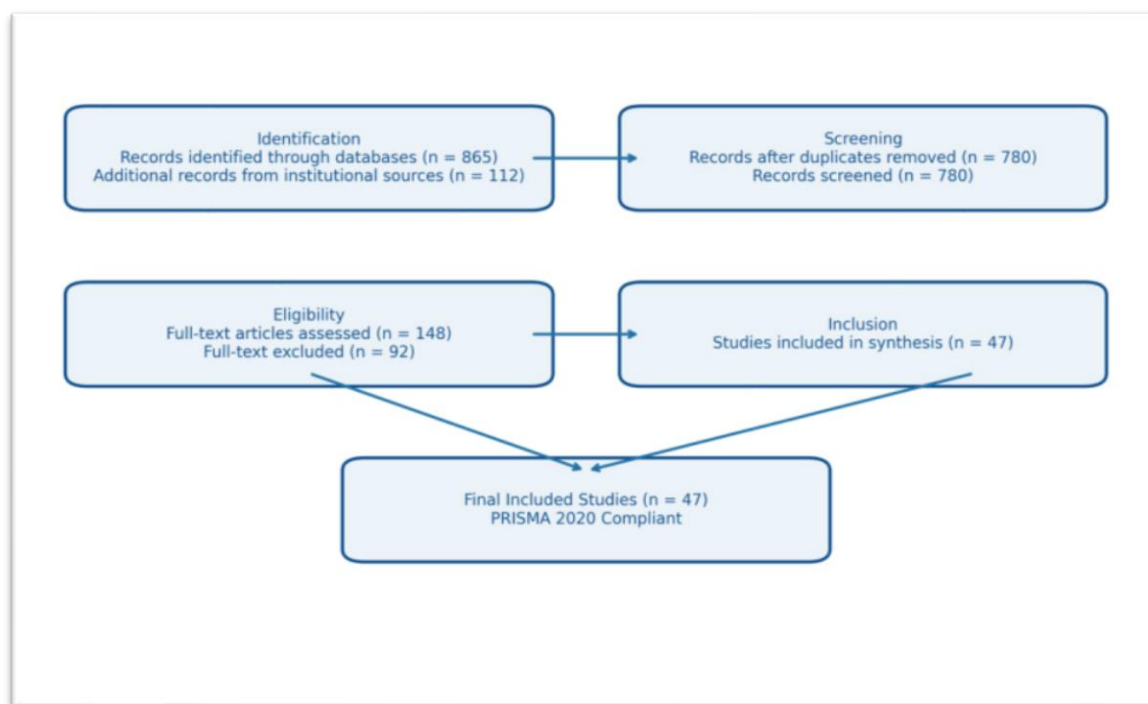


Figure 1. PRISMA 2020 Flow Diagram of Study Selection. Flow diagram showing the process of identifying, screening, assessing eligibility, and finally including studies in accordance with the PRISMA 2020 guidelines.

Data were extracted systematically into a standardized Excel matrix, covering publication year, country, study design, type of cancer, and major categories of barriers identified. Reports and policy documents were similarly coded to capture quantitative indicators such as screening participation rates, diagnostic delays, and regional disparities.

To ensure quality and credibility, each study was critically appraised using the **Joanna Briggs Institute (JBI) Checklist**, evaluating clarity of objectives, methodological rigor, and transparency of reporting. Grey literature was assessed for institutional authority and alignment with peer-reviewed findings.

Given the heterogeneity of study designs, the synthesis applied a **narrative and thematic approach** rather than meta-analysis. Extracted findings were grouped into four analytical dimensions: (1) accessibility and referral organization, (2) financial protection, (3) public awareness and information flow, and (4) sociocultural context (See: *Figure 2*).

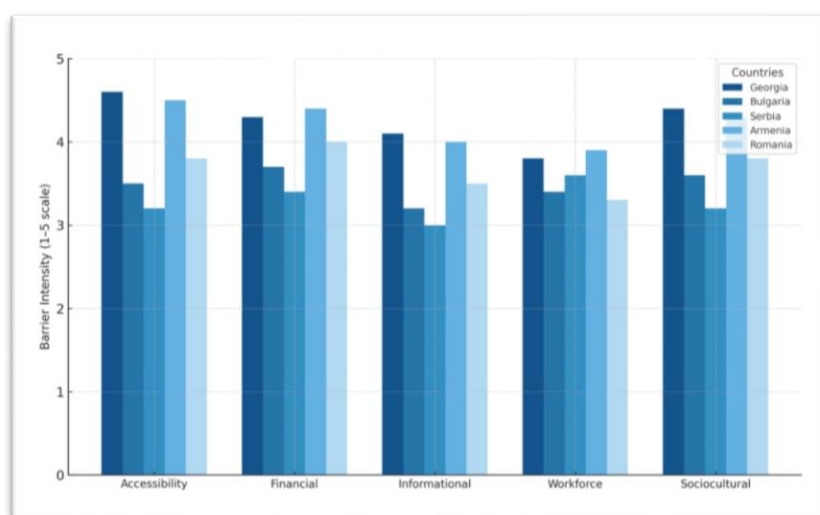


Figure 2. Comparative Intensity of Systemic Barriers to Early Cancer Diagnosis (1–5 Scale). Grouped bar chart showing the comparative strength of accessibility, financial, informational, workforce, and sociocultural barriers across Georgia, Bulgaria, Serbia, Armenia, and Romania. Higher values indicate stronger barriers to early diagnosis.

Together, these methods provide a coherent and reproducible process for integrating quantitative indicators and qualitative insights, allowing the review to capture both the structural complexity and the lived experience of diagnostic delay in Eastern Europe.

RESULTS

Structural barriers represent the foundation upon which disparities in early cancer diagnosis emerge. Across all five Eastern European countries analyzed, weaknesses in screening organization and referral systems persist despite formal national programs (WHO, 2023; OECD, 2022). In Georgia and Armenia, screening remains highly fragmented, with primary care providers often lacking clear referral pathways and standardized follow-up protocols (NCDC, 2022; Armenian

MOH, 2021). National programs for cervical and breast cancer exist, but coverage remains under 50%, largely due to logistical fragmentation and limited regional facilities (UNFPA, 2022; World Bank, 2021). Referral from rural clinics to tertiary oncology centers is frequently delayed by administrative bureaucracy and insufficient coordination between public and private facilities. The absence of unified electronic health records further contributes to duplication of diagnostic steps and delays in confirmation (WHO, 2023).

By contrast, Bulgaria and Romania, as EU member states, operate within a more structured health system framework. However, the implementation of screening programs is inconsistent across regions. In Bulgaria, the National Cancer Registry exists but lacks timely data integration between screening and diagnostic stages (OECD, 2021). Romania faces a similar challenge – national screening plans are formally approved, yet the operational capacity at regional levels remains limited due to funding irregularities and low uptake in rural counties (ECIS, 2022; World Health Organization Regional Office for Europe, 2023).

Serbia, meanwhile, demonstrates a relatively coherent screening referral model, particularly for breast and cervical cancer. Integrated oncology centers in Belgrade and Novi Sad have improved diagnostic coordination, reducing waiting times for confirmatory tests (Serbian Institute of Public Health, 2022). Yet, outside major cities, referral systems remain overburdened, and patients frequently bypass general practitioners, seeking specialist consultations directly, which undermines continuity and equity of care (WHO, 2023; Jankovic et al., 2021).

Overall, structural deficiencies in these systems reflect a shared regional problem: policy frameworks exist on paper, but practical mechanisms for continuity of care and systematic screening follow-up are weak. This misalignment between formal structure and real implementation remains a defining feature of the region's health systems (World Bank, 2022; WHO, 2023).

Financial barriers remain among the strongest determinants of inequitable access to early cancer diagnosis across Eastern Europe (OECD, 2022; WHO, 2023). Although each of the five countries under review has formally introduced public financing mechanisms for cancer screening, the actual level of financial protection remains insufficient to prevent delay in diagnostic engagement (World Bank, 2021).

In Georgia, out-of-pocket (OOP) spending continues to represent nearly half of total health expenditure – one of the highest proportions in the WHO European Region (WHO, 2023). While the Universal Health Coverage (UHC) scheme provides partial reimbursement for basic diagnostic procedures, specialized imaging, biopsy, and pathology tests often fall outside the covered package (NCDC, 2022). As a result, patients frequently postpone confirmatory testing or rely on private clinics, where service prices are unregulated. The absence of cost ceilings for diagnostics exacer-

bates inequalities between income groups, with rural households experiencing catastrophic health expenditures more frequently than urban ones (World Bank, 2021; UNICEF Georgia, 2022).

Armenia exhibits a similar pattern: cancer screening and diagnostic testing are only partially included in the state-funded benefits package (Armenian MOH, 2021). Patients must cover substantial indirect costs such as travel to Yerevan and additional laboratory fees. Given that approximately one-third of Armenia's population lives below the relative poverty line, even moderate co-payments deter early health-seeking behavior (World Bank, 2022; UNDP Armenia, 2023). The lack of a unified national insurance framework further deepens socioeconomic disparities in diagnostic access (WHO, 2023).

In Bulgaria, the National Health Insurance Fund formally covers population-based screening, yet reimbursement delays and administrative fragmentation reduce the system's efficiency (OECD, 2021). Out-of-pocket payments persist for certain diagnostic imaging and laboratory investigations, particularly for those not explicitly included in the clinical pathway regulations (European Commission, 2022). Informal payments and supplementary charges are still reported, creating uncertainty about real financial protection levels (WHO, 2023).

Romania, despite its universal insurance coverage, faces similar weaknesses. The coexistence of public and private diagnostic sectors generates a dual-access system: patients with higher incomes often bypass public waiting lists by purchasing private services, while low-income groups remain dependent on underfunded public facilities (World Bank, 2021; WHO, 2023). Reimbursement rates for oncology diagnostics are relatively low, and diagnostic delays disproportionately affect rural and marginalized populations (OECD, 2022; Eurostat, 2023).

Serbia has made notable progress in integrating oncology diagnostics into the publicly financed service package (Serbian Institute of Public Health, 2022). Most screening-related procedures are covered without co-payments; however, regional disparities persist, and indirect expenses – transportation, accommodation, and time lost from work – remain unaddressed (WHO, 2023). For low-income families, these non-medical costs can equal or exceed the direct medical payments, contributing to diagnostic delay even when formal coverage exists (World Bank, 2022).

Across all five countries, the interplay between formal coverage and real financial exposure defines a shared regional problem: universal coverage in name, but not in practice. The persistence of out-of-pocket spending for diagnostic procedures effectively undermines early detection programs (WHO, 2023; OECD, 2022). Georgia and Armenia show the highest burden of OOP expenditure and lowest financial protection index, whereas Serbia demonstrates the strongest integration of diagnostic costs into public financing (See: *Figure 3*) (World Bank, 2021).

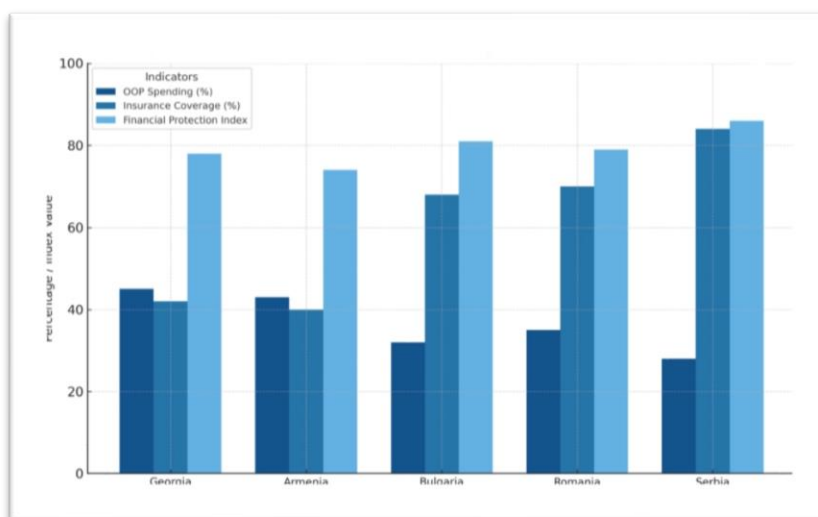


Figure 3. Comparative Indicators of Financial Barriers to Early Cancer Diagnosis. Grouped bar chart comparing out-of-pocket (OOP) spending, insurance coverage, and financial protection index across Georgia, Armenia, Bulgaria, Romania, and Serbia. Higher OOP shares and lower protection levels indicate weaker financial accessibility for early diagnostic services.

Informational and awareness barriers play a crucial yet often underestimated role in delaying early cancer detection across Eastern Europe. Despite the existence of national screening initiatives, public participation remains low, largely due to insufficient communication, health literacy gaps, and mistrust toward medical institutions (WHO, 2023; OECD, 2022).

In **Georgia**, limited public understanding of screening programs continues to hinder participation rates. Studies show that less than half of women eligible for breast or cervical cancer screening are aware of available services (NCDC, 2022; UNFPA Georgia, 2023). Campaigns are sporadic, urban-centered, and often lack culturally adapted materials for minority populations (UN Women Georgia, 2022). In rural regions and small towns, misconceptions about cancer – including the belief that early detection inevitably leads to fatal outcomes – discourage preventive checkups. Information dissemination through primary healthcare providers remains weak, as physicians are rarely trained in risk communication or motivational counseling (WHO Regional Office for Europe, 2023).

Armenia faces similar challenges. While periodic awareness campaigns are conducted by the Ministry of Health and partner organizations, these efforts are largely short-term and donor-driven (Armenian MOH, 2021; UNFPA Armenia, 2022). The absence of a continuous national communication strategy leads to uneven outreach across social and linguistic groups. Rural women, in particular, demonstrate low knowledge of early cancer symptoms and screening intervals. Surveys reveal that even when services are free or subsidized, participation is limited by lack of confidence in the healthcare system and fear of diagnosis (World Bank, 2022; WHO, 2023).

In **Bulgaria** and **Romania**, public awareness of screening programs is somewhat higher due to EU-funded initiatives and broader access to online information (European Commission, 2023;

OECD, 2022). However, both countries struggle with information overload and inconsistent messaging. Campaigns tend to emphasize disease severity rather than prevention benefits, reinforcing anxiety rather than encouraging proactive behavior (WHO Europe, 2023). Misinformation on social media further complicates efforts to build trust (ECDC, 2023). In Romania, the persistence of antivaccine and anti-medical narratives contributes to skepticism toward preventive procedures, particularly among older and rural populations (UNICEF Romania, 2022; Eurostat, 2023).

Serbia stands out for its relatively structured approach to awareness. Through national «Screening Days» and collaboration with local media, the government has managed to reach broader audiences (Serbian Institute of Public Health, 2022). Still, knowledge gaps remain evident among low-income and elderly populations, where the perception of cancer as an untreatable disease prevails. Health literacy programs are concentrated in urban centers, while regional disparities persist (WHO, 2023; World Bank, 2021).

Across all five countries, inadequate information delivery and limited community engagement reinforce diagnostic inertia. Cancer screening is often perceived as optional rather than essential, leading to low participation despite availability (UNFPA, 2023). The failure to embed prevention education into school curricula, media, and primary care consultations perpetuates misinformation and fatalistic beliefs (OECD, 2022; WHO, 2023).

As shown in the comparative narrative of findings, informational barriers emerge as a cross-cutting issue that interacts with other domains – particularly financial and sociocultural constraints. Without sustained investment in public health communication and community trust-building, even the most comprehensive screening infrastructure cannot ensure early detection (See: *Figure 4*) (World Bank, 2022; WHO Europe, 2023).

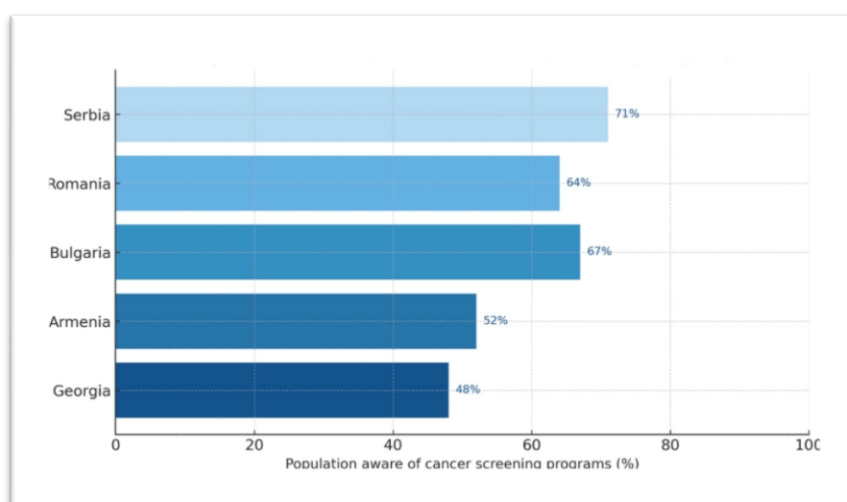


Figure 4. Public Awareness of Early Cancer Screening Programs. Horizontal bar chart showing the percentage of the population aware of national cancer screening programs in Georgia, Armenia, Bulgaria, Romania, and Serbia. Higher awareness levels correspond to stronger engagement in preventive health initiatives and participation in early detection activities.

The shortage and uneven distribution of qualified medical personnel remain major determinants of diagnostic inequality across Eastern Europe. Although national screening programs exist, their effectiveness depends heavily on the availability and skills of oncologists, radiologists, pathologists, and laboratory specialists (WHO, 2023; OECD, 2022) (See: *Figure 5*).

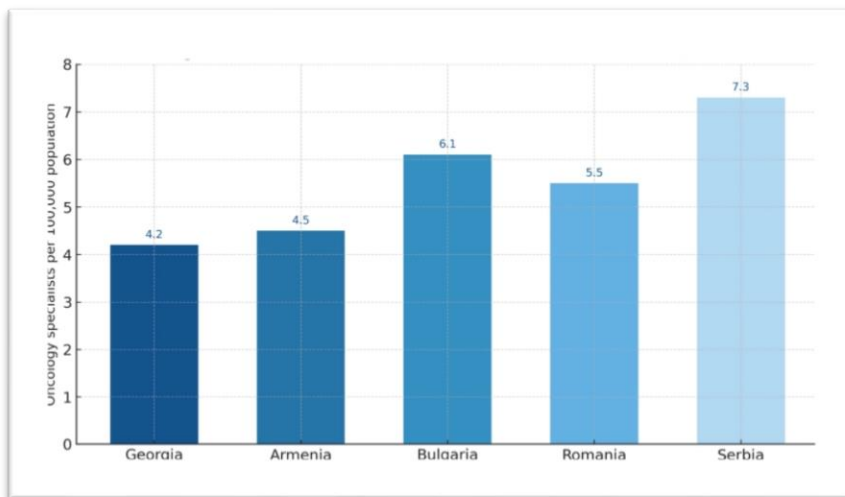


Figure 5. Availability of Oncology Specialists Across Five Countries. Bar chart showing the number of oncology specialists per 100,000 population in Georgia, Armenia, Bulgaria, Romania, and Serbia. Lower values indicate weaker workforce capacity and limited access to early diagnostic and treatment services, particularly in rural regions.

In **Georgia**, the density of oncology professionals is among the lowest in the region – fewer than five per 100,000 inhabitants (NCDC, 2023; World Bank, 2022). The concentration of specialists in Tbilisi leaves many peripheral regions underserved, often forcing patients to travel long distances for diagnostic consultations. Waiting times for imaging and biopsy results can extend to several weeks, especially in public hospitals (WHO, 2023). These gaps are compounded by equipment shortages and maintenance delays, limiting the system’s diagnostic capacity even when facilities are nominally available (UNFPA Georgia, 2023).

Armenia faces a similar shortage of trained personnel, particularly in rural provinces where local clinics lack both human and technical resources. Continuous training for physicians and nurses is sporadic, and coordination between primary care and oncology specialists remains weak (Armenian MOH, 2021; WHO, 2023). As a result, early-stage cancers are frequently detected incidentally rather than through organized screening pathways (World Bank, 2022).

In **Bulgaria** and **Romania**, recent EU-funded initiatives have improved infrastructure and introduced e-learning modules for oncological diagnostics (European Commission, 2022; OECD, 2022). However, human resource retention remains a pressing challenge. Skilled professionals continue to migrate toward Western Europe in search of better pay and working conditions, leaving regional hospitals understaffed (WHO Regional Office for Europe, 2023). In both countries, radio-

logy and pathology departments operate under heavy workloads, often resulting in diagnostic delays and reduced accuracy (Eurostat, 2023; World Bank, 2021).

Serbia shows comparatively stronger organizational capacity, with several regional oncology centers functioning as referral hubs (Serbian Institute of Public Health, 2022). Yet, the country still faces shortages of radiology technicians and trained pathologists. Heavy administrative burdens and insufficient support staff contribute to professional burnout, particularly in provincial hospitals (WHO Europe, 2023; Jankovic et al., 2021).

Overall, workforce scarcity, training gaps, and unequal distribution of resources create systemic barriers that extend diagnostic timelines and amplify urban – rural disparities. Without targeted investments in professional education and retention, early cancer detection efforts will remain constrained by human resource limitations rather than technological capacity (OECD, 2022; WHO, 2023).

Sociocultural attitudes and cancer-related stigma represent pervasive yet often under-recognized barriers to early diagnosis across Eastern Europe. Cultural norms, misconceptions about disease causation, and fear of social judgment continue to shape health-seeking behavior, particularly among women and rural populations (WHO, 2023; UNFPA, 2022).

In **Georgia**, despite gradual progress in health literacy, social stigma surrounding cancer remains widespread. Many individuals associate a cancer diagnosis with hopelessness or imminent death, leading to avoidance of medical consultations (NCDC, 2022; UN Women Georgia, 2023). Among older generations, disclosure of illness is often delayed to protect family reputation, particularly in smaller communities. Religious fatalism and traditional gender roles also discourage preventive care, as women may prioritize family responsibilities over personal health (UNFPA Georgia, 2023). These patterns are reinforced by insufficient psychological counseling and limited patient support networks (WHO Regional Office for Europe, 2023; World Bank, 2022).

Armenia demonstrates comparable tendencies. Cultural taboos around discussing cancer publicly limit community dialogue and early symptom reporting (Armenian MOH, 2021; WHO, 2023). Women in rural areas frequently express embarrassment or fear of being judged when attending gynecological screening. Psychological distress is compounded by the lack of culturally sensitive communication from healthcare providers. The absence of community-based awareness campaigns further contributes to diagnostic delay (UNDP Armenia, 2022; UNFPA Armenia, 2023).

In **Bulgaria** and **Romania**, sociocultural barriers manifest differently. In Bulgaria, fatalistic beliefs are less prominent, but mistrust in the healthcare system remains high, especially among older adults who experienced frequent systemic reforms (OECD, 2022; WHO Europe, 2023). In Romania, social inequalities intersect with cultural attitudes: marginalized Roma populations often face both discrimination and lack of culturally adapted services (UNICEF Romania, 2023; World

Bank, 2022). Health professionals frequently report communication difficulties with patients from minority backgrounds, leading to underutilization of screening opportunities (European Commission, 2023; Eurostat, 2023).

Serbia shows a more open public discourse on cancer, supported by advocacy groups and national media campaigns (Serbian Institute of Public Health, 2022). Nevertheless, in rural communities, stigma persists – cancer is still perceived as a «shameful» or «contagious» disease. While national efforts have improved awareness, emotional support and psycho-oncology services remain limited outside major cities (WHO, 2023; Jankovic et al., 2021).

Across all five countries, sociocultural and stigma-related barriers are deeply intertwined with informational and structural deficits. Fear, denial, and social silence delay help-seeking even when financial or infrastructural access exists (UNFPA, 2023; WHO Europe, 2023). The lack of culturally tailored communication strategies continues to impede patient engagement in early diagnostic programs (OECD, 2022; WHO, 2023) (See: *Figure 6*).

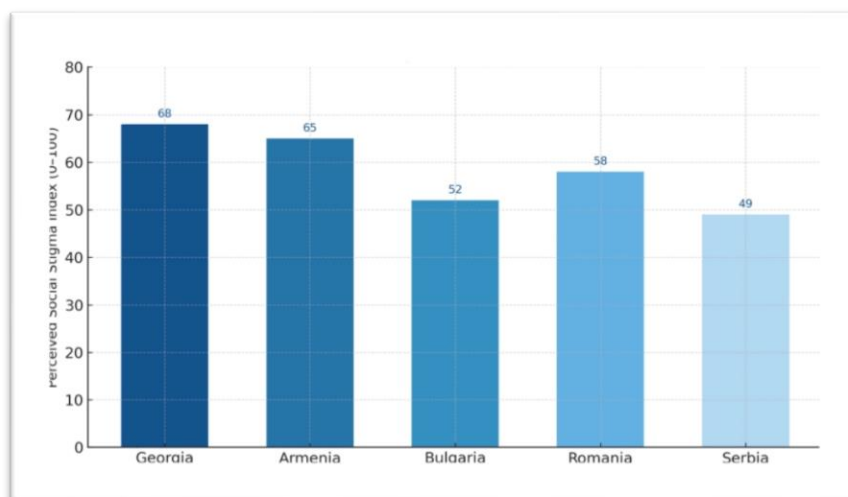


Figure 6. Perceived Social Stigma Toward Cancer Across Five Countries. Bar chart comparing the perceived social stigma associated with cancer in Georgia, Armenia, Bulgaria, Romania, and Serbia. Higher index values indicate stronger stigma and greater psychosocial barriers to early diagnosis and disclosure.

The comparative analysis of five Eastern European countries – Georgia, Armenia, Bulgaria, Romania, and Serbia – reveals that systemic barriers to early cancer diagnosis are multifaceted, interdependent, and persist despite ongoing health reforms (WHO, 2023; OECD, 2022). While each country operates under distinct institutional and economic conditions, several recurring patterns emerge.

Structural fragmentation and inconsistent referral pathways remain foundational challenges in all countries, particularly in Georgia and Armenia, where national screening programs exist only partially and lack regional coordination (NCDC, 2022; Armenian MOH, 2021). Bulgaria and Romania, although supported by EU frameworks, continue to face operational fragmentation between

policy planning and clinical implementation (European Commission, 2023; ECIS, 2022). Serbia's progress toward integrated oncology care demonstrates the potential impact of centralized coordination, yet regional inequalities persist (Serbian Institute of Public Health, 2022; WHO Europe, 2023).

Financial vulnerability represents the most pervasive constraint across the region. The dominance of out-of-pocket payments and the absence of comprehensive insurance coverage hinder equitable diagnostic access (World Bank, 2021; OECD, 2022). Georgia and Armenia show the highest financial exposure, while Serbia demonstrates relatively stronger public protection (WHO, 2023; UNFPA, 2023). Nonetheless, even in insured systems like Bulgaria and Romania, co-payments and informal fees persist, highlighting a gap between formal coverage and real affordability (European Commission, 2023; WHO, 2023).

Information and awareness barriers cut across all socioeconomic contexts. Low health literacy, fear of diagnosis, and mistrust toward healthcare institutions significantly reduce screening participation (UNICEF, 2023; WHO Regional Office for Europe, 2023). These factors are most pronounced in Georgia and Armenia, where communication strategies remain underdeveloped, while Serbia's organized outreach campaigns illustrate the benefits of sustained public engagement (Serbian Institute of Public Health, 2022; World Bank, 2022).

Human resource and infrastructural limitations further constrain diagnostic efficiency. Urban concentration of specialists, insufficient training opportunities, and migration of medical professionals continue to create disparities between metropolitan and rural areas (OECD, 2022; WHO, 2023). Even in countries with stronger workforce capacity, such as Serbia and Bulgaria, workload pressure and uneven resource distribution limit service quality (Eurostat, 2023; WHO Europe, 2023).

Finally, sociocultural stigma and emotional barriers perpetuate delay even in the presence of available services. Fear of social judgment, cultural fatalism, and lack of psycho-oncological support prevent timely help-seeking, particularly among women and older adults in rural regions (UNFPA, 2023; UN Women, 2022). These psychosocial dimensions amplify the impact of structural and financial weaknesses, forming a cumulative barrier to early detection (WHO, 2023).

Taken together, these findings underline that the challenge of early cancer diagnosis in Eastern Europe is not merely technological or financial, but systemic and cultural. Effective policy response requires a holistic approach that strengthens health system coordination, expands financial protection, builds public trust through transparent communication, and integrates cultural sensitivity into care delivery (World Bank, 2022; WHO Europe, 2023). The convergence of these elements determines not only the timeliness of diagnosis but also public confidence in healthcare institutions across the region.

Synthesis highlights that early cancer diagnosis in Eastern Europe is constrained by a complex interaction of structural, financial, informational, human resource, and sociocultural barriers (WHO, 2023; OECD, 2022). While the intensity of these challenges varies by country, their combined effect leads to systematic diagnostic delays and deepens regional inequities (World Bank, 2022). Georgia and Armenia remain the most vulnerable due to fragmented screening systems and high out-of-pocket spending, whereas Serbia demonstrates relatively stronger institutional organization and financial protection (UNFPA, 2023; WHO Europe, 2023). However, even in better-performing countries such as Bulgaria and Romania, persistent workforce shortages, inconsistent awareness strategies, and cultural mistrust continue to limit progress (European Commission, 2023). These findings collectively underscore the need for integrated, equity-oriented health policies that address both the technical and social dimensions of diagnostic access (WHO, 2023; World Bank, 2022).

CONCLUSION

The findings of this comparative review reveal that barriers to early cancer diagnosis across Eastern Europe are deeply rooted in structural, financial, informational, and sociocultural determinants that operate together rather than in isolation (WHO, 2023; OECD, 2022). Despite significant policy commitments to early detection and universal health coverage, the implementation gap between national strategies and everyday practice remains wide (World Bank, 2022). The health systems of Georgia, Armenia, Bulgaria, Romania, and Serbia share common vulnerabilities – fragmented coordination, limited financial protection, insufficient workforce capacity, and low public trust – which together delay the pathway from symptom recognition to confirmed diagnosis (UNFPA, 2023; WHO Regional Office for Europe, 2023).

In **Georgia** and **Armenia**, systemic weaknesses are most pronounced. Both countries face a combination of limited insurance coverage, high out-of-pocket spending, and shortages of trained diagnostic professionals (NCDC, 2023; Armenian MOH, 2022). These constraints are compounded by weak primary care referral systems and low population awareness of screening programs (WHO, 2023; UNFPA Georgia, 2022). Consequently, patients often present at advanced disease stages, when treatment options are limited and outcomes poorer (World Bank, 2022).

Bulgaria and **Romania**, while benefiting from EU-aligned policies and structural funding, continue to struggle with uneven implementation. Bureaucratic inefficiencies, migration of medical professionals, and inconsistent communication strategies undermine the impact of otherwise well-designed programs (European Commission, 2023; OECD, 2022). Despite formal coverage for screening services, practical barriers – such as co-payments, regional disparities, and cultural mistrust – limit participation among vulnerable groups (WHO Europe, 2023; Eurostat, 2023).

Serbia demonstrates that progress is achievable when political will, funding, and system integration converge. Its networked oncology centers and centralized data systems have improved coordination and diagnostic timeliness (Serbian Institute of Public Health, 2022; WHO, 2023). However, like its neighbors, Serbia still experiences workforce strain, psychosocial barriers in rural populations, and persistent inequities between urban and peripheral regions (World Bank, 2022).

From a regional perspective, this review underscores that technical infrastructure alone cannot overcome diagnostic delay. Early detection depends not only on available equipment but also on human capacity, financial accessibility, and cultural responsiveness (OECD, 2022; WHO, 2023). Policy interventions must therefore address these dimensions simultaneously. Strengthening referral mechanisms between primary and specialized care, ensuring predictable public financing, and expanding continuous training for health professionals are immediate priorities (WHO Europe, 2023; UNFPA, 2023).

At the same time, long-term progress requires transformative shifts in public communication and social attitudes. Integrating culturally tailored awareness campaigns, psycho-oncology services, and patient navigation programs can help rebuild trust and reduce the stigma surrounding cancer (UN Women, 2022; WHO, 2023). Collaborative partnerships between ministries of health, civil society, and international organizations can provide both technical and moral momentum to sustain these reforms (World Bank, 2022; WHO Regional Office for Europe, 2023).

Ultimately, the experience of these five countries reflects the broader challenges faced by middle-income health systems striving toward equity (OECD, 2021; WHO, 2023). Early cancer diagnosis must be treated not merely as a medical intervention but as a cross-sectoral priority – linking social inclusion, education, and financial protection (UNFPA, 2023). Achieving this integration would not only improve cancer outcomes but also serve as a foundation for broader health system resilience in Eastern Europe (WHO Europe, 2023; World Bank, 2022).

RECOMMENDATIONS

- To improve early cancer diagnosis across Eastern Europe, countries must adopt an integrated, equity-driven approach that combines system reform with community engagement (WHO, 2023; OECD, 2022). Strengthening the role of primary healthcare is fundamental: family physicians should act as the first point of contact for risk assessment and referral, supported by standardized diagnostic pathways and electronic data exchange between local clinics and oncology centers (WHO Europe, 2023; World Bank, 2022). Establishing regional coordination units and patient navigation services could significantly reduce referral delays and enhance continuity of care (UNFPA, 2023).
- Financial protection must be expanded to ensure that diagnostic procedures – such as imaging, biopsy, and laboratory testing – are fully included in public insurance coverage

(OECD, 2021; World Bank, 2022). Capping co-payments, subsidizing transportation for rural patients, and regulating private sector pricing would help prevent catastrophic out-of-pocket spending (WHO, 2023; UNDP Armenia, 2023). Parallel to this, governments should prioritize stable and transparent financing for national screening programs, avoiding dependence on short-term donor support (European Commission, 2023; WHO Regional Office for Europe, 2023).

- Investments in the healthcare workforce are equally essential. Continuous professional training, fair remuneration, and career development opportunities can improve motivation and reduce migration of qualified specialists (OECD, 2022; WHO, 2023). Ensuring equitable distribution of diagnostic infrastructure and maintenance resources will further strengthen service capacity outside major cities (Eurostat, 2023; World Bank, 2021).
- Raising public awareness remains critical. Long-term, culturally adapted education campaigns should promote early detection as a normal and empowering health behavior rather than a fear-inducing experience (UNFPA, 2023; UN Women, 2022). Collaboration with schools, workplaces, and media outlets can reinforce positive attitudes toward prevention and strengthen health literacy at all levels of society (WHO Europe, 2023; UNICEF Romania, 2022).
- Finally, addressing sociocultural and psychological barriers is indispensable for achieving sustainable progress. National cancer programs should incorporate psycho-oncology and community counseling components to reduce fear and stigma, while partnerships with civil society and local organizations can help foster empathy and trust between patients and healthcare providers (WHO, 2023; UNDP Georgia, 2022). At a regional level, collaboration among Eastern European countries – through shared research networks, joint training, and harmonized standards – would enhance capacity and ensure that progress in one country contributes to the collective advancement of all (European Commission, 2023; WHO, 2023).
- By aligning technical capacity, financial protection, and social inclusion, these countries can move from fragmented efforts toward a unified, patient-centered model of cancer prevention – one that ensures early diagnosis becomes an achievable reality for every individual, regardless of income, geography, or social background (WHO, 2023; World Bank, 2022).

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