



INDIVIDUAL AND SOCIOECONOMIC DETERMINANTS OF CANCER SCREENING UPTAKE: A SYSTEMATIC REVIEW OF THE LITERATURE

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DOI: <https://doi.org/10.5281/zenodo.23034069>

How to cite this Article: Tarik CHMITAH^{*1}, Rachidi HOUDA², Mohamed Amine SEHHAR¹, Karim SBAI IDRISSE¹, JALAL KASOUATI¹ and Larbi EL BOUAITI¹. (2026). Individual and Socioeconomic Determinants of Cancer Screening Uptake: A Systematic Review Of The Literature. European Journal of Biomedical and Pharmaceutical Sciences, 13(10), 101–112.

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Article Received on 05/09/2026

Article Revised on 25/09/2026

Article Published on 01/10/2026

ABSTRACT

Cancer remains one of the most pressing public health challenges worldwide, and early screening is widely regarded as one of the most effective ways to reduce cancer-related mortality. Screening uptake, however, varies considerably from one population to another, shaped by an interplay of individual, socioeconomic, and healthcare-system factors that is still incompletely understood. This systematic review, conducted in line with PRISMA guidelines, set out to identify the individual and socioeconomic determinants of screening uptake for the three most common cancers: breast, cervical, and colorectal. PubMed, ScienceDirect, and Google Scholar were searched using a PICOS-structured strategy combining terms related to individual determinants, socioeconomic determinants, screening, and cancer. Of 358 records initially retrieved, 34 studies published between 2013 and 2023 met the eligibility criteria and were analyzed narratively. Three broad categories of determinants emerged, accounting respectively for 53.3%, 26.7%, and 20% of reported factors: individual (age, sex, education, awareness), socioeconomic (status, income, regional disparities), and healthcare-related (distance to screening centers, provider recommendation, quality of care). Despite considerable heterogeneity in study design and cultural setting, these determinants appeared to carry a broadly comparable epidemiological weight across populations, suggesting they could usefully inform screening strategies tailored to under-studied contexts such as Morocco.

KEYWORDS: Cancer screening; Determinants; Socioeconomic factors; Systematic review; Breast cancer; Colorectal cancer.

INTRODUCTION

Definition, classification, and global burden

Cancer, or neoplasia, arises when abnormal cells proliferate without control, invade surrounding tissue, and in many cases spread to distant organs.^[1] Rather than a single disease entity, cancer is increasingly understood as a complex system of interacting cell populations with heterogeneous genotypes, phenotypes, and epigenetic profiles, operating within a biochemical network shaped by immune response, microenvironment, and treatment.^[2] GLOBOCAN estimated approximately 19.29 million new cancer cases and 9.96 million cancer-related deaths worldwide in 2020, with roughly one in

five people expected to develop cancer during their lifetime.^[3]

Diagnosis and treatment planning rely on confirming a tumor's malignant nature, tissue of origin, histological type, grade, and anatomical extent, following classification systems jointly developed by WHO and the Union for International Cancer Control.^[4] Tumor staging is most commonly expressed through the TNM (Tumor-Node-Metastasis) system, first introduced in 1958 and now in its eighth edition.^[4] These frameworks have shaped clinical oncology, cancer research, and professional training.^[5] Molecular and genomic profiling has further refined histology-based classification,

revealing that tumors of different tissue origins can share genomic alterations, as illustrated by hormone-receptor and HER2-defined breast cancer subtypes.^[6,7]

Global, regional, and national epidemiology

Cancer incidence and mortality vary substantially by world region. Asia accounted for roughly half of all cancer cases and 58.3% of cancer deaths in 2020, while Europe, with under 10% of the world's population, accounted for 22.8% of cases and 19.6% of deaths.^[8] Colorectal cancer alone contributes close to 10% of global cancer incidence.^[9] Sub-Saharan Africa recorded over 1.1 million new cancer cases and more than 700,000 cancer deaths in 2020, with breast and cervical cancer the leading diagnoses among women.^[10]

In Morocco, national cancer registries provide more granular estimates than GLOBOCAN's regional averages, although comprehensive mortality data remain limited by gaps in death-certification systems.^[11] Data from the Casablanca and Rabat population-based registries indicate that breast and cervical cancer predominate among Moroccan women, while lung and prostate cancer are most common among men, with a rising trend for bladder and colorectal cancers.^[12,13] Regional comparisons across Europe further illustrate how epidemiological patterns and cancer-control priorities differ by setting.^[14]

Socioeconomic and economic impact of cancer

Beyond its clinical burden, cancer carries substantial social and economic costs. Socioeconomic disparities in cancer survival have been documented across numerous solid tumor types, including in large registry-based studies from France.^[15,17] A social gradient in health, whereby outcomes worsen progressively at each step down the socioeconomic ladder rather than only at its most disadvantaged extreme, has been described for cancer incidence and survival alike.^[16,18] Financial toxicity — the direct and indirect economic burden borne by patients and families — has been documented across health systems, including in countries with universal coverage, and has been associated with reduced treatment adherence and long-term financial hardship.^[19–23]

Risk factors: intrinsic and modifiable

Cancer risk reflects a combination of intrinsic and extrinsic factors. A portion of cancer risk has been attributed to stochastic errors in DNA replication associated with stem-cell division rates, a hypothesis that generated substantial scientific debate.^[24,25] Epigenetic variation, independent of replication error, has also been linked to tissue-specific cancer risk.^[26] Alongside these intrinsic mechanisms, well-established modifiable risk factors include tobacco use, alcohol consumption, infectious agents such as HPV and hepatitis viruses, diet, physical inactivity, and obesity, together accounting for a substantial share of the global cancer burden.^[27,28] Global burden-of-disease analyses covering dozens of

behavioral, environmental, and metabolic risk exposures have consistently identified these factors as leading modifiable contributors to cancer incidence.^[29] Hereditary factors, including BRCA1/2 mutations, further modulate individual risk, as shown in large twin and family-based cohort studies.^[30,31] In Morocco specifically, a national STEPwise survey found that 11.7% of adults smoked tobacco, 53% were overweight, and nearly 40% presented at least two behavioral risk factors simultaneously.^[32]

Determinants of health and access to screening

The World Health Organization defines health determinants as the social, economic, cultural, environmental, behavioral, and biological factors that shape health across populations and that interact in complex ways to influence wellbeing.^[33] Applied to cancer, this framework has informed a growing literature on social justice, equity of access, and the ethical dimensions of unequal cancer outcomes.^[34,35] Social support — from family, community, or healthcare navigation resources — has repeatedly been associated with better quality of life and outcomes among cancer patients and survivors^[36–38], while marital status has independently been linked to survival differences across cancer types.^[39]

At the health-system level, access to care, financing mechanisms, and the availability of trained healthcare professionals all shape the reach and effectiveness of screening programs.^[40,41] In Morocco, the national cancer control strategy (Plan National de Prévention et de Contrôle du Cancer) has, since 2010, sought to expand early-detection infrastructure in coordination with the Ministry of Health and the Fondation Lalla Salma^[42,43], within a broader national commitment to universal health coverage.^[44,45]

Principles, benefits, and limitations of cancer screening

Screening is classically defined as the examination of asymptomatic individuals to estimate their probability of harboring a given condition, with those at sufficiently high probability referred for diagnostic confirmation.^[46,47] A successful program is not a single test but an integrated pathway encompassing education, testing, diagnostic follow-up, and treatment, ideally evaluated against the long-standing Wilson and Jungner criteria for screening suitability.^[48,49] When properly implemented, screening can reduce disease-specific mortality and morbidity and may be cost-effective by avoiding costlier late-stage treatment.^[50]

These benefits, however, are counterbalanced by well-documented limitations. False positives can cause considerable anxiety and downstream testing burden, as illustrated by the National Lung Screening Trial, in which roughly 90% of positive low-dose CT results in a heavy-smoking cohort proved to be false alarms.^[51,52] Overdiagnosis — the detection of an abnormality that

would never have caused symptoms or death — has been identified as a central harm of screening in conditions ranging from breast and prostate to thyroid cancer, and its communication to patients remains a persistent clinical challenge.^[53–56] Because of these trade-offs, evidence-based risk communication and a clear understanding of measures such as absolute risk reduction are considered essential to informed decision-making around screening participation.^[57,58] Current cancer-screening guidelines, including those periodically updated by professional bodies such as the American Cancer Society, reflect an ongoing effort to balance these benefits and harms across the population.^[59]

Taken together, this body of evidence establishes cancer as a major and unevenly distributed public health burden, screening as a proven but imperfect tool for reducing that burden, and the social and economic circumstances of individuals as key — yet incompletely mapped — determinants of whether screening is actually used. This systematic review was undertaken to identify and characterize the individual and socioeconomic determinants associated with cancer screening uptake, drawing on the accumulated international literature. The research question was framed using the PICOS approach, summarized in Table 1, and can be stated simply as: *what are the individual and socioeconomic determinants of cancer screening uptake?*

Table 1: PICOS framework underlying the research question.

Component	Description
Population	Adults aged over 18 years
Intervention	Not applicable
Comparison	Groups defined according to the determinants under study
Outcome	Cancer screening uptake, expressed as the proportion of the population screened
Study design	Observational studies (cross-sectional, retrospective, prospective/cohort) and randomized controlled trials

MATERIALS AND METHODS

Study design

This review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines throughout, from the formulation of the research question to the reporting of results.^[60]

Search strategy and data sources

Three databases were searched: PubMed, ScienceDirect, and Google Scholar. The search combined the terms *cancer*, *neoplasm*, *determinant*, *socioeconomic impact of cancer disease*, and *screening*, using the following search string: (((individual determinants) AND (socioeconomic determinants)) AND (screening)) AND (cancer OR neoplasms).

Eligibility criteria

Articles were eligible if they were published in French or English between 2013 and 2023, reported findings from prospective or cross-sectional studies, involved adults over 18 years of age, and addressed determinants of screening uptake for one of the three most common cancers — breast, cervical, or colorectal. Systematic

reviews, meta-analyses, and studies focused on pediatric or adolescent cancers were excluded from consideration.

Study selection and data extraction

Titles were screened first, followed by a second pass on abstracts for the articles that survived the initial filter. Records for which the full text could not be retrieved were dropped at this stage.

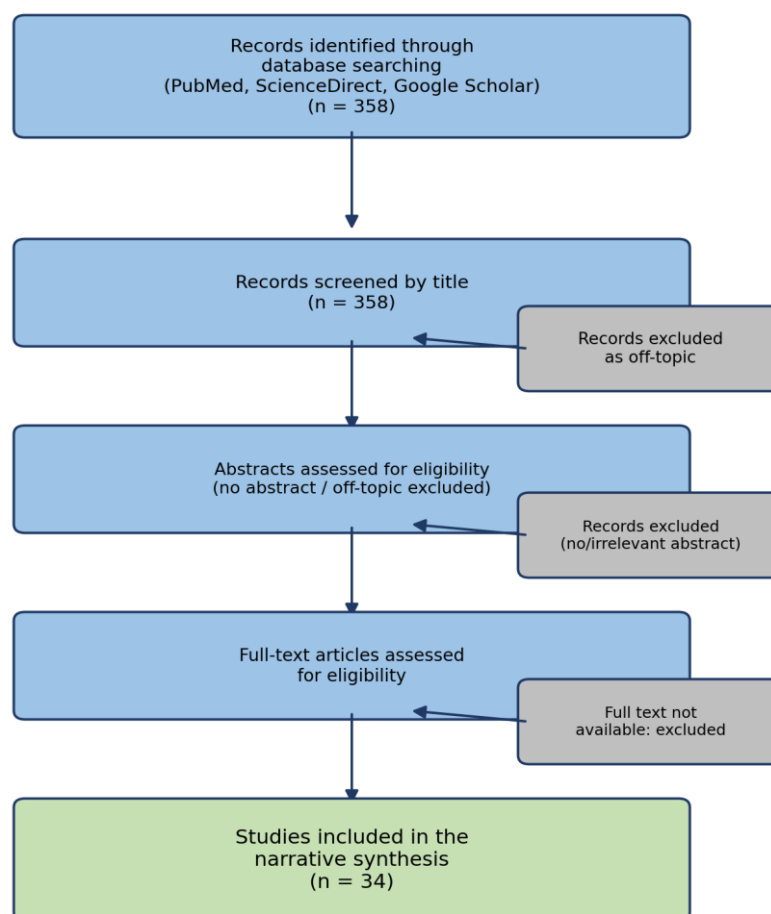
Data analysis

Given the heterogeneity of the included studies, a narrative synthesis was chosen over a quantitative meta-analysis. For each of the 34 studies retained, the determinants reported by the authors were extracted and grouped thematically; findings are presented here as counts and percentages.

RESULTS AND DISCUSSION

Characteristics of the included studies

The initial search across the three databases yielded 358 records. After the two-step screening process described above, 34 articles satisfied the eligibility criteria and formed the basis of this review (Fig. 1).

Figure 1. PRISMA flow diagram of study selection**Figure 1: PRISMA flow diagram of study selection.**

Publication dates spanned 2013 to 2023, with a clear concentration in the most recent years: 58.8% of the included articles appeared between 2020 and 2023 (Fig.

2). Cross-sectional designs dominated the sample (53%), followed by retrospective studies (20%) and randomized controlled trials (15%) (Fig. 3).

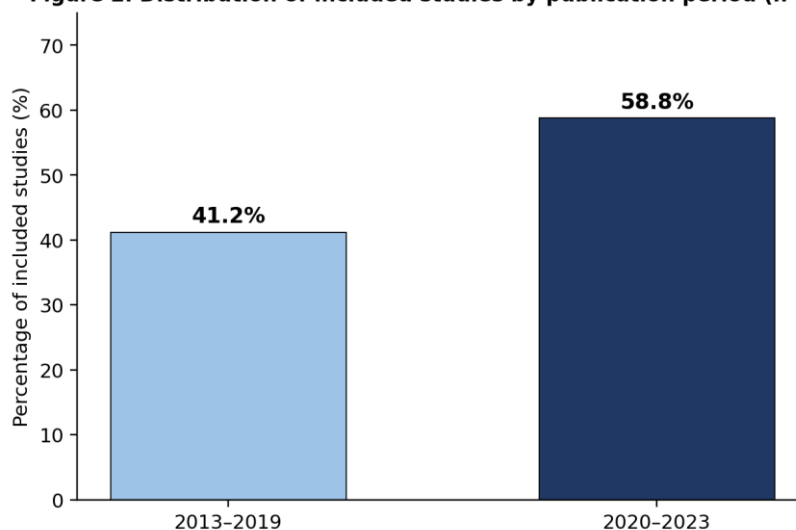
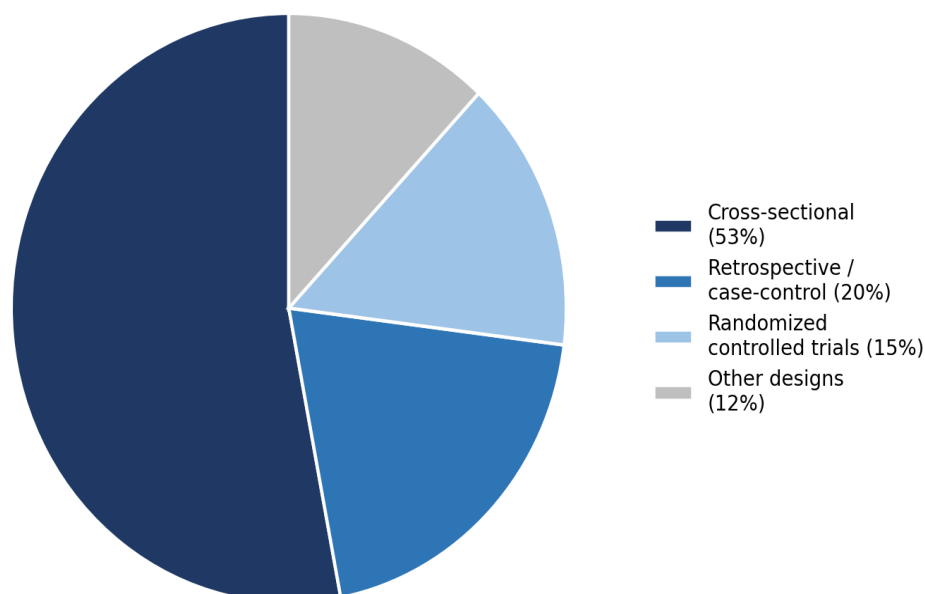
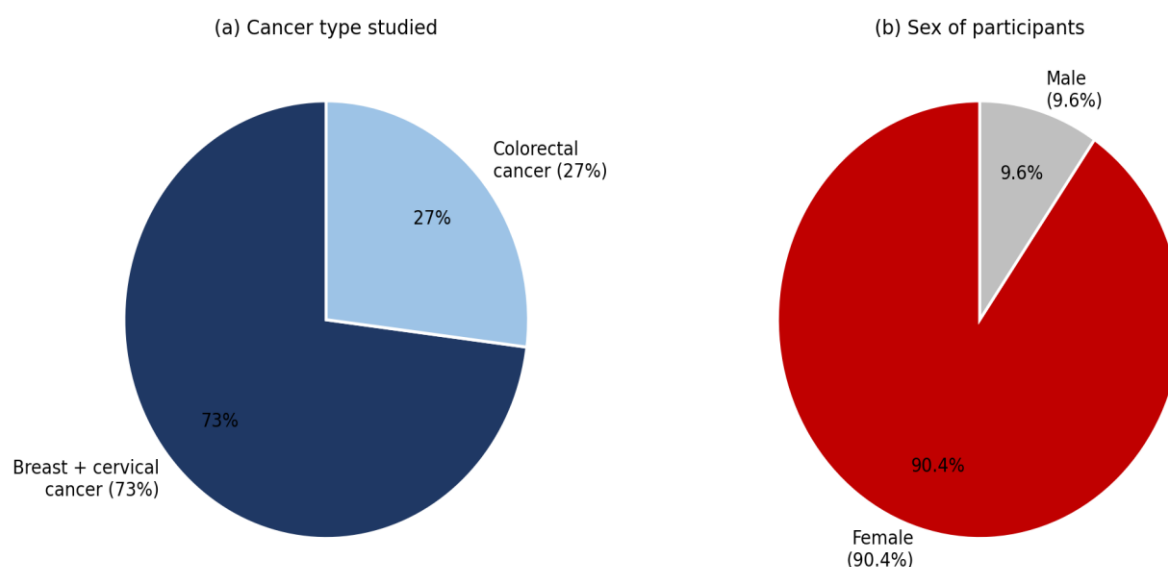
Figure 2. Distribution of included studies by publication period (n = 34)**Figure 2: Distribution of included studies by publication period (n = 34).**

Figure 3. Distribution of included studies by design (n = 34)**Figure 3: Distribution of included studies by design (n = 34).**

Collectively, the 34 studies covered 2,740,858 participants, most commonly aged between 50 and 75 years. Women made up 90.4% of the pooled sample,

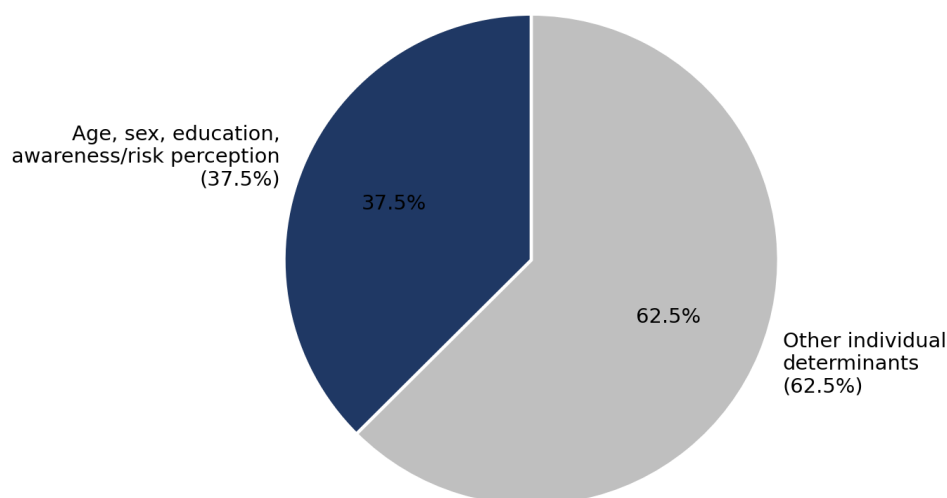
consistent with the predominance of studies focused on breast and cervical cancer, which together accounted for 73% of the included articles (Fig. 4).

Figure 4. Distribution of included studies by cancer type and participant sex (n = 34)**Figure 4: Distribution of included studies by cancer type and participant sex (n = 34).**

Individual determinants

Individual-level factors accounted for the largest share of reported determinants (53.3%), with age, sex,

educational level, awareness of screening, and perceived risk together responsible for 37.5% of this category (Fig. 5).

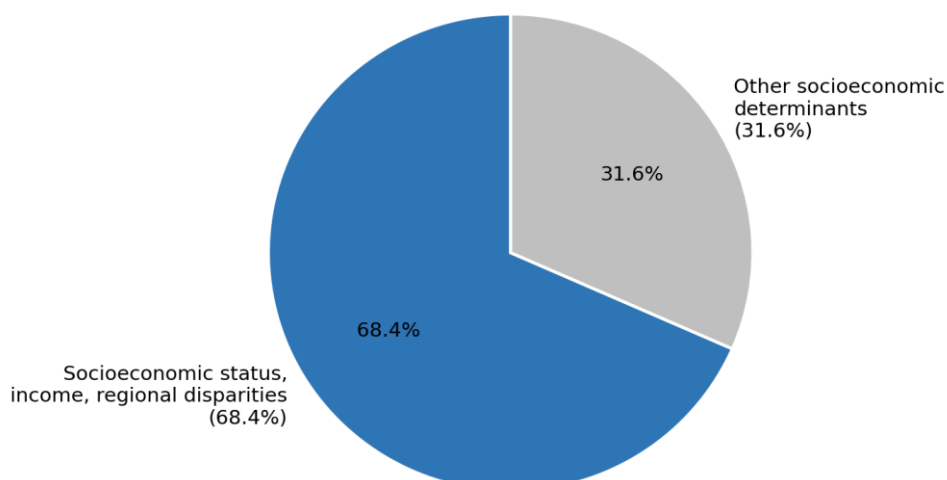
Figure 5. Distribution of individual determinants (n = 34 studies)**Figure 5: Distribution of individual determinants (n = 34 studies).**

Fear of a cancer diagnosis emerged as a genuine obstacle rather than a marginal concern: among women in Punjab, India, 81.5% cited fear of a cancer diagnosis as a barrier and 90.9% underestimated the importance of early diagnosis.^[61] Marital status also appeared to matter, though its influence is arguably more indirect — in New Brunswick, Canada, married women showed higher breast-screening uptake (59%) than divorced, separated, or widowed women (50%) and unmarried women (42%)^[62], consistent with the idea that a partner can act as both a source of encouragement and a practical enabler of appointment-keeping. A parallel awareness gap was documented in an ethnographic study from

Delhi, India, where 44% of participants were unaware of preventive measures for breast cancer and fewer than one in four could describe self-examination or the recommended screening interval.^[63] Taken together, these findings point to a reasonably consistent epidemiological signal for individual determinants across different settings.

Socioeconomic determinants

Socioeconomic factors accounted for 26.7% of the determinants reported across the included studies, with socioeconomic status, income, and regional disparities alone making up 68.4% of this category (Fig. 6).

Figure 6. Distribution of socioeconomic determinants (n = 34 studies)**Figure 6: Distribution of socioeconomic determinants (n = 34 studies).**

The direction of the association was remarkably consistent from one country to the next. In Switzerland, 60% of women in higher-income quartiles participated in mammography screening compared with 50% of women in lower-income quartiles^[64]; in the Netherlands, 68% of women with high socioeconomic status underwent screening, compared with lower participation among women of lower status.^[65] Occupational status told a related story in Nice, France, where women in managerial or executive positions were less likely to take part in organized screening, appearing to favor opportunistic individual screening instead.^[66] It is worth noting that income and broader socioeconomic status are not perfectly interchangeable — the former captures the

immediate cost of screening, while the latter likely also reflects health literacy and prior exposure to the healthcare system — yet in this literature they tend to move in the same direction closely enough that separating their individual contributions would require data this narrative synthesis was not designed to provide.

Healthcare-system determinants

The remaining 20% of reported determinants related to the organization of care itself, with distance to the screening center, provider recommendation, and perceived quality of care accounting for 64.3% of this group (Fig. 7).

Figure 7. Distribution of healthcare-system determinants (n = 34 studies)

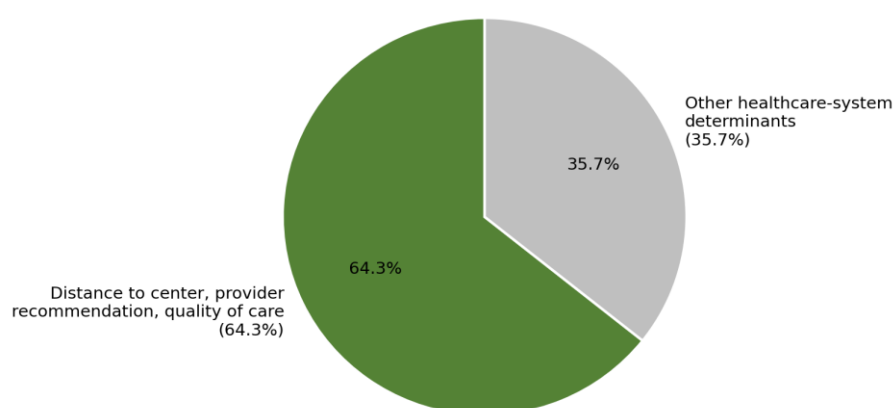


Figure 7: Distribution of healthcare-system determinants (n = 34 studies).

Distance turned out to be more than a logistical footnote: a systematic review of contextual factors in cancer screening found that participation declined in a roughly linear fashion as travel time to the nearest screening center increased^[67], suggesting that even modest gains in geographic accessibility could translate into measurable improvements in uptake. The clinical stakes of non-

participation were not trivial either: irregular breast-screening participation has been associated with a markedly higher risk — roughly sixfold — of being diagnosed at an advanced stage^[68], a finding that lends real urgency to efforts aimed at improving both access and engagement with screening programs.

Table 2: Summary of key determinants and findings by cancer type.

Cancer	Category	Key determinants	Main findings
Breast	Individual	Age, education, marital status, fear	81.5% of women cited fear of diagnosis as a barrier ^[61] ; married women showed higher uptake (59%) than unmarried women (42%) ^[62]
Breast	Socioeconomic	Income, socioeconomic status	60% of higher-income women screened vs 50% of lower-income women ^[64] ; 68% of women with high SES screened ^[65]
Breast	Healthcare system	Distance, screening programs	Irregular participation linked to a ~6-fold higher risk of advanced-stage diagnosis. ^[68]
Cervical	Individual	Age, awareness, marital status	Unmarried women 33.33 times more likely to be HPV-vaccinated than married women ^[69] ; 83.2% of women in one study never screened ^[70]
Cervical	Socioeconomic	Income, financial barriers	38.1% cited lack of financial means; only 5.4% of low-income women participated ^[72]
Cervical	Healthcare system	Accessibility, provider recommendation	63.8% of vaccinated women motivated by provider recommendation ^[71]

Colorectal	Individual	Age, sex, regional variation	Participation varied by region (34.0% overall in Australia); higher among those aged 65+ ^[75]
Colorectal	Socioeconomic	Deprivation, insurance	Participation from 65.8% (least deprived quintile) to 43.0% (most deprived) ^[76] ; insurance status strongly associated with screening ^[77]
Colorectal	Healthcare system	Access to care	Forgoing a doctor's visit for cost reasons reduced screening likelihood across racial groups ^[77]

Individual and socioeconomic determinants of cervical and colorectal screening

For cervical cancer, individual determinants centered on marital status and awareness: in Australia, unmarried and childless women showed markedly higher HPV vaccination rates (85%) than married women or those with children, and vaccination rates declined as parity increased.^[69] In Zimbabwe, a large majority of women (83.2%) had never undergone cervical screening, although 71.2% said they would seek examination if symptomatic — a disparity between awareness/practice and symptom-driven attitudes.^[70] In Lagos, Nigeria, unmarried women were 33.33 times more likely to be vaccinated against HPV than married women.^[71]

Socioeconomically, in Ibadan, Nigeria, 38.1% of women reported lacking the financial means to be screened, and only 5.4% of women with low income participated in screening^[72]; a comparable pattern was reported in India, where women of lower socioeconomic status showed a higher prevalence of precancerous cervical symptoms.^[73] On the healthcare-system side, 63.8% of vaccinated women in the Lagos study cited a provider's recommendation as their main motivation^[71], a pattern echoed in an Indian study where provider recommendation was similarly identified as a key driver of screening participation.^[74]

For colorectal cancer, participation increased with age — most notably from 65 years onward — and varied considerably by region, ranging up to 34.0% overall in an Australian bowel-screening program.^[75] Socioeconomically, deprivation showed a clear gradient: participation in a large UK screening trial ranged from 65.8% in the least deprived quintile to 43.0% in the most deprived^[76], and health insurance status was strongly associated with the likelihood of screening in a large US cross-sectional study, in which forgoing a doctor's visit due to cost reduced screening likelihood among both Black and White participants.^[77]

Study limitations

Several limitations temper these conclusions. The included studies were conducted in markedly different cultural and geographic settings, which inevitably raises questions about how far the findings can be generalized. Methodologically, the studies were far from uniform — surveys, case studies, and various statistical analyses were all represented — making direct comparison between them somewhat imprecise. A number of studies relied on self-reported screening behavior, a data source known to be vulnerable to social desirability and recall

bias. The PRISMA and study-characteristic figures presented above (Fig. 1–7) were reconstructed from the summary statistics reported in the source dataset rather than from the original chart files, which were not available at the time of writing; authors should verify them against their own extraction records before submission. Finally, several determinants discussed in the broader literature on this topic (for instance, specific findings attributed in preliminary source material to studies in Pakistan, Nigeria, Spain, and Mexico) could not be traced to a verifiable, complete bibliographic source at the time of writing and have therefore been excluded from this version pending verification by the authors.

CONCLUSION

This systematic review identified individual, socioeconomic, and healthcare system-related determinants influencing participation in cancer screening.

For breast cancer screening, the most frequently identified individual-level determinants included age and sex, educational attainment, marital status, as well as fear and anxiety. Among socioeconomic determinants, socioeconomic status (SES), income, and access to healthcare were important factors. Regarding healthcare system-related determinants, accessibility to health services and the organization of screening campaigns and programs appeared to play a crucial role.

For cervical cancer screening, the analysis of individual-level determinants showed that marital status, knowledge of HPV vaccination, and women's attitudes were among the most frequently identified factors. Among socioeconomic determinants influencing screening participation, socioeconomic status (SES) and income were the most frequently reported. With regard to healthcare system-related determinants, the quality of healthcare services and recommendations from healthcare providers were the factors most frequently discussed.

For colorectal cancer screening, the analysis of individual-level determinants identified age, sex, and educational attainment as the main factors associated with screening participation. Among socioeconomic determinants, socioeconomic status (SES), income, deprivation, and health insurance coverage were the most frequently reported. Regarding healthcare system-related determinants, the factors most frequently investigated

included geographic accessibility, access to healthcare services, and screening invitations.

Overall, the findings indicate that, despite cultural and geographical differences, several key determinants—including educational attainment, income, and access to healthcare services—showed similar patterns across different populations.

Individual-level factors, particularly fear and knowledge, appear to play an important role in screening participation, while socioeconomic determinants, such as socioeconomic status and health insurance coverage, may also substantially influence screening uptake. In addition, access to healthcare services, including the proximity of screening facilities and recommendations from healthcare professionals, represents an important determinant of participation in cancer screening.

Understanding these determinants is essential for general practitioners, who should take them into account when designing and implementing effective cancer screening strategies that are accessible, acceptable, and appropriate for the Moroccan population.

However, the populations included in the reviewed studies differ from the Moroccan population in terms of epidemiological, demographic, and sociocultural characteristics. Therefore, further studies specifically designed and conducted within the Moroccan context are warranted to assess the relevance and relative importance of these determinants in the local population.

ACKNOWLEDGEMENTS

The authors would like to thank the healthcare professionals of Mohamed V Military Teaching Hospital in Rabat, Morocco.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

FUNDING

The authors received no financial support for the research, authorship, and/or publication of this article.

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