

PRIMARY AND SECONDARY PREVENTION IN ONCOLOGY: IMPACTS ON PUBLIC HEALTH

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ABSTRACT

Cancer is one of the leading causes of global morbidity and mortality, making primary and secondary prevention essential strategies to reduce its incidence and impact on public health. This study aims to analyze the effects of primary and secondary prevention on reducing cancer incidence and mortality, emphasizing the impact of these strategies on public health. This is an integrative literature review, with a search for articles published between 2018 and 2025 in the PubMed, SciELO, LILACS, Web of Science, and Scopus databases, using controlled descriptors. The results show that primary prevention, through vaccination, tobacco control, and promotion of healthy habits, significantly reduces the risk of cancer, but faces barriers such as behavioral resistance and misinformation. Secondary prevention, on the other hand, focused on screening and early diagnosis, improves survival rates, but comes up against inequality of access and limited infrastructure of health services. It is concluded that the integration between both strategies, combined with investments in technology and health education, is essential to optimize early detection and minimize the impacts of cancer on the population.

Keywords: Prevention. Oncology. Tracing. Primary prevention. Secondary prevention.

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INTRODUCTION

Oncology is one of the greatest challenges faced by health systems worldwide, as cancer is among the leading causes of morbidity and mortality. According to the World Health Organization (WHO), the incidence rate of neoplasms has grown considerably, influenced by factors such as population aging, changes in lifestyles, and exposure to carcinogens (PAHO, 2024). In this scenario, primary and secondary prevention strategies become essential to alleviate the burden of the disease and reduce the socioeconomic impacts related to cancer treatment (Lima *et al.*, 2022).

Primary prevention aims to reduce the incidence of cancer by intervening in modifiable risk factors, such as smoking, lack of physical activity, diet, and exposure to carcinogenic substances (Sabóia *et al.*, 2022). For this, it is essential to implement public policies, environmental regulations and educational programs that encourage the population to adopt healthy habits. It is estimated that about one-third of cancer cases can be avoided with the effective execution of these strategies, highlighting the importance of actions aimed at promoting health (Lima *et al.*, 2022).

Within this panorama, Primary Health Care (PHC) plays a crucial role in cancer prevention, since it can detect risk factors early and facilitate access to screening exams. Strengthening the Family Health Strategy (FHS), along with training health professionals to identify the early signs of the disease, is vital to expand the coverage of preventive actions and reduce inequalities in access to cancer care (Nazaré *et al.*, 2020). In addition, PHC is important in health education, through information campaigns that encourage the population to follow preventive measures.

Immunization against infections that can lead to the development of neoplasms, such as the human papillomavirus (HPV) and the hepatitis B virus (HBV), is established as one of the most effective strategies in cancer prevention. Vaccination programs have shown a significant impact on decreasing the incidence of cervical, liver, and oropharyngeal cancers. However, challenges such as low vaccination coverage and the increase in misinformation still hinder the effectiveness of these initiatives, especially in low- and middle-income countries (De Carvalho; Coast; France, 2019).

On the other hand, secondary prevention focuses on the early detection of the disease, allowing for less invasive treatments with a more favorable prognosis. Screening exams, such as mammography for breast cancer, colonoscopy for colorectal cancer, and Pap smear for cervical cancer, are key strategies to reduce mortality from neoplasms. Early

diagnosis enables more effective therapeutic interventions, resulting in lower hospital costs and improved quality of life for patients (Lima *et al.*, 2022).

Despite the relevance of screening programs, their implementation faces obstacles such as inequality in access to health services, low adherence by the population, and the need for an integrated infrastructure to ensure regular testing. In low-income nations, the lack of trained professionals and the scarcity of adequate equipment compromise the effectiveness of these strategies, underlining the importance of investments in infrastructure and professional training (Pereira, 2024).

In addition, the social determinants of health directly impact the adoption of preventive habits and adherence to screening exams. Aspects such as socioeconomic status, education level, and access to information affect people's perception of cancer risks and the importance of early detection (Viana *et al.*, 2019). Awareness campaigns, such as Pink October and Blue November, play an important role in health education, promoting social involvement and instigating the active search for preventive exams. However, for these initiatives to produce lasting impacts, it is necessary to strengthen public policies that ensure equitable access to health services (Console, 2023).

Given all this, this study proposes to analyze the effects of primary and secondary prevention on reducing cancer incidence and mortality, emphasizing the impact of these strategies on public health. Understanding the challenges and opportunities of preventive actions is crucial to improve cancer control policies and strengthen the health system.

THEORETICAL FRAMEWORK

CANCER PREVENTION AND ITS LEVELS

Cancer prevention is one of the most effective strategies to reduce the incidence and mortality of the disease, being moderate at three levels: primary, secondary and tertiary. Primary prevention aims to prevent the onset of the disease by reducing exposure to risk factors, while secondary prevention seeks early detection, increasing the chances of successful treatment. According to the World Health Organization (WHO), up to 40% of cancer cases could be avoided with the adoption of adequate preventive measures (PAHO, 2024). These strategies are widely debated in the scientific literature due to their impact on public health and the economics of health systems (Silva; Sanabria, 2022).

PRIMARY PREVENTION: REDUCTION OF RISK FACTORS

Primary prevention consists of adopting measures that minimize exposure to environmental and behavioral elements related to the development of cancer. According to the National Cancer Institute (INCA), smoking is responsible for about 30% of cancer deaths and is related to lung, mouth, esophageal, and bladder tumors (INCA, 2020). To mitigate this risk factor, tobacco control policies, such as increasing taxes on cigarettes, granting advertising, and implementing educational campaigns, are effective in reducing the number of consumers (Magalhães; Galvão, 2022).

Diet also plays a crucial role in cancer prevention. Excessive consumption of ultra-processed foods and processed meats increases the risk of colorectal cancer by up to 30% (Ferraz, 2023). On the other hand, diets rich in fiber, fruits, and vegetables are associated with the incidence of gastrointestinal cancer and other types of neoplasms. In addition, regular physical activity reduces the risk of breast and colorectal cancer by approximately 20%, as it regulates hormones, improves the immune response, and controls body weight (Ferraz, 2023).

Vaccination against infectious agents is also an essential primary prevention strategy. Immunization against the human papillomavirus (HPV) can prevent up to 90% of cases of cervical cancer, while the vaccine against hepatitis B significantly reduces the incidence of liver cancer (De Carvalho; Coast; France, 2019). However, adherence to these programs faces challenges, such as the spread of misinformation and vaccine hesitancy, which compromise population coverage, especially in low- and middle-income countries.

SECONDARY PREVENTION: EARLY DIAGNOSIS AND SCREENING

Secondary prevention is based on early detection of cancer, allowing for less invasive treatments with higher success rates. Cancer screening has a proven impact on reducing cancer mortality, especially for neoplasms such as breast, colorectal, and cervical cancer (Magalhães; Galvão, 2022).

Mammography, for example, can reduce breast cancer mortality by 25% to 30% in women aged 50 to 69 when performed regularly. The Pap smear and, more recently, the DNA test for HPV, are effective strategies in detecting precursor lesions of cervical cancer, contributing to a reduction of up to 70% in mortality from the disease (Oliveira *et al.*, 2023).

In the case of colorectal cancer, colonoscopy allows the identification and removal of pre-malignant polyps, reducing the risk of disease progression by up to 60% (INCA, 2024).

Despite the benefits, the effectiveness of screening programs depends on factors such as population adherence, health service infrastructure, and training of professionals responsible for interpreting the tests. In developing countries, inequality in access to health services and the population's lack of knowledge are challenges that compromise the coverage of preventive strategies (Pereira, 2024).

INTEGRATION OF PRIMARY AND SECONDARY PREVENTION

The combination of primary and secondary prevention strategies is essential for more effective cancer control. Programs that combine health promotion with screening exams significantly increase early diagnosis rates and reduce the incidence and mortality of the disease (Martins *et al.*, 2022). In this context, Primary Health Care (PHC) plays a fundamental role in educating the population, identifying risk factors, and referring them to preventive exams.

In addition to biomedical approaches, the social determinants of health directly influence adherence to preventive measures. Groups in situations of greater socioeconomic vulnerability have difficulties accessing health services, are more exposed to risk factors, and have lower adherence to screening tests (Pilla, 2021). Thus, intersectoral policies that integrate health, education, and food security are indispensable to reduce inequalities in cancer prevention.

ECONOMIC IMPACT OF CANCER PREVENTION

Investments in primary and secondary prevention generate benefits not only for the health of the population, but also for the sustainability of health systems. Studies indicate that every dollar invested in prevention can save up to five dollars in cancer treatments, simplifying costs with hospitalizations, high-cost therapies and associated complications (Banna; Gondinho, 2019).

In addition, the adoption of new technologies, such as artificial intelligence applied to diagnosis, biomarkers, and genetic testing, can optimize screening strategies, allowing for more accurate and earlier diagnoses (Abreu; Nascimento, 2019). The advancement of scientific research on immunoprevention and gene therapies opens up new possibilities for

reducing the global burden of cancer and improving cancer prevention policies (Nascimento, 2023).

METHODOLOGY

This investigation consists of an integrative literature review, which is a methodological approach that enables the condensation of relevant scientific studies on a specific topic, ensuring a detailed and critical analysis of the available evidence. Integrative review is commonly applied in the health area, as it allows the inclusion of various types of studies, contributing to the creation of guidelines and well-founded public policies. This method was chosen for its ability to aggregate different perspectives and offer a comprehensive view of primary and secondary cancer prevention, as well as its impacts on public health.

The central question of this research was formulated to identify the main cancer prevention strategies and their effects in the context of public health. Thus, the question that guided the review was: "What are the primary and secondary prevention strategies in oncology and what are their impacts on public health?". The precise definition of this issue allowed for a more rigorous selection of studies, facilitating the analysis of the evidence found in the literature.

To ensure the inclusion of relevant and up-to-date studies, specific selection criteria were established. The review covered scientific articles published between 2018 and 2025, due to the need to consider recent research on the subject. The inclusion criteria were: articles published in scientific journals, studies related to the proposed theme, available in full, free of charge, and in Portuguese, English or Spanish. Studies that did not meet these criteria and were duplicates were excluded.

The search for studies was carried out in databases recognized worldwide, ensuring the selection of publications of relevance and scientific impact. The databases consulted were PubMed/MEDLINE, Scopus, Web of Science, SciELO, and LILACS. To ensure a comprehensive search, controlled and uncontrolled descriptors were used, combined by Boolean operators. The search terms included expressions such as "Prevention"; "Oncology"; "Tracking"; "primary prevention" and "secondary prevention", in addition to their translations into English and Spanish.

The selection of studies was carried out in a systematic three-step process. First, the titles and abstracts were read, discarding those that did not correspond to the inclusion

criteria. Afterwards, the selected articles underwent a thorough reading to assess their adequacy about the objective of the review. Finally, only studies that met all the established criteria were included. Screening was carried out independently by two researchers, and any disagreements were resolved by consensus.

As this is an integrative review, without direct involvement with human beings, the study did not require approval from an ethics committee. However, guidelines were followed that guarantee transparency and accuracy in the analysis of the data, respecting the ethical principles of scientific research and ensuring that all sources used were properly referenced. One of the limitations of the review is the time constraint, since only articles published from 2013 onwards were considered. In addition, choosing studies in only three languages may have resulted in the exclusion of relevant publications in other languages. Another limitation concerns the heterogeneity of the studies evaluated, since different methodologies can make it difficult to directly compare the results.

Thus, this integrative review aims to synthesize the best evidence on primary and secondary cancer prevention strategies and their effects on public health. Through a careful analysis of the literature, it is expected to provide subsidies for the creation of more effective and accessible public policies to the population, contributing to the reduction of cancer incidence and mortality.

RESULTS AND DISCUSSION

In this integrative review, we analyzed evidence from different studies that address primary and secondary cancer prevention strategies, with emphasis on their impacts on public health. The results extracted from the works of Costa (2020), Barreto *et al.* (2024), Maia da Silva and Machado Neto (2024), Facin (2019) and Mazzuco *et al.* (2024) show a diversity of approaches and challenges regarding the implementation of prevention policies.

Table 1 is presented below, which summarizes the main cancer prevention strategies identified in the studies analyzed, the impacts reported in the literature, and the challenges associated with the implementation of these measures. This systematization allows us to understand the points of convergence and divergence among the authors and the aspects that need greater attention for the improvement of cancer prevention policies.

Table 1 – Main Prevention Strategies and their Impacts

STRATEGY	TYPE OF PREVENTION	IDENTIFIED IMPACTS	REPORTED CHALLENGES	REFERENCE
Vaccination (HPV, HBV)	Primary	Significant reduction in the incidence of cervical and liver cancer	Low vaccination coverage and misinformation	Barreto <i>et al.</i> (2024)
Tobacco control and promotion of healthy habits	Primary	Reduction of risk factors for various neoplasms	Resistance to behavior change	Costa (2020)
Physical activity and behavioral intervention	Primary/Complementary	Potential protective effect against colorectal cancer	Inconclusive evidence	Facin (2019)
Screening exams (mammography, Pap smear, colonoscopy)	Secondary	Reduction of cancer mortality	Population adhesion and insufficient infrastructure	Mazzuco <i>et al.</i> (2024)
Technological innovation (AI in cytological analysis)	Secondary	Increased diagnostic accuracy	Need for investments	Maia da Silva; Machado Neto (2024)

SOURCE: Authors, 2025.

The results presented in Table 1 show that primary and secondary cancer prevention involves a range of interconnected strategies, each with its specific challenges. Vaccination against HPV and hepatitis B is one of the most effective measures to reduce the incidence of neoplasms associated with viral infections; however, low population adherence remains a significant obstacle (Barreto *et al.*, 2024).

About the promotion of healthy habits, smoking cessation and the adoption of a balanced diet are widely recognized as essential for reducing the risk of cancer. However, as highlighted by Costa (2020), behavioral resistance and inequalities in access to healthy foods still represent relevant barriers to the effective implementation of these policies.

Secondary prevention, in turn, has shown significant impacts on reducing cancer mortality, especially through screening tests. Mazzuco *et al.* (2024) reinforce that, although mammography, Pap smears, and colonoscopy are highly effective tools, population adherence is still limited, whether due to misinformation, geographic barriers, or structural deficiencies in the health system.

In addition, technological advances in oncology, such as the use of artificial intelligence in cytological analysis, can provide considerable gains in diagnostic accuracy and the efficiency of screening tests. However, as pointed out by Maia da Silva and

Machado Neto (2024), the implementation of these innovations requires substantial investments in infrastructure and professional training, which can hinder their applicability in health systems in developing countries.

Thus, the integration between primary and secondary prevention measures is essential for cancer control. The review of the studies shows that, despite the advances achieved, there are still significant challenges to be overcome, such as expanding vaccination coverage, strengthening educational campaigns, and improving infrastructure for screening tests. The strengthening of public policies and the adoption of interdisciplinary approaches are essential ways to improve preventive strategies and reduce the burden of cancer on public health.

FINAL CONSIDERATIONS

This study aimed to analyze the effects of primary and secondary prevention on reducing cancer incidence and mortality, emphasizing the impact of these strategies on public health. The literature review showed that, although prevention policies have advanced significantly, challenges persist in their effective implementation, especially about population adherence, structural barriers and inequalities in access to health services.

The analysis of the different studies allowed us to answer the central question of the research: "What are the primary and secondary prevention strategies in oncology and what are their impacts on public health?". The findings demonstrate that primary prevention, through vaccination, tobacco control, promotion of healthy habits, and health education, plays a fundamental role in reducing the incidence of cancer. However, adherence to these measures still faces challenges, such as low vaccination coverage and population resistance to the adoption of new healthy habits.

On the other hand, secondary prevention, based on screening and early diagnosis, has proven to be a crucial strategy in reducing mortality, providing more effective and less invasive treatments. However, problems related to inequality in access to exams, limitations in the infrastructure of health services, and the need for professional qualification are obstacles that compromise the effectiveness of these programs.

The results of this review reinforce the importance of an integrated approach between primary and secondary prevention. Public policies that strengthen educational campaigns, expand the availability of screening tests, and invest in new technologies, such as artificial intelligence for diagnostic analysis, can optimize efforts in the early detection of

cancer. In addition, the improvement of Primary Health Care (PHC) and the continuous training of health professionals are essential strategies to ensure the effective implementation of these measures.

Thus, it is concluded that cancer prevention should be seen as a public health priority, requiring continuous and intersectoral efforts to ensure that preventive strategies are accessible to the entire population. Investments in infrastructure, technological innovation, and equity in access to health services are key to reducing the global burden of cancer and improving public health indicators.

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