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Policy Recommendations Based on the Study of Behavioural Barriers and Preferences in CRC Primary Prevention

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Introduction

Colorectal cancer (CRC) remains a significant global public health challenge, ranking as the third most common cancer and the second leading cause of cancer-related deaths worldwide (Sung et al., 2021). In 2020, approximately 1.9 million new cases were diagnosed, with projections estimating a rise to 3.2 million by 2040 due to aging populations and lifestyle changes (Xi & Xu, 2021). CRC imposes substantial economic burdens, with direct medical costs in the United States alone exceeding $24 billion annually, alongside indirect costs from lost productivity and caregiving (Mariotto et al., 2020). These trends underscore the urgent need for effective primary prevention strategies, which aim to reduce incidence through risk factor modification before disease onset.

Primary prevention of CRC focuses on addressing modifiable risk factors, including poor diet, physical inactivity, obesity, smoking, and excessive alcohol consumption, which collectively account for over 50% of cases (Keum & Giovannucci, 2019). For instance, high consumption of red and processed meats is associated with a 20–30% increased risk, while regular physical activity can reduce risk by up to 25% (World Cancer Research Fund/American Institute for Cancer Research, 2018). Socioeconomic and environmental factors further exacerbate disparities in CRC incidence, with low-income populations facing barriers to healthy food access and preventive education (Siegel et al., 2020). These complexities highlight the necessity of tailored, evidence-based interventions that address both individual behaviors and systemic inequities.

Despite advances in screening and treatment, primary prevention remains underutilized in policy frameworks. Screening, while effective for early detection, does not address the root causes of CRC and is inaccessible to many in low-resource settings (Ladabaum et al., 2020). Moreover, public health campaigns often lack integration with community-level strategies, limiting their reach and impact. The World Health Organization (2020) emphasizes that comprehensive prevention, combining policy measures like taxation on unhealthy foods with education and infrastructure for physical activity, could avert millions of cases. Yet, gaps persist in translating such recommendations into actionable, context-specific policies.

This study employs a mixed-methods approach to bridge these gaps, combining quantitative and qualitative data concerning barriers and facilitators of CRC primary prevention, to propose attainable and sustainable policy recommendations. By examining CRC prevention through a socioecological lens, it seeks to inform policies that are both evidence-based and equitable. The significance of this work lies in its potential to reduce CRC incidence, alleviate healthcare system strain, and address disparities in high-risk populations.

Methods

To systematically identify barriers, facilitators, and vulnerabilities in CRC primary prevention, a mixed-methods approach was adopted, including a large-scale survey targeting a diverse group of participants aiming to assess participants' stance and attitudes towards CRC primary prevention common barriers, key facilitators, and effective mitigation strategies. To this end, a structured, closed-end questionnaire was designed. The 96-item questionnaire included sections tailored to three key groups: citizens (46 items), clinicians (29 items), and policymakers (21 items). It was made available in nine languages—Dutch, English, French, German, Greek, Italian, Lithuanian, Romanian, and Spanish, and was digitally administered from May to July 2024 via an online platform (SurveySparrow) certified to ensure data protection and anonymity. Participation was voluntary and completely anonymous.

A sample size formula was employed to determine the necessary number of citizen participants to achieve reliable results, using a 95% confidence interval, a 50% population proportion for maximum variability, and a 5% margin of error. Given the combined general population of the consortium countries, a minimum of 384 participants was required. Ultimately, 922 citizens participated in the survey, exceeding the required sample size. For clinicians, including General Practitioners and Gastroenterologists from primary, secondary, and tertiary settings, a comparative analysis of relevant studies guided the estimation of an appropriate sample size. Existing studies on barriers and facilitators of primary prevention interventions involving clinicians often employed qualitative methods with small groups (Rubio-Valera et al., 2014). Consequently, a small convenience sample of 30–50 clinicians was selected. In total, 66 clinicians from various regions and work settings participated in the survey. Correspondingly, a small convenience sample of 30–50 policymakers was deemed appropriate (Alberti et al., 2007; Lee et al., 2014) as the scarce existing studies supported this methodology. A total of 28 policymakers participated in the survey.

To gain deeper insights and validate the survey findings, a series of focus groups was conducted. Between September and October 2024, six focus group sessions were held with healthcare experts and policymakers from various European countries to explore shared cultural beliefs, misconceptions, and viewpoints that enriched the understanding of the quantitative findings. In addition, a workshop with over 40 cancer survivors from all over Europe provided a complementary perspective on the challenges of CRC primary prevention. By integrating the quantitative and qualitative findings the study developed a holistic understanding of the multifaceted challenges and enablers, ultimately guiding the development of several policy recommendations that are discussed in this paper.

Key Findings

The analysis of the collected data underscores the influence multiple factors pose to one's healthy choices through both behavioral and structural barriers to the adoption of positive and preventive health behaviors. All groups in our survey agree on the potent effect of financial barriers that are recognized as the most significant structural barrier due to its numerous manifestations. Health insurance coverage, the affordability of healthier choices, job stability, as well as being employed or not employed were identified as parameters hindering individuals from seeking preventive care. Additional structural barriers acknowledged involve the lack of incentives towards healthier choices and the scarcity of infrastructure and programs to facilitate making activity choices more feasible.

The highlighted structural barriers encompass geographic disparities, accessibility and cost of healthy options, lack of organizational health literacy, ineffective coordination among stakeholders, healthcare discrimination, housing conditions, food insecurity, and transportation were addressed and poor data collection mechanisms. Besides, the necessity for a societal systemic approach to prevention was emphasized, focusing on embedding preventive behaviors into daily activities. Structural barriers also concern the lack of dedicated excellence centres, inadequate patient-provider communication, and GPs' current role contributing predominantly to treatment rather than prevention. Inadequate preventive policies, insufficient resources, and inaccessibility of preventive services due to systemic inadequacies and out-of-pocket costs were widely recognized as well.

Healthcare system challenges emerged, as well as the need for dedicated training for healthcare providers to enhance their ability to deliver individual care and engage patients from the early stages of interventions. All groups agreed on the importance of collaborative health decision-making, while supporting health education and literacy. They also recognized the necessity of sustainable programs that extend throughout an individual's life and help him/her overcome specific obstacles, such as financial difficulties.

Accessibility was deemed as a critical factor for the adoption of preventive behaviors as identified barriers impair not only one's ability to approach and make use of healthcare services, but also his/her ability to make healthy choices, as they are frequently out-of-the-way when compared to the less healthy ones. Proposals for addressing those barriers included setting up sports areas within office spaces, incorporating sport club memberships in employment contracts, and integrating welfare programs to work benefits and remuneration. Financial incentives as well as the active involvement of the school community were suggested as governmental policies apart from improving food quality, and making healthy options more accessible, need to foster multidisciplinary collaboration to enhance the overall impact. Living labs and participatory approaches to understand community needs and support preventive behaviors were proposed, alongside redefining GPs' roles and incentivizing their involvement in prevention.

Technological barriers also emerged as significant, with all study groups agreeing on the significance of the lack of technical developments that facilitate the easy intake of healthier options and access to genetic testing for high-risk CRC groups. However, clinicians appeared merely supportive of prioritizing the development of such tools and piloting them whereas policymakers appeared more concerned with resources availability and circumstances' maturity for such endeavors.

Cognitive and behavioral barriers including knowledge gaps, stigma, and low health literacy levels emerged as prominent ones given how they impacted individuals' decision-making capacity. Among the commonly agreed identified challenges were cognitive biases, adherence issues, poor digital health literacy competencies, inadequate patient-provider communication, cultural beliefs, predispositions, and the lack of CRC prevention awareness, that linked with cancer anxiety and fear, leads to unhealthy lifestyle choices. Particularly, individuals with poor health literacy levels presented with limited awareness for preventive care and the impact of health recommendations. Their knowledge gap makes them more susceptible to social influences, cultural obstacles and motivational challenges. The repercussions can be severe considering how people rely on their social support networks, including their families, for encouragement & assistance, schedule regular check-ins with healthcare providers, while making decisions regarding treatment. As highlighted in the survey, the influence of online health forums and platforms is also critical in today's context.

With patient-provider communication being consistently identified as inadequate, the lack of effective communication is linked to a lack of trust towards healthcare professionals. Emphasis was also placed on improving communication by implementing preference assessment tools, fostering co-creation of health decisions, and supporting patient-centered care through dedicated training for doctors. This would help reduce the preventive behaviors knowledge gap, especially in lower socio-economic groups, and ensure ongoing support through follow-up consultations. In addition, financial incentives for healthcare providers are required to ensure the active involvement of healthcare professionals in promoting CRC prevention. Moreover, the needs for culturally tailored information, leveraging media and social media campaigns, and improving invitation schemes for prevention programs to overcome cultural barriers were emphasized. Ambassador programs, customized to target populations and initiatives engaging younger age groups, were recommended.

As it was noted, the policies currently at place addressing barriers improve the knowledge on healthy choices, while enhancing individuals' health literacy levels. They also address socio-cultural influences, accessibility issues, and financial constraints to a lesser extent, indicating great room for improvements. However, policies and programs, especially those targeting CRC prevention, are important to promote regular health check-ups and preventive screenings through the collaboration of health authorities, healthcare providers, and community leaders. This way, apart from increasing public awareness about prevention programs via making health information truly available and accessible, they could be able to tackle cultural influences and stigma. Nevertheless, if the participation criteria for preventive programs are not expanded and the application processes not facilitated, individuals may be deterred again from participating.

Policy Recommendations

1. Enhance Awareness & Health Literacy

Comprehensive policies should prioritize strengthening health literacy, particularly among underserved populations, to empower individuals with the knowledge needed for informed decision-making regarding CRC prevention. These policies should also incorporate financial community- led incentives to encourage participation in preventive measures, fostering engagement and sustainability. Promotion of digital literacy and digital health information literacy among healthcare professionals and patients is vital for bridging gaps in access to accurate CRC prevention information. By equipping both groups, individuals and healthcare professionals, with the skills to navigate digital resources, the dissemination and adoption of preventive behaviors can be significantly improved.

Educational programs targeting schools and communities play a crucial role in raising awareness of CRC prevention. These programs should aim to cultivate healthy behaviors from a young age, addressing dietary habits, physical activity, and routine screening adherence. Community-based initiatives can further reinforce these messages, ensuring broader reach and sustained impact. Community outreach programs should be strengthened to provide accessible and tailored education on CRC prevention. These efforts are essential for addressing the unique barriers faced by vulnerable populations, creating inclusive platforms that offer support and resources for behavioral change. The active involvement of community leaders and culturally relevant ambassadors appears as a powerful strategy for improving outreach and encouraging participation in preventive measures. By leveraging their influence and trust within communities, these ambassadors can dispel misconceptions, foster dialogue, and champion CRC prevention efforts in culturally sensitive ways

2. Encourage & Facilitate Access to Preventive Care

Telemedicine services should be expanded to address disparities in access to preventive care. This expansion is particularly essential for remote areas, resource-poor communities, and vulnerable populations. By offering virtual consultations and care, telemedicine reduces geographical and financial barriers, ensuring timely and effective CRC prevention measures for those who need them most. In this line of thought, the development of digital health platforms and mobile applications is crucial for delivering personalized preventive care and disseminating accurate health information. These tools can empower individuals to monitor their health, adopt preventive behaviors, and make informed decisions, while also providing healthcare professionals with a streamlined approach to offering tailored advice and resources.

Artificial intelligence (AI) and machine learning models should be utilized to analyze patient data and provide tailored preventive interventions. These technologies can uncover patterns and insights that inform evidence-based policymaking, optimize resource allocation, and ensure interventions are precisely targeted to the needs of specific populations, enhancing overall effectiveness in CRC prevention efforts.

3. Combat Cultural & Social Challenges

To enhance the delivery of effective preventive care, ongoing training should be provided to healthcare providers in cultural competences and patient-centered care. These initiatives will equip clinical staff with the necessary skills to address the diverse needs of patients, ensuring that preventive interventions are culturally sensitive, inclusive, and respectful. Efforts are required on reducing stigmatization and creating judgment-free environments that encourage individuals to participate in preventive measures. By fostering an atmosphere of acceptance and understanding, these environments can help dismantle barriers rooted in fear or shame, enabling broader engagement in CRC prevention activities.

Holistic health approaches that integrate environmental, mental, and physical well-being should be incorporated into CRC prevention strategies. Addressing these interconnected dimensions of health can create a supportive framework for sustained preventive behaviors, emphasizing overall wellness alongside targeted interventions. Workplace-based wellness programs and safe spaces should be established to integrate preventive behaviors into daily routines. These initiatives can offer employees opportunities to engage in health-promoting activities, receive education on CRC prevention, and adopt healthier lifestyle choices in a supportive and accessible setting.

4. Address Inequalities & Vulnerabilities

The appropriate environment, which encompasses preventive behaviors, requires that policies should address critical social determinants of health, such as housing conditions and food insecurity. These structural challenges significantly influence individuals' ability to adopt healthy lifestyles and access preventive care. Targeted measures to improve living standards and ensure food security are essential components of a comprehensive approach to CRC prevention. Tailored interventions must be designed, implemented, and continuously monitored to address the specific needs of high-risk populations, including individuals with low socio-economic status, migrants, and refugees. These groups often face unique barriers, such as limited access to healthcare, language obstacles, and financial constraints.

All prevention strategies need to be inclusive, explicitly targeting vulnerable and marginalized populations to reduce health disparities. This involves creating accessible healthcare services, culturally sensitive outreach programs, and eliminating systemic barriers that hinder participation. Inclusivity ensures that no group is overlooked in the fight against CRC, promoting health equity across diverse communities.

5. Increase Availability of Resources & Promote Sustainable Practices

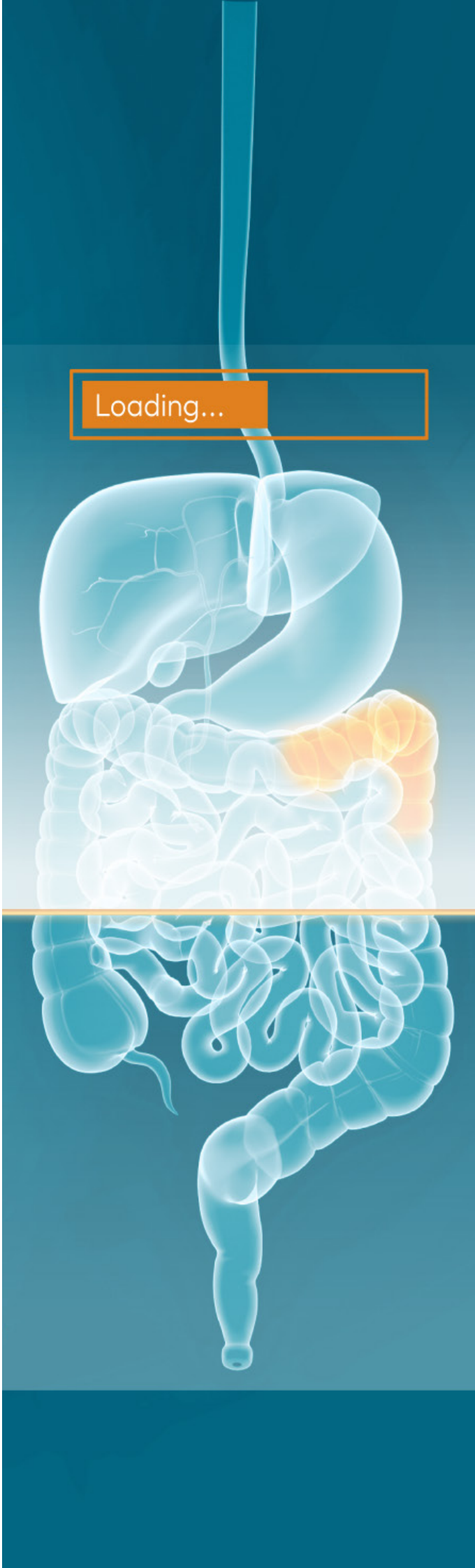
The adoption of long-term strategies is critical for sustaining CRC prevention efforts over time. These strategies should include robust mechanisms for ongoing monitoring and evaluation to track progress and identify areas for improvement. By ensuring continuity and adaptability, these approaches can maintain momentum and effectiveness in addressing preventive care challenges. Adequate funding is essential for the success of preventive care programs. Policies should aim to increase financial support and ensure resource allocation aligns with identified needs, addressing gaps in access, education, and infrastructure. Stable funding streams empower preventive measures to be more comprehensive and effective.

Public-Private Partnerships (PPPs) should be actively facilitated to leverage resources, expertise, and innovation for CRC prevention efforts. These collaborations can enhance the reach and impact of interventions by pooling knowledge and capital, fostering a unified approach to overcome barriers in preventive care. Collaboration between public and private sectors is important to be prioritized to maximize the effectiveness of prevention initiatives. Joint efforts enable a multidisciplinary approach, integrating diverse expertise and resources to tackle the multifaceted challenges of CRC prevention. Strengthening these partnerships ensures sustainability and innovation in policy development and implementation.

6. Support Policy Implementation

Robust monitoring and evaluation mechanisms should be established to systematically assess the effectiveness and impact of CRC preventive programs. These mechanisms will enable continuous improvement by identifying successful strategies and areas requiring modification, ensuring that preventive initiatives remain relevant, and evidence-based. To maintain public trust and enhance program effectiveness, transparency and accountability must be integral to the implementation of CRC prevention policies and programs. Clear reporting structures and accessible updates on progress will foster confidence among stakeholders and ensure adherence to planned objectives.

Policies that promote healthy dietary guidelines and encourage genetic testing for individuals at increased cancer risk are vital components of a proactive approach to CRC prevention. These measures support early detection and intervention while fostering healthier lifestyle choices across populations. Interdisciplinary approaches should be adopted to address the multifaceted barriers to CRC prevention. Collaboration among healthcare providers, policymakers, educators, and community leaders can integrate diverse perspectives and expertise, resulting in comprehensive solutions that tackle prevention barriers from multiple angles.



Implementation & Implications

Addressing barriers is crucial for improving the uptake of preventive measures as implementing interventions designed to promote equality and provide targeted support for high-risk groups can lead to better health outcomes. Through the international survey as well as the focus groups and the workshop, which involved healthcare experts, policymakers, and citizens, including cancer survivors, the detailed analysis conducted identified common barriers, effective facilitators, and population groups in need of interventions. One valid conclusion drawn is that the complexity of CRC primary prevention requires a holistic approach with integrated and comprehensive policies to overcome the various barriers. Effective implementation of interventions must prioritize though equality, inclusivity, and targeted support for high-risk populations to not only improve health outcomes but also minimize disparities in access to preventive care (Alberti et al., 2007; Lee et al., 2014).

An important takeaway is the adoption of holistic and integrated policies that consider the complexity of CRC primary prevention. Said policies should aim to simultaneously address barriers across diverse settings and incorporate community engagement, technological innovations, and cultural sensitivity (Rubio-Valera et al., 2014). A significant insight from this research is the necessity for a "whole-of-society" approach, emphasizing interventions that account for the contexts in which individuals live and work. Stakeholders across all sectors—healthcare providers, policymakers, and the public, need to collaborate to ensure effective implementation and inclusivity. The findings also highlight challenges in prioritizing target population groups. While high-risk individuals, marginalized populations, and those of low socio-economic status require focused attention, balancing this prioritization with universal approaches is critical. This balance ensures the wider population benefits from preventive measures without exacerbating inequalities.

Sustainability of CRC prevention efforts ought to be regarded as a pressing priority. Implementing longitudinal studies is essential to evaluate the effectiveness, feasibility, and scalability of interventions. Such studies will not only provide insights into the sustainability of preventive programs but also guide policymakers and practitioners in refining strategies over time (Alberti et al., 2007; Rubio-Valera et al., 2014). Despite aiming to reduce the limitations and biases of our study to a significant extent, several of them should be examined in future projects. Larger-scale studies, that also adopt a mixed-methods approach, are needed to investigate the effects of barriers and facilitators on more extensive and diversified samples. Those studies are important to incorporate follow-up elements that our study lacked due to time constraints, as well as standardized evaluation metrics to systematically assess the effectiveness of CRC prevention interventions, if such efficacy assessments lie within their scope.

Future implementation research must embrace innovative solutions, such as genetic testing, mobile health applications, and artificial intelligence, to enhance precision in identifying and addressing population needs. Furthermore, longitudinal studies focusing on behavioral insights are required to illuminate factors such as cognitive biases, social influences, and motivational challenges that impact engagement in preventive measures. These findings will guide the development of interventions that address behavioral and societal dynamics effectively (Lee et al., 2014).

Needs assessments and policy impact assessments should precede the design and deployment of new policies. Such evaluations ensure that interventions are tailored to meet the specific needs of individuals and communities, thereby increasing their likelihood of success. Additionally, future studies must strive to overcome limitations identified in this research, such as time constraints and sample diversity, by incorporating mixed methods approaches and follow-up elements to strengthen the evidence base (Alberti et al., 2007).

Conclusions

In summation, addressing the multifaceted barriers to CRC primary prevention is pivotal to reducing its burden on populations worldwide. The findings from this study strongly underscore the need for comprehensive, inclusive, and innovative strategies that can overcome the complexities associated with CRC prevention. Tackling these barriers requires a holistic approach that integrates behavioral, technological, and policy dimensions, ensuring interventions are both equitable and effective. Hence, the immediate next step is the formation of cross-sector working groups to pilot these interventions in select regions.

On the policy front, this study highlights the importance of integrated and inclusive policymaking. Equitable resource allocation, targeted support for high-risk and marginalized populations, and transparent monitoring and evaluation mechanisms are fundamental to ensuring the sustainability and effectiveness of CRC prevention initiatives. Policies should also promote cross-sector collaboration, uniting healthcare providers, policymakers, researchers, and community leaders in a coordinated effort to tackle CRC prevention from all angles. Importantly, a "whole-of-society" approach is paramount for addressing the diverse contexts in which individuals live and work. Such an approach ensures that interventions are not only focused on high-risk groups but also engage the broader population, fostering a culture of prevention and early detection.

Ultimately, the integration of behavioral, technological, and policy innovations presents a transformative opportunity to advance CRC prevention efforts. By prioritizing inclusivity, equity, and collaboration, these strategies have the potential to significantly reduce health disparities and improve outcomes across diverse population groups. This comprehensive and forward-looking approach will not only benefit individuals and communities but also contribute to the broader global effort to reduce the burden of CRC and enhance public health outcomes.

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