

Colorectal Cancer in the Context of Nutrition Transition and Urbanization: A Public Health Systems Perspective

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Abstract

Colorectal cancer (CRC) is increasingly observed among younger populations and in regions undergoing socioeconomic and nutritional transitions. This paper explores colorectal cancer from a public health systems perspective, emphasizing structural determinants beyond individual lifestyle factors. Changing dietary patterns driven by globalization, urbanization, and food system transformation have increased exposure to risk factors such as ultra-processed foods, red and processed meats, and sedentary lifestyles. Biological mechanisms including gut microbiota alteration, chronic inflammation, and metabolic dysfunction contribute to carcinogenesis; however, these mechanisms are strongly influenced by broader social and environmental contexts. Current health systems remain largely treatment-oriented, resulting in delayed diagnoses and limited preventive impact. The paper discusses governance-related approaches including nutrition policy reform, community-based prevention strategies, and integration of screening within primary healthcare systems. A prevention-centered model addressing food environments, urban planning, and health governance is proposed as a sustainable approach to reducing future CRC burden. The study highlights the need for multisectoral collaboration to align policy, healthcare, and social systems toward population-level prevention.

Keywords: Colorectal Cancer, Public Health, Nutrition Transition, Health Governance, Disease Prevention, Health Systems.

INTRODUCTION

Colorectal cancer (CRC) is increasingly recognized as a global public health concern rather than a condition confined to older adults or high-income countries. Recent epidemiological trends demonstrate rising incidence among younger populations and in regions undergoing rapid socioeconomic transitions [1,10]. These shifts suggest that broad structural changes in lifestyle, food systems, and urban environments are influencing disease patterns. The global nutrition transition has transformed traditional dietary habits into consumption patterns dominated by ultra-processed foods, refined carbohydrates, red and processed meat, and sugar-sweetened beverages [4]. These transitions are shaped by urbanization, market globalization, aggressive food marketing, and changing work environments, which collectively alter population-level exposure to dietary risks.

Biologically, these changes contribute to colorectal carcinogenesis through altered gut microbiota, prolonged exposure to intestinal carcinogens, chronic inflammation, and metabolic disturbances [5,6].

Nevertheless, focusing only on biological pathways may overlook important structural influences. Food choices are often shaped by socioeconomic conditions, accessibility, urban design, and policy environments rather than individual preference alone.

Health systems in many settings remain oriented toward treatment after disease onset, with limited emphasis on prevention and early detection [1,9]. Screening programs often face barriers related to affordability, awareness, and accessibility, especially in low- and middle-income countries. Consequently, late-stage diagnosis remains common, increasing morbidity and healthcare burden.

This paper presents a public health systems perspective on colorectal cancer and argues for prevention-focused policies that address social, environmental, and governance determinants.

Public Health Drivers of Colorectal Cancer

Global changes in food systems have reduced accessibility to high-fiber diets while increasing dependence on processed and convenience foods. Low fiber intake and excessive consumption of red and processed meats are associated with microbiome disruption and inflammatory mechanisms linked to CRC development [3,5]. Urban environments may further amplify risk by reducing opportunities for physical activity through poor walkability, limited green space, and sedentary occupational patterns. Structural conditions such as food deserts and economic constraints influence dietary behavior and increase exposure to unhealthy food choices. These environmental and behavioral determinants interact across the life course, creating cumulative biological vulnerability and population-level disease risk.

Health Systems and Prevention Challenges

Current health systems predominantly emphasize diagnostics, treatment, and tertiary care. While essential, this approach provides limited impact on future disease prevention. Preventive services such as dietary counseling and screening remain weakly integrated into primary healthcare pathways.

Limited awareness, affordability constraints, and fragmented preventive infrastructure contribute to delayed detection [9]. Risk-based screening strategies, rather than reliance solely on age thresholds, may improve early identification among younger populations with emerging risk profiles. Integration of preventive services into routine healthcare is necessary to reduce long-term disease burden.

Policy and Governance Approaches

Effective colorectal cancer prevention requires policy interventions beyond individual behavior change. Evidence supports regulatory measures such as taxation of sugar-sweetened beverages, front-of-pack labeling, marketing restrictions, and incentives for healthy food production [7,8]. Community-based initiatives including nutrition education, school-based health promotion, and localized screening programs can shift social norms toward healthier lifestyles. Urban planning policies that promote physical activity and access to healthy food environments are equally important.

At the governance level, CRC prevention should be embedded within national non-communicable disease strategies and supported through long-term public health investment.

Conclusion

Colorectal cancer represents a visible indicator of broader systemic challenges involving food systems, urban environments, and healthcare organization. Rising incidence highlights the need for prevention-centered public health action rather than reliance on treatment-based models alone. Sustainable

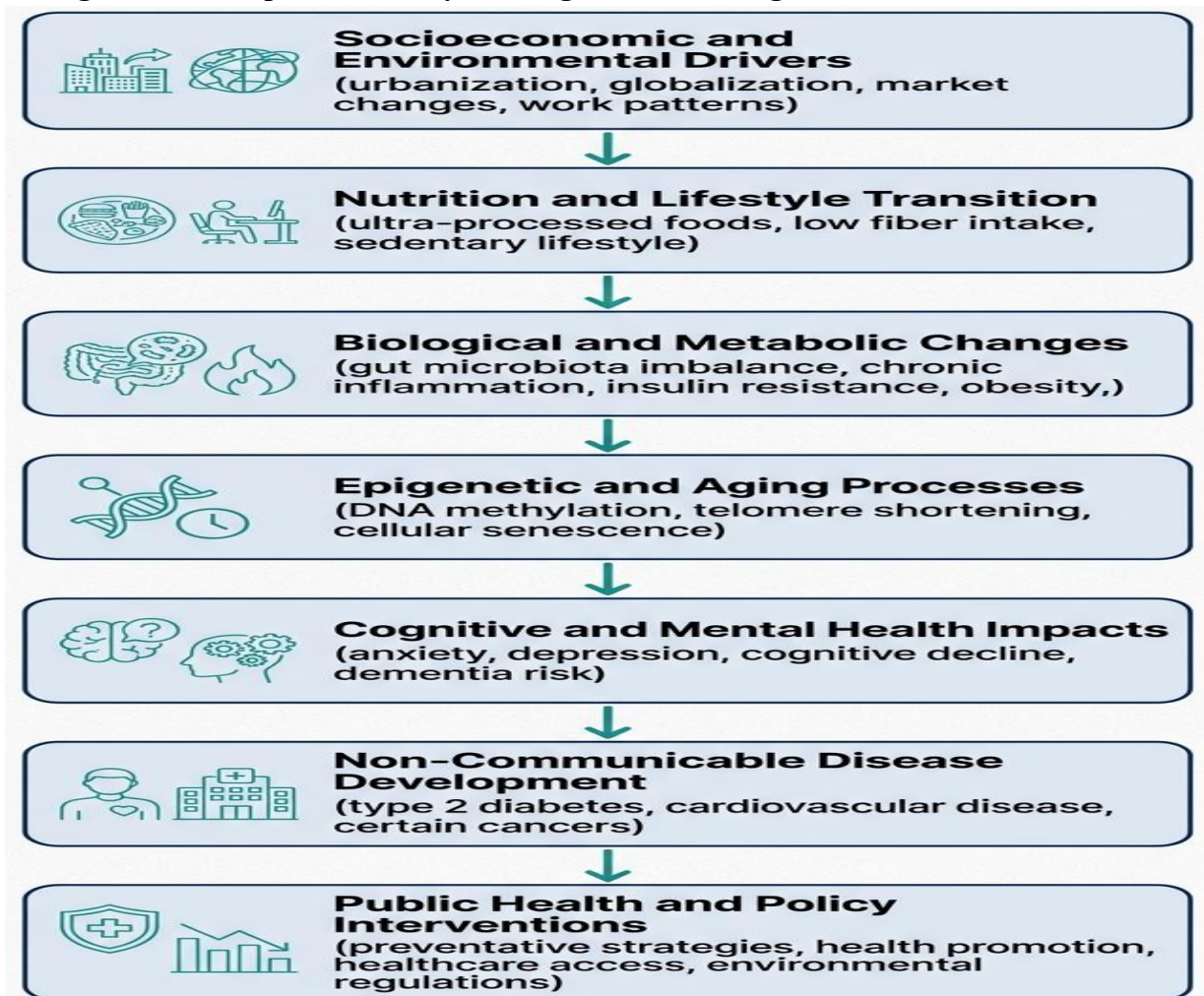
reduction of colorectal cancer burden requires multisectoral collaboration integrating nutrition policy, urban planning, community engagement, and healthcare system reform. Creating environments where healthy choices become accessible and affordable is essential for long-term population health improvement.

1. Tables & figures

Table 1: Public Health Interventions for Colorectal Cancer Prevention Across Levels

Prevention level	Main focus	Key interventions	Expected public health impact
Primary prevention	Reduce exposure to risk factors before disease onset	Nutrition policies, taxation of sugar-sweetened beverages, regulation of ultra-processed foods, promotion of physical activity, urban planning for walkability.	Reduction in population-level risk factors and long-term incidence
Secondary prevention	Early detection and risk identification	Screening programs (fecal occult blood testing, colonoscopy), risk-based screening models, community awareness campaigns, integration with primary healthcare.	Early diagnosis, improved survival rates, reduced treatment burden
Tertiary prevention	Reduce complications after diagnosis	Access to treatment, lifestyle counseling for survivors, follow-up care, rehabilitation services.	Improved quality of life, reduced recurrence and mortality
Policy and governance support (cross-cutting)	Systems-level coordination	Multisectoral governance, health financing, surveillance systems, public health legislation.	Sustainable prevention and health equity improvement

Figure 1: Conceptual Pathway Linking Societal Changes to Colorectal Cancer Risk



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