

Global Trends in the Promotion of Fruit and Vegetable Consumption for Better Nutrition and Health

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Most people would agree with the statement: fruit and vegetables are rich in micronutrients and health-promoting phytochemicals, and in many cases, low in energy. A healthy diet should be diverse with plenty of fruit and vegetables. Research provides strong evidence that increased intake of fruit and vegetables is associated with lower incidences of micronutrient deficiencies and non-communicable diseases, lower economic/social/personal costs induced by non-communicable diseases (NCDs), lower morbidity and mortality rates, and improved well-being [1-6]. Daily consumption of at least 5 servings a day or 400 g of fruit and vegetables is highly recommended in dietary guidelines worldwide. However, the great majority of people in all countries do not eat enough fruit and vegetables [7-10]. Moving from awareness of the benefits of fruit and vegetables to actual consumption remains a global challenge.

Throughout the world, dietary patterns are shifting towards increased consumption of energy-dense food and highly processed foods [11-13]. Urbanization, food industry marketing, and trade liberalization over the past two decades have facilitated this 'nutrition transition'. Populations in countries or regions undergoing rapid economic change are experiencing the nutrition transition as rates of obesity and

chronic diseases rise. Factors influencing fruit and vegetable consumption and eating behaviors vary by age, social/economic demographics, food systems, and many other personal and environmental drivers [7,14]. Income, prices and availability (including seasonality), consumer preferences, home production and intra-household decision-making are major determinants affecting fruit and vegetable consumption in lower income countries [15].

Great effort has been made to promote fruit and vegetable consumption worldwide. Nutrition and health interventions, gardens in schools for children and adolescents and in communities for families, recipe creation and cooking demonstrations, social marketing and behavior change communications through mass media and social media campaigns, and promotion of positive social images, lifestyle, physical activity and other dietary improvements aim to encourage greater consumption [16-20]. Yet scientific evidence indicates limited success in reaching the desired consumption and nutrition outcomes at the individual and population levels [21]. Lack of clear evidence-based strategies leading to increased fruit and vegetable consumption has hindered the development of policies for large-scale implementation.

To promote healthy eating and increased fruit and vegetable consumption for nutrition and health outcomes, a focus solely on understanding and promoting what, how, and why to eat is insufficient to achieve expected outcomes. It is crucial that the foods we promote, including fruit and vegetables, must be available and affordable. Compared to staple foods, fruit and vegetable production is intensive in terms of knowledge, inputs and labor, incurring high risks for the farmer. Fresh produce is highly perishable and subject to large price fluctuations due to supplies and seasonality [22-23]. Often it is children who do not like to eat vegetables and simply increasing supplies of affordable fruit and vegetables may not result in greater consumption. Besides increased knowledge of the benefits of fruit and vegetables, many consumers need additional incentives to actualize behavior change and increase fruit and vegetables in their diets. Better understanding of the linkage of agriculture to health and the food system from agricultural inputs, production and postharvest to markets and consumers may help researchers and policy makers identify options for intervention strategies [24-26]. Many drivers or enabling factors in fruit and vegetable consumption, as well as disabling factors, may be outside the scope of promotion interventions and result in unexpected outcomes. Multisectoral collaborations are crucial to identify and address major gaps along the impact pathway.

Food policies will be effective only if they are developed with input from both the agricultural and health sectors, thereby enabling the development of coherent policies that will ultimately be beneficial to agriculture, human health and the environment [27]. A number of market oriented policy initiatives were suggested in areas of nutrition, innovation, information and promotion across the European Union and in other countries [28-30]. Strategies to increase fruit and vegetable consumption by the US Centers for Disease Control and Prevention (CDC) highlight multisectoral and market approaches, such as improving access to grocery stores; encouraging/allowing local farmers to sell fruit and vegetables directly to schools, universities, medical centers, governments and non-government workplaces; expanding the number, size and frequency of farmers' markets; improving access to fruit and vegetables in workplaces, meetings, events, cafeterias; greater support and promotion of community and home gardens; and incorporation of fruit and vegetables in school activities [31].

Biodiversity for food and nutrition has gained more attention and advocacy in the agriculture and nutrition communities [32-34]. Many traditional vegetables or indigenous/local vegetables in tropical Asia and Africa are nutritious and easy to grow, but are underutilized [35-38]. Greater traditional vegetable consumption has been limited by (1) loss of traditional knowledge and methods in their utilization, especially with urban migration; (2) low priority given to research on improvement of local landraces to meet production and market requirements; (3) high perishability of leafy traditional veg-

etables compared to cabbage, onions and some fruit vegetables; (4) altered or changing consumption patterns and food habits; (5) food systems characterized by easier (physical and economic) access to foods of low nutritional quality; (6) high priority given by food aid programs to staple foods without consideration of the human need for diverse food groups. The international community only recently has become aware of this problem, although the situation has developed over a long time due to the neglect of dietary diversity and concentration on the production of staple crops. Nutrition and health outcomes result from the entire process, from agricultural and food production to marketing and consumption. However, without discussion among the agricultural, food and nutrition/health sectors, the food systems that have developed are unable to meet the nutritional requirements of many populations. It is a challenging yet urgently needed task to bring local nutritious food, including traditional vegetables and fruit, back into rural and urban food systems. Fortunately, active advocacy by donor agencies and international agricultural research centers has led to better linkages and synergy among the agriculture, food, and nutrition/health communities, resulting in revived interest in traditional vegetables, such as the case of increased African nightshade (*Solanum* spp.) marketing and consumption in Kenya.

Promotion of fruit and vegetable consumption for nutrition and health is a global challenge that will continue for the coming decades. Combined efforts of multiple interventions involving multiple sectors and across settings are essential to facilitate healthier eating choices by children, adolescents, adults and the elderly.

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