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Agricultural policy and societal factors influence patients' ability to follow a healthy diet



The INTERHEART and INTERSTROKE studies found that modifiable health and lifestyle factors— including unfavorable levels of consumption of fruits and vegetables, physical activity, alcohol, abdominal obesity, psychological factors, smoking, lipids, blood pressure and diabetes— accounted for at least 90% of the risk for myocardial infarction (MI) and stroke worldwide [1,2]. Accordingly, the most effective way of preventing MI and atherosclerotic cardiovascular disease (ASCVD) in general is to follow a healthy lifestyle throughout one's lifetime [3]. Pharmacologic therapies typically only furnish a 10–25% reduction of relative risk, [4–6] while lifestyle measures may reduce risk by over 80% [7]. While statins, antihypertensives, and other preventive therapeutics play a critical role in the treatment of patients with or at risk for ASCVD, lifestyle improvement, including a healthier diet, remains at the core of all preventive efforts [3].

National attempts at chronic disease prevention, however, have historically been inadequate. Before the COVID pandemic, the leading causes of premature mortality in the United States (U.S.) were ASCVD, cancer, and diabetes, which are largely preventable [7] and yet accounted for sixty percent of all mortality in the U.S. and over \$850 billion in healthcare costs and lost productivity annually [8,9]. Nearly one-fourth of our \$3.5 trillion annual healthcare spending could be saved by improving our patients' lifestyle habits and eliminating preventable diseases. Our patients cannot solely be blamed for their poor lifestyle habits. The decisions of an individual are often shaped by circumstances and social determinants of health – education, socioeconomic status, legislation, upbringing, adverse childhood experiences, structural racism, and more [10].

While the epidemiological evidence supporting a diet rich in whole fruits, vegetables, whole grains, and legumes is clear, [11,12] over 90% of Americans consume below the minimum recommended level of these foods daily [13]. Moreover, 98% of Americans exceed the recommended daily amount of solid fats and added sugars [13]. These nutritional inadequacies are explained partially by access to, availability, and proximity of healthy food. In low-income neighborhoods, grocery stores face the challenge of low profit margins and high overhead costs, exacerbated by having a consumer-base that often has less time for home meal preparation [14]. This combination of factors creates food deserts (i.e., where fully-provisioned grocery stores are scarce) and food swamps (i.e., where there is an abundance of inexpensive, processed convenience foods) [15]. Such a dearth of fresh produce can lead to poor nutrition, highlighting an individual's context as a major social determinant of health [16,17]. Even if the government were to step in and erect grocery stores on every block, U.S. Department of Agriculture (USDA) data indicate that the U.S. food system supplies only 75% of the daily vegetable servings recommended for the standard 2000-calorie diet [18] – in other words, even if people had access to vegetables, there would not be enough to go around. Fig. 1.

Additionally, grocery stores' success in food deserts is dependent on demand for healthy food, as simply the presence of healthy food is insufficient to improve food purchasing habits [19]. Those with easy access to farmers' markets and grocery stores, and an existing desire to purchase healthy foods, are more able to tap into the limited supply of produce than those who live in rural areas or areas underserved by grocery chains [20,21]. Access needs to be paired with financial disincentivization of unhealthy foods, a potent method of reducing consumption of energy-dense foods and improving cardiometabolic health, [22] as was shown by Mexico's soda tax [23]. This strategy is especially effective at motivating those who are younger, female sex, have lower income, and are of non-White race/ethnicity, as these groups tend to rank cost of food more important than taste when making food purchase decisions [24].

As agricultural policy dictates production, government-issued payments directly encourage overproduction of commodities that are the basic ingredients of processed, energy-dense foods [25]. Although this supply may be a result of the demands of the American palate, this does not justify the ample production of health-impairing foods. Some data suggest that agricultural subsidies do little to impact food production or price, [26] implying that this money may be better spent elsewhere. Moreover, between 1995 and 2012, 23 Congress members and their families received farm subsidies, highlighting a clear conflict of interest [27]. Federal agricultural subsidies over the last 25 years have amounted to nearly \$200 billion for corn, soybean, sorghum, livestock, and dairy alone [28]. Much of the former three are converted into agricultural feed, and a large portion of all five are the raw materials for sweetened drinks, processed foods, and high-fat meat and dairy products [25]. Furthermore, in 2015, the U.S. government spent \$22.2 billion in direct and indirect subsidies to the dairy sector, allowing them to sell dairy products at below market value [29]. Subsidized foods can often be less expensive for consumers, as they are partially paid for by the government; [30] hence, individuals with fewer financial means are more likely to buy inexpensive foods made from subsidized ingredients, which are by nature unhealthy [24]. A study of more than 10,000 participants showed that over half of calories consumed are from major subsidized food commodities, nearly all of which are of poor nutritional value, underlining the importance of subsidizing fruits and vegetables instead of the raw materials for energy-dense, processed foods [22,31]. Food policy, health, and societal factors are inextricably linked, [32] and disproportionately affect low-income individuals who are most sensitive to the cost of healthy foods.

The conflict between agribusiness and healthful dietary choices stems, in part, from the USDA's diverging internal mandates, to both promote the agricultural industry and steer the U.S. Dietary Guidelines. These guidelines, which dictate how billions of dollars are spent on the National School Lunch Program (NSLP), the Supplemental Nutrition Assistance Program (SNAP), and the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), disproportionately affect the health of low-income groups that rely on these programs. Moreover, the U.S. Dietary Guidelines Advisory Committee is comprised of

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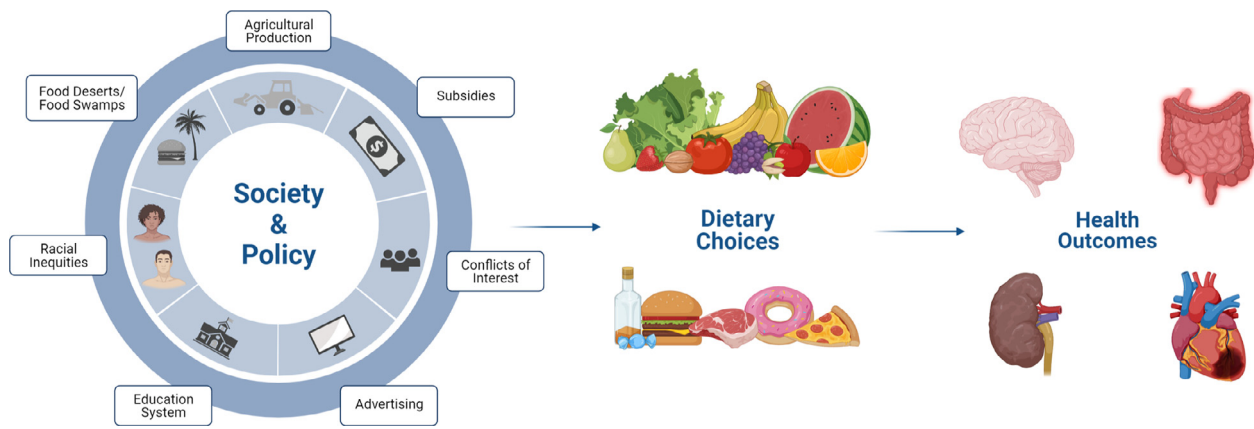


Fig. 1.

advisors to General Mills, Kraft, Campbell's, and a number of pharmaceutical companies [33]. In light of these potential conflicts of interest, it is imperative that food policy reflects the current scientific consensus that a diet high in fiber and low in cholesterol and saturated fat, exemplified by a plant-based diet, is paramount to prevent cardiometabolic disease. Rerouting government subsidies towards fruit and vegetable programs would stimulate production, ameliorating our current production deficit, and ideally helping to promote their consumption.

These legislative changes would reorient our production and recommendation of healthful foods; yet such changes do not necessarily portend widespread acceptance of fruit and vegetable consumption. The privatization of food distribution in a free market complicates the acceptance of healthy foods by the public. Food companies spend over \$11 billion on television advertisements annually; [34] of this, 80% is spent on soda, fast food, candy, and unhealthy snacks, and less than 0.5% is spent on fruits and vegetables [35,36]. Many companies go as far as to employ child psychologists to understand how to draw children towards their products, [37] and more than 98% of television food advertisements seen by children are for products high in fat, sugar, and/or sodium [38–40]. Furthermore, with the advent of personalized advertising across media platforms, Black teenagers are more than twice as likely as White teenagers to see commercials for these unhealthy items [36,41,42]. These advertisements may have a long-lasting negative impact on the health and well-being of children and teenagers, as research shows that what we eat during childhood strongly influences lifelong dietary choices [43,44]. Moreover, families that cook less at home and buy more prepackaged foods are more likely to buy foods that are unhealthy if they are shown ads for unhealthy foods [24,45]. This targeted advertising is driven by the shareholder value movement, obligating private food corporations to yield increasing returns to investors; [46,47] as such, realigning financial incentive with health as opposed to profits is critical.

Reducing corporate incentive to market unhealthy foods to children, while simultaneously improving the quality of food available in schools, is essential to properly nourish our youth [48]. School feeding programs worldwide account for \$100 billion annually, and are directly correlated with cognition and educational achievement [49]. Reassuringly, improving school meals to fulfill more nutritional guidelines has been shown to have no detrimental effect on revenue, making this a financially feasible decision even for poorly funded school districts [50]. Nutrition education initiatives have shown promise; the Food, Health, & Choices intervention was a nutrition education curriculum in New York public schools that costed \$8.5 million, but was estimated to save \$8.1 million in direct medical costs, and 1600 quality-adjusted life-years [51]. While dietary interventions through school meal programs and post-intervention follow up studies are needed to better evaluate the effects of improved school meal quality on the cardiometabolic health out-

comes of schoolchildren, a small randomized controlled trial in children did find that healthier dietary patterns led to improved cardiometabolic health [52].

Diet, a key element of our health, is largely determined by the food system, including availability, agricultural subsidies, education, and advertising. These factors differ enormously from individual to individual and region to region, leading to vastly different health outcomes. Quality of diet, exercise, non-smoker status, and body mass index are all correlated with race, ethnicity, level of education, and household income, underlining the importance of these factors in influencing our health. Figure 1 outlines some of the societal and policy factors that influence dietary choices and ultimately shape health outcomes.

In order to address and eventually overcome inequities in health-care, we need to address societal factors contributing to poor health in the first place. The North Karelia project in Finland was a brilliantly executed collaboration between health services, schools, non-governmental organizations, the food industry, and media that illustrated the immense potential such a collaboration has to reduce the prevalence of ischemic heart disease [53]. This project developed and disseminated healthy, easy-to-prepare recipes, while reducing the salt and fat content in dairy products and baked goods sold by restaurants and food distributors. Dairy farmers were provided with resources to switch to berry farming, television broadcasts began including programs focused on healthy lifestyles, using popular figures as role models, and community-based initiatives provided reliable nutrition education. This broad, comprehensive initiative reduced the national rates of ischemic heart disease by 65%, all-cause mortality by 45%, and increased life expectancy by over six years. Similar government-industry partnerships in the U.S. involving the food industry, agricultural policy legislators, the USDA, and the Centers for Disease Control, paired with robust lifestyle education in schools and community centers, and media programs with advertising regulations, holds enormous potential to improve our country's cardiovascular health.

1. Limitations

Our understanding of the sociocultural factors, institutions, and laws that shape dietary choices is colored by our personal experiences in academic and clinical medicine, and the insights provided to us by the dozens of patients we interact with on a daily basis. Public behavior, especially when it comes to diet, is a dynamic entity that is strongly influenced by cultural factors spanning from the individual to the national and international levels, and consequently is challenging to study objectively. Our interpretation of this data was initiated as a genuine attempt to illustrate areas for improvement in our society that we believe could benefit the health of patients in our country that needlessly ail with preventable diseases.

Conclusions

In sum, we propose implementing the following policy advancements: 1) shifting agricultural subsidies towards fruits and vegetables, 2) revamping NSLP, SNAP, and WIC to focus on providing plant-based options to the individuals who utilize these programs, and 3) creating comprehensive public initiatives to improve our national advertising and dietary culture. Overall, reorienting federal funding to address these factors could reduce billions of dollars of healthcare spending downstream. If we want to prevent the chronic diseases that plague our nation, it begins with addressing foundational inequities engendered by our agricultural, legislative, and social systems.

Author contributions

All authors contributed to the conceptualization, preparation of the original draft, editing of the manuscript, and provided final review of the manuscript.

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