Association Between Sustainability and Cancer – Recent Literature Analysis and Indication of Points for Improvement

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Abstract from Laine JE, Huybrechts I, Gunter MJ, et al.: Co-benefits from sustainable dietary shifts for population and environmental health: an assessment from a large European cohort study. Lancet Planet Health. 2021;5(11):e786–e796.

Abstract

Background: Unhealthy diets, the rise of non-communicable diseases, and the declining health of the planet are highly intertwined, where food production and consumption are major drivers of increases in greenhouse gas emissions, substantial land use, and adverse health such as cancer and mortality. To assess the potential co-benefits from shifting to more sustainable diets, we aimed to investigate the associations of dietary greenhouse gas emissions and land use with all-cause and cause-specific mortality and cancer incidence rates.

Methods: Using data from 443,991 participants in the European Prospective Investigation into Cancer and Nutrition (EPIC) study, a multicentre prospective cohort, we estimated associations between dietary contributions to greenhouse gas emissions and land use and all-cause and cause-specific mortality and incident cancers using Cox proportional hazards regression models. The main exposures were modelled as quartiles. Co-benefits, encompassing the potential effects of alternative diets on all-cause mortality and cancer and potential reductions in greenhouse gas emissions and land use, were estimated with counterfactual attributable fraction intervention models, simulating potential effects of dietary shifts based on the EAT–Lancet reference diet.

Findings: In the pooled analysis, there was an association between levels of dietary greenhouse gas emissions and all-cause mortality (adjusted hazard ratio [HR] 1.13 [95% CI 1.10–1.16]) and between level and all-cause mortality (1.18 [1.15–1.21]) when comparing the fourth quartile to the first quartile. Similar associations were observed for cause-specific mortality. Associations were also observed between all-cause cancer incidence rates and greenhouse gas emissions, when comparing the fourth quartile to the first quartile (adjusted HR 1.11 [95% CI 1.09–1.14]) and between all-cause cancer incidence rates and land use (1.13 [1.10–1.15]); however, estimates differed by cancer type. Through counterfactual attributable fraction modelling of shifts in levels of adherence to the EAT–Lancet diet, we estimated that up to 19–63% of deaths and up to 10–39% of cancers could be prevented, in a 20-year risk period, by different levels of adherence to the EAT–Lancet reference diet. Additionally, switching from lower adherence to the EAT–Lancet reference diet to higher adherence could potentially reduce food-associated greenhouse gas emissions up to 50% and land use up to 62%.

Interpretation: Our results indicate that shifts towards universally sustainable diets could lead to co-benefits, such as minimising diet-related greenhouse gas emissions and land use, reducing the environmental footprint, aiding in climate change mitigation, and improving population health.

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Knowledge Transfer

Environmental Background
The current food system is a major driver of global environmental footprints, with increases in greenhouse gas (GHG) emissions and water use, pollution, habitat destruction, loss of biodiversity, and much more [1, 2]. Diets improving health and at the same time the environment have been leading to so-called ‘co-benefits’ where it may be possible to mitigate dietary-related GHG emissions and other environmental impacts [1]. Vegetarian diets have become increasingly popular over the past years, with people choosing plant-based diets for environmental, ethical, and health reasons [2, 3]. For example, many sources of plant-based diets are not as resource-intensive compared to the production of animal-derived food products [3]. The consideration of the environmental impact of diets on both population and planet health is crucial for the development of sustainable public health policies [1].

Clinical Background
In 2020, cancer was a leading cause of death with approximately 10 million deaths globally [2]. It is estimated that 30–50% of cancers could be prevented by employing prevention strategies such as reduction/cessation of smoking, reduction of overweight/obesity, reduction/cessation of alcohol consumption, and avoidance of environmental carcinogens and an unhealthy diet [3, 4]. Researchers have identified multiple diet components that negatively impact cancer risk, such as intake of red and processed meat, fast foods, and other processed foods. Instead, health policies advocate and promote a diet that is rich in whole grains, vegetables, and fruits [2]. In fact, some evidence suggests that following a plant-based diet may be associated with a lower cancer risk overall; however, for specific cancers the evidence is limited [2, 3]. The study selected included specific collected cancer data [1].

Plant-Based Diet Definition
Different types of plant-based diets exist and range from strict exclusion of animal products to the reduction or limitation of animal-based foods [2]. Vegetarian diets are characterised by the avoidance of meat [2, 3]. However, there are lacto-ovo vegetarians who eat no animal flesh but do consume eggs and dairy products. Lacto-vegetarians follow the same restrictions but also exclude eggs [2, 3]. Pescatarians on the other hand are vegetarians who include fish and seafood in their diets, whereas vegans exclude all animal products [2, 3]. Over the past decades, multiple health benefits and a favourable environmental impact of plant-based diets have been increasingly recognized [2, 5, 6]. However, it is important to note that not all plant-based diets have equal health benefits, and many include less healthy plant-derived foods which may influence the risk of cancer and overall outcome [2, 3].

Results and Discussion Review
The prementioned co-benefits for human and environment health can be achieved by adhering to diets that consider both nutritional quality and planetary health [7]. It is however important to find a way of distinguishing between healthy and unhealthy plant-based diets in order to achieve a healthful dietary pattern [8]. The dietary pattern index could be a useful tool for determining dietary quality [9]. It is a composite measure of the quantities and portions of all foods, drinks, and nutrients in one’s diet as well as the frequency with which they are consumed [7, 9]. Based on this index, an overall plant-based diet index (PDI) was created as well as 2 subindices: a healthy plant-based diet index (hPDI) and an unhealthy plant-based diet index (uPDI) [2, 5, 9]. A higher PDI score represents greater consumption of all types of plant foods, whereas a higher hPDI score reflects greater consumption of healthy plant foods (fruits, vegetables, and whole grains) and a higher uPDI is indicative of a greater consumption of refined grains and sugary beverages [5, 9]. In the specific study selected, a parallel approach was designed to assess the food categories that contribute to GHG emissions and land use levels [1]. According to Laine et al. [1], the highest GHG scores were assigned to meat and meat products, followed by dairy products. While higher hPDI scores are associated with lower risk of all-cause mortality, a similar relationship was determined with a declining score derived from food categories with higher GHG emissions within this newly developed dietary index [1, 2].

Conclusion for Practice and Research
There is a lack of intervention studies assessing the association between plant-based diets and cancer risk. However, there are abundant observational studies, including multiple longitudinal cohort studies, that demonstrate a decreased overall cancer risk among subjects who follow plant-based diets. Studies that merge different dietary pattern analyses in this particular area, such as hPDI and food GHG emissions, could further elucidate the association between sustainability and human health. Nutritional research on cancer risk is continuously progressing, and there are several opportunities for future research to further support our understanding of best practice. This study thus has the potential to merge healthy dietary patterns that may not be clearly vegan or vegetarian and enable a more data-based method of assessing the dietary pattern and its impact on health and the environment. In a world where dietary patterns and food choices are linked with ethical and environmental values it is important to expand research methods and consider such trends.

Key Message
The development of a global sustainable diet faces numerous challenges. Guidance for establishing a healthy diet, in particular one that achieves co-benefits aligned with environmental and ethical beliefs, remains crucial to public health and the quest to reduce the incidence of diet-related mortality and cancers while at the same time meeting planetary health goals.
Disclosure Statement
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