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The importance of considering both nutrient quality and climate impact to support sustainable development

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It is well documented that high adherence to dietary recommendations, guidelines, or indexes is associated with reduced mortality—both total mortality and disease-specific mortality, such as cancer-specific mortality—compared with low adherence (1, 2). The novelty of the study by Strid et al. (3) in this issue of *The American Journal of Clinical Nutrition* is that the authors take into account both dietary density and diet-related greenhouse gas emissions (GHGEs), highlighting the urgent need for dietary choices that are nutritious and healthy, but also help combat climate change. In this context, nutrient density was used to assess diet quality and diet-related GHGEs were a measure of climate impact.

Approximately 25% of total GHGEs is generated from the production, processing, and transportation of food, but the amount of GHGEs varies greatly among different food products (4). In general, animal-based products generate higher emissions, whereas plant-based products generate lower emissions. The aim of the present research was to study the effects of diets varying in nutrient density and climate impact on total mortality, using the nutrient density index Nutrient Rich Foods (5) adjusted to national reference values. A strength of this research is the use of a large population-based cohort study, The Va¨sterbotten Intervention Programme (VIP), in Sweden. The analyses are based on data from 1990 to 2016 and cover 75,501 women and 71,1620 men with a mean follow-up time of 11.8 y for women and 11.1 for men. All participants completed a semiquantitative FFQ at enrollment and participants were followed up by linkage to the population-based registry of causes of death.

The study showed that total mortality was 13% lower in the group of women whose diet was characterized as having high nutrient density and low climate impact, than in the group with low nutrient density and high climate impact. However, total mortality was also 13% lower in the group of women with high nutrient density and high climate impact, indicating that although high nutrient density was identified as the most important factor for human health, it is feasible to combine healthy and climate-friendly food habits. This is an important message because increasing incidence of diet-related diseases and climate change are 2 major societal challenges that are being tackled by the Sustainable Developmental Goals (6).

The same result was not seen for men. Instead, men had an 11% increased mortality risk for a diet with low nutrient density and low climate impact, as compared with low nutrient density and high climate impact. Although we do not know how to explain these associations, we could speculate. Previous studies from Sweden show that people with low diet-related GHGEs had higher intakes of added sugars than people with high diet-related GHGEs, because sugar is a plant-based product with low climate impact (7). At the same time, high intake of added sugars is known to increase the risk of diet-related diseases (8, 9). The group with low diet density and low climate impact might be characterized by high consumption of carbohydrates and sugars, in particular, whereas the group with low diet density and high climate impact may be characterized by high consumption of meat, and in particular red and processed meat. This seems to be supported in Figure 3 in the present study. Thus, it is plausible that high consumption of sugars was more strongly associated with mortality than was high consumption of red and processed meat. However, in order to find out what drives the association for men, more studies and better methods for analyzing GHGEs are needed. In the present study, the GHGEs were dichotomized, where below the median value was considered "low" climate impact and above the median value was considered "high" climate impact. A more fine-grained approach might have better identified the potential variation in climate impact between groups. This highlights the need for future methodological work to establish standardized methods for taking into account the climate impact of diet.

Another weakness that might have influenced the result is that only 1 assessment of diet was included in the analyses and the dishes in the questionnaire had not been updated since the 1980s. The questionnaire included 3 questions about "meat" (meat, meat casserole, and minced meat dishes) but did not ask what kind of meat it was, and a previous validation study indicated that the assessment of meat intake was underestimated as compared with repeated 24-h recalls, especially among men (10). Because beef is the type of meat that contributes the most to diet-related GHGEs (11), the assessment of climate impact may have been underestimated.

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The dietary indexes used in the present study were based only on nutrient intake. In the future, recommendations and guidelines based on food intake or a combination of nutrients and food intake might give a more nuanced picture of dietary quality and climate impact, making it easier to identify the drivers of diet-related GHGEs. Also, food-based guidelines may offer more pedagogical tools for the general public. In Sweden, the Nordic Nutrition Recommendations are nutrient-based (12) but have been "translated" into foods and the recommendation is to eat ≥500 g of vegetables and fruits per day. At the same time, in order to promote the health of both humans and the planet, red and processed meat should be limited to no more than 500 g/wk (13).

In conclusion, the work by Strid et al. adds an important piece to the growing body of evidence considering both nutritional and climate aspects of food habits to support sustainable development.

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