

## The challenges of eating a healthy and sustainable diet<sup>1,2</sup>

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As evidence detailing the detrimental effects of food production on the environment continues to mount, several key areas have emerged as priorities for public health nutrition policy makers, researchers, and practitioners to consider. Climate change is one of those, and in this issue of the *Journal*, Macdiarmid et al (1) use a mathematical modeling approach to explore how adapting the United Kingdom's current dietary intake could reduce the impact of greenhouse gas emissions (GHGEs); they do this by identifying which foods meet nutrient requirements while minimizing GHGE contributions and combining these to produce a realistic 7-d diet. To achieve this goal, changes are necessary to existing food-based dietary guidelines to reflect reductions necessary within certain food groups—for example, meat and dairy foods—and increases within others—for example, bread, rice, and potatoes. Such revisions are also timely for health to rebalance nutrient intake and reinforce previous suggestions for food-based dietary guidelines to incorporate sustainability criteria (2).

Some European countries, such as Germany and Sweden, have developed guidelines for their citizens that integrate health and sustainability when making food choices (3), although the Swedish guidelines were withdrawn following incompatibility with the European Union's internal market (4). Both guides recommended choosing seasonal, local, and, where possible, organic fruit and vegetables; consuming less meat and fish; and considering packaging (3, 4). The German advice also advocates purchasing fair trade—certified produce wherever possible (3).

The concept of incorporating the sustainability aspects of the human diet with those of nutrition was first evoked more than 20 y ago (5), amid concerns over the environmental implications of food production, as well as identifying the need to incorporate sustainability into nutritional guides to advise citizens. Yet, it is still unclear exactly what constitutes a sustainable diet (6), from either an environmental or a biological perspective, except to say that a diet rich in a variety of plant foods—ie, fruit and vegetables—tends to be more health promoting for both humans and the natural environment (7). Comparisons between vegetarian and nonvegetarian diets have illustrated vast differences in their environmental impact, with the nonvegetarian diet using 2.9 times more water, 2.5 times more primary energy, 13 times more fertilizer, and 1.4 times more pesticides than the vegetarian diet (8). Animal-based foods also generate more GHGEs than do plant-based foods, with the exception of fruit and vegetables grown in greenhouses (9). There are even tensions between human health and the environmental impact of fruit and vegetable consumption, which accounts for ~2.5% of the United

Kingdom's total GHGEs (10), with air-freighted produce, unseasonal produce, prepared (trimmed or chopped) produce, and fragile or highly perishable produce being the major contributors of this sector (10). Tailoring dietary recommendations to regional circumstances, ie, favoring healthy foods that can be produced locally, could provide better outcomes for the environment and public health nutrition (11).

Sustainable and certified produce is more expensive, and cost is a recognized barrier to accessing a healthy, sustainable diet (12); this concern has been integrated into Macdiarmid et al's research (1) by ensuring that the resulting diet remains affordable to the consumer. In creating this diet, the authors have also illustrated the challenge of tackling embedded social norms within everyday eating practices (13). One such example is whole-grain breakfast cereal, which would provide a wide variety of daily nutrients required and a 90% reduction in GHGEs; however, it is ordinarily consumed in combination with milk, which produces far higher GHGEs. Key areas such as meat consumption are also entrenched in social and cultural practices (14) and make up the “standard” British dinner plate, so this diet proposed by Macdiarmid et al (1) is realistic because meat is included on most days, in smaller amounts. Some argue that a meat-free diet is not good for human health because of the nutrients it supplies or for environmental health as grazing livestock play an important role in carbon sequestration, which reduces GHGEs; evidence suggests that the merits of different livestock types to reduce GHGEs largely depend on the scale and type of system in which the animals are reared (15). Even so, the future sustainability of current protein sources such as meat and fish remains one of the biggest challenges for a sustainable food system, and this qualification has been reflected internationally in the nutrition policy agendas of some European countries (16).

The research approach taken by MacDiarmid et al (1) is based on sound evidence of dietary intake that uses the most comprehensive life-cycle analysis (LCA) food list currently available, and crucially it acknowledges that GHGEs, although important, are only one part of the wider sustainability picture. (An LCA is

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an assessment of the environmental effects a product or service has during its lifetime, from cradle to grave. In an LCA, all of the important processes during the product's life cycle are included. An LCA can, for example, be used for assessing how much greenhouse gas is emitted to the environment during the production of 1 L milk.) It is therefore vital that any revisions to food-based dietary guidelines also consider sustainability in a holistic way to incorporate the social dimensions involved both in food production, eg, labor and trade ethics, but also at the consumption end of the food chain. Further research in this respect needs to address the influence of the built and retail environment on food-purchasing decisions and the role of packaging within a healthy and sustainable food system. Any revisions to food-based dietary guidelines should also consider how labeling can best be aligned with advice given to consumers, so that confusion is minimized.

Guidance should be provided to health professionals in defining the key messages appropriate to facilitate the behavioral change required, so that food choices are both healthy and sustainable. Nutritionists and dietitians in particular will need to play a key role in delivering such messages and must be informed of the issues that resonate with consumers, such as local food choice and meeting nutritional demands within a fixed food budget. Food groups that present challenges within current food-based dietary guidelines, eg, fish (17), need careful consideration during the process of deciding how best to communicate the required shifts to the wider public.

When designing public health nutrition interventions, specialists should consider broadening criteria to include the food consumption process as a whole—ie, growing, purchasing, cooking, and eating—to build on the link between healthier dietary intakes and attitudes toward sustainable food (18). This process might involve collaboration with other elements of local government—eg, planning, transport, or environment—to ensure cohesion in delivery. Researchers need to add to the evidence base by evaluating the impact of interventions that incorporate both health and environmental sustainability objectives.

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