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Revealing the hidden costs of what we eat

Shifting our diets to be more sustainable can be a powerful way for each of us to address both climate change and global food insecurity, however making such adjustments at the large scales necessary to make a difference globally can be a delicate matter.

“Changes in food demand in one part of the world can have cascading environmental and human welfare implications for people around the world,” said Joe DeCesaro, data analyst at UC Santa Barbara’s National Center for Ecological Analysis & Synthesis (NCEAS).

Despite the seemingly daunting complexity of the global food system, to ensure a healthy population and planet, global diet shifts are required. To remove some of the uncertainty surrounding such an ambitious yet critical endeavor, DeCesaro and an international collaboration of researchers set out to understand where and how these environmental pressures might occur within hypothetical global shifts to each of four types of diets: Indian, Mediterranean, EAT-Lancet (largely plant-based, “flexitarian”) and average government-recommended food-based dietary guidelines (FBDGs). The most beneficial of the four? The Indian diet, with an estimated 20.9% reduction in food production-based global environmental pressure. The least beneficial of the selected diets? FBDGs, with a potential 35.2% global increase in environmental pressure.

The researchers’ study is published in the journal Environmental Research Letters.

Following food flow

The global food system is one of the largest drivers of environmental change, according to the study, contributing to about a third of global greenhouse gas emissions and using more than 70% of freshwater resources, on top of degrading and disturbing land for agriculture and contributing the majority of nutrient pollution in waterways and coastal waters. For these reasons, moving toward a more sustainable diet — one that leans away from resource-intensive foods like red meat, for instance — can ease the pressure on the environment, with the added

benefit of being healthier, especially when the diet also involves cutting back on refined sugars and starches and increasing nutrient-dense foods such like vegetables and legumes.

But that's just part of the solution, according to the researchers.

"We wanted to know who would actually be feeling the change from the food production if these shifts occur," said Ben Halpern, NCEAS director and a coauthor on the study. What has not been well understood is how environmental pressures may move, or if new ones might be generated by a large-scale shift in diet, especially given that food is often produced in one part of the world and eaten in another part of the world.

"The research was motivated originally by the question: Whose consumption is generating the pressures of food production that are being felt by people and places around the world?" DeCesaro said. "Are poorer countries paying the environmental price of producing higher pressure foods that are being eaten by richer countries or vice versa? Our methods allow us to track changes in the environmental pressures from the producer to the consumer, and vice versa, in a standardized format across four pressures. Our work is quite novel in this space."

Using available data on a variety of factors, including countries' average diets, trade flow and the global environmental pressures of food production, the researchers were able to map to a high degree of precision the changes in environmental pressure that would occur with a global shift to each of four types of diets, the mostly vegetarian Indian diet, the plant-forward Mediterranean and EAT-Lancet diets, and average government-recommended dietary guidelines.

“We felt these four diet scenarios gave us a good variation of diet types from low meat to higher quantities of meat and dairy while also maintaining cultural relevance,” noted DeCesaro. “The Indian and FBDGs being directly from government recommendations, the Mediterranean being widely discussed for its health benefits, and the EAT-Lancet diet being developed by subject matter experts.”

The researchers found that shifts to three of the four diets examined — all except the FBDGs — resulted in reductions in global cumulative pressure. The Indian diet in particular performed the best out of the sustainable popular diets largely due to the difference in red meat consumption — the Indian diet recommends no red meat while the FBDGs typically recommend more red meat than countries already consume.

Meanwhile, global reductions in pressure, according to the study, would come mostly from dietary shifts in higher-income countries.

“Higher-income countries’ average current diets have higher consumption quantities of most food categories than the recommended quantities in our diet scenarios,” DeCesaro said. “Essentially, these countries are over-consuming, compared to the recommendations of the diet scenarios, while lower-income countries are, on average, under-consuming in these categories.”

Additionally, should the world shift toward more sustainable, plant-forward diets, lower-income countries would see an increase to their food-production related environmental pressures, DeCesaro said, “but that is mainly due to the diet scenarios meeting more of their daily needs.” To ensure the goals of food security and equitable access to adequate nutrition for these countries, the authors call for support from wealthier countries via access to imports of efficiently produced foods, economic development where it can improve dietary health and reduce environmental pressures of food production, and through innovation and knowledge sharing of efficient and environmental food production practices.

“Sharing sustainable agricultural practices will help reduce any increases in pressures seen from diet shifts,” DeCesaro said. Continuing in this vein, the researchers are currently working to directly analyze current food trade patterns and the subsequent environmental pressures traded with it, with no diet shifts.

“A big message from our work,” summarized Halpern, “is that the decisions we make about what we eat are important for reducing our environmental footprint, but other people may pay the price for those decisions.”

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