We have more than enough calories, but what about other nutrients?

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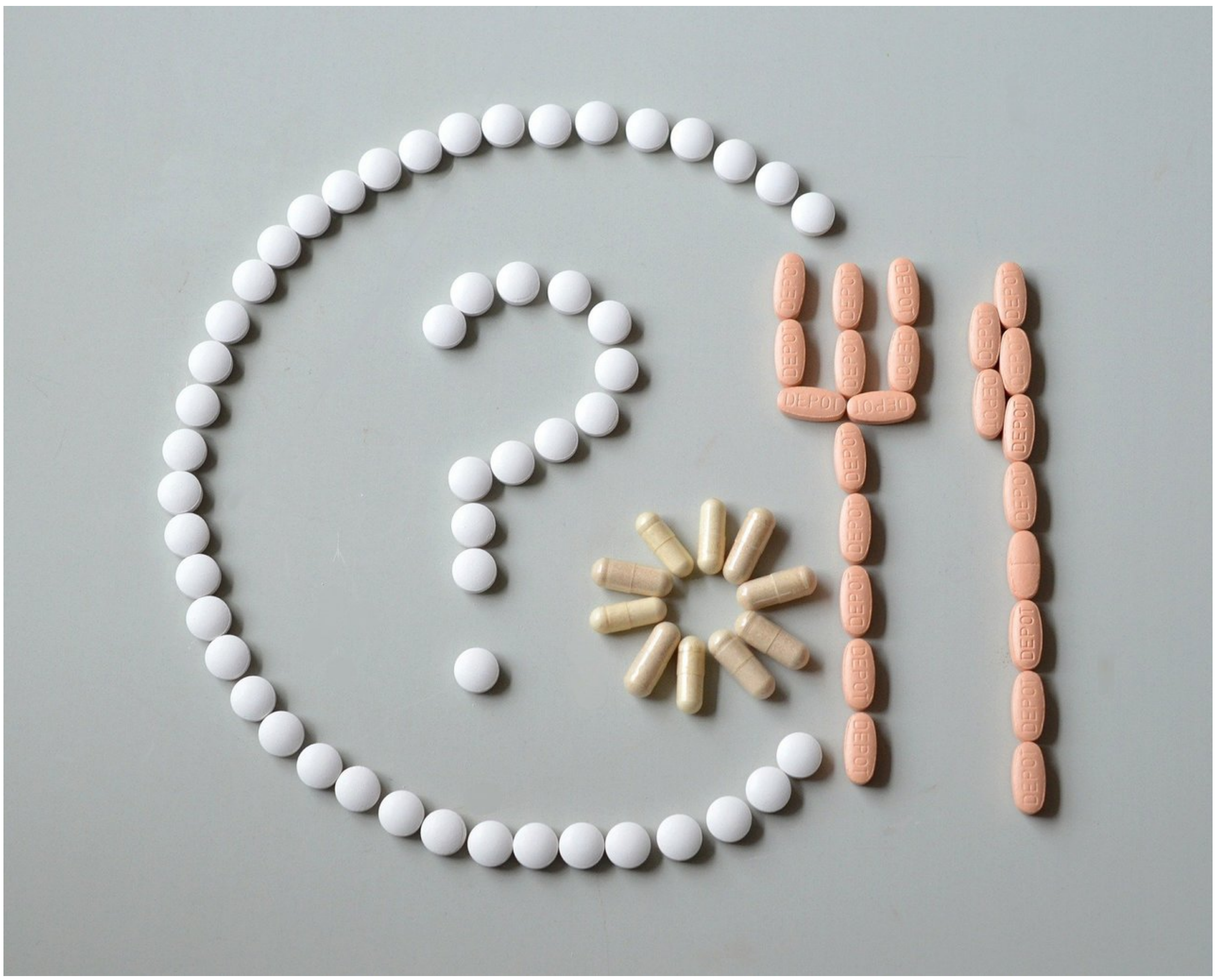

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The United Nation's second Sustainable Development Goal targets the end of malnutrition in all forms by 2030. But new research shows that to meet this target, we need a different approach to assessing the nutrient sufficiency of the global food system. Published in *Frontiers in Sustainable Food Systems*, this is the first study to quantitatively map the flow of energy, protein, fat, essential amino acids and micronutrients from 'field-to-fork' at a global level and identify hotspots where nutrients are lost. The study shows that while we produce far more nutrients than is required for the global population, inefficiencies in the supply chain leave many people nutrient deficient. The research highlights the complexities that arise in delivering a balanced food system, which can only be handled by a holistic approach.

"There are two main issues with how we currently talk about food systems," says Hannah Ritchie from the University of Edinburgh, who led the study. "The first is that we focus our measure of food security in terms of calories (energy), when micronutrient malnutrition ('hidden hunger') affects more than ~2 billion people across the world."

"The second issue," she continues, "is that aspects of our food system are reported in tonnes or kilograms, and it's very hard to put these numbers in the context of how many people this could feed.

"We wanted, for the first time, to assess the full food system in useful metrics—average nutrients per person—across all the nutrients that are essential to good health."

The research team used food balance and nutrient composition datasheets from the UN Food and Agriculture Organization (FAO) to quantify digestible protein, fat, calories, amino acids and micronutrients (calcium, zinc, iron, folate and vitamins A, B6, B12 and C) across the supply chain—from crop production to food delivered to households. Food and nutrient losses were calculated from FAO regional waste data, and all metrics were normalized to average per person per day (pppd). Nutrient supply values were compared to average nutritional requirements to assess whether these would be sufficient by the time food arrives at the household level.

The researchers were surprised to find that all nutrients, not just calories, exceed average requirements.

"Previous studies have shown that we produce much more than we need in terms of calories (5,500-6,000 kilocalories pppd), but I was not expecting this for protein and essential micronutrients. Some nutrients were up to five times the average requirement," explains Ritchie.

But while all nutrients exceed requirements, food wastage and nutrient losses in the supply chain mean that by the time some nutrients (e.g. calcium and folate) reach households, they barely scrape by.

"This would be okay in a perfectly equitable food system," explains Ritchie. "But with large inequalities in food availability, we know that many people will be deficient in several essential nutrients".

To further complicate the picture, not all stages of loss are the same for every nutrient. For example, the largest losses of many micronutrients (vitamin A, vitamin C, folate and calcium) occur in post-harvest waste of fruits and vegetables, while the largest losses of energy and protein occur in allocation of crops to animal feed and biofuel.

"This is important information to understand," says Ritchie. "Knowing that the highest-impact interventions for maintaining micronutrients may not be the same as for calories, which may not be the same as for protein, will help to focus our efforts for food security and nutrition."

Complicated trade-offs also arise in the production of meat and dairy.

"When you consider that more than ~80% of farmland is used for grazing or animal feed production, livestock are clearly an inefficient way of producing food," explains Ritchie. "But, while livestock are an inefficient converter of feed, they remain the only natural dietary source of vitamin B12 and an important source of high-quality protein and lysine (an amino acid) for many people," she continues.

Overall, the researchers produced a high-level framework that can inform policy decisions on global food security, and show where to target efforts for improved sufficiency and possible trade-offs that may arise. This framework is limited by the resolution of data used, which doesn't capture regional or local dynamics, but the researchers advocate its usefulness.

"This study is just the start," says Professor David Reay, a supporting researcher from the University of Edinburgh. "In the future, this replicable framework can be used to map food pathways for specific regions and countries. Our hope is that governments and development agencies can use it to assess food security risks and develop locally specific solutions."

The researchers' work emphasises the complexity of ensuring a balanced food system and the necessity of a holistic approach to meeting future food targets. "With population growth, intensifying climate change impacts and rapidly changing diets, the need for evidence-based, holistic assessments of our food system have never been more urgent," advises Professor Reay.

More information: *Frontiers in Sustainable Food Systems*, DOI: 10.3389/fsufs.2018.00057 , www.frontiersin.org/articles/1 … sufs.2018.00057/full

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