

Billions worldwide consume inadequate levels of micronutrients critical to human health, new study finds

August 29 2024



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More than half of the global population consumes inadequate levels of several micronutrients essential to health, including calcium, iron, and

vitamins C and E, according to a new study by researchers at Harvard T.H. Chan School of Public Health, UC Santa Barbara (UCSB), and the Global Alliance for Improved Nutrition (GAIN). It is the first study to provide global estimates of inadequate consumption of 15 micronutrients critical to human health.

The study is published in *The Lancet Global Health* journal.

Micronutrient deficiencies are one of the most common forms of malnutrition globally, and each deficiency carries its own health consequences, from adverse pregnancy outcomes, to blindness, to increased susceptibility to infectious diseases. Previous research has estimated the amounts of micronutrients available to and consumed by people; this study evaluates whether these intakes meet requirements recommended for human health and looks at the inadequacies specifically facing males and females across their lifespans.

"Our study is a big step forward," said co-lead author Chris Free, research professor at UCSB. "Not only because it is the first to estimate inadequate [micronutrient](#) intakes for 34 age-sex groups in nearly every country, but also because it makes these methods and results easily accessible to researchers and practitioners."

The researchers used data from the Global Dietary Database, the World Bank, and dietary recall surveys in 31 countries to compare nutritional requirements with nutritional intake among the populations of 185 countries. (They have made these data, as well as code for analysis, [freely available](#).) They divided populations into males and females belonging to 17 age groups: zero to 80 in five-year spans, as well as an 80+ group. The assessment studied fifteen vitamins and minerals: calcium, iodine, iron, riboflavin, folate, zinc, magnesium, selenium, thiamin, niacin, and vitamins A, B6, B12, C, and E.

The study found significant intake inadequacies for nearly all of the evaluated micronutrients, excluding fortification as a potential source of additional nutrients. Inadequate intake was especially prevalent for iodine (68% of the global population), [vitamin E](#) (67%), calcium (66%), and iron (65%). More than half of people consumed inadequate levels of riboflavin, folate, and vitamins C and B6. Intake of niacin was closest to sufficient, with 22% of the global population consuming inadequate levels, followed by thiamin (30%) and selenium (37%).

Estimated inadequate intakes were higher for women than men for iodine, vitamin B12, iron, and selenium within the same country and age groups. Conversely, more men consumed inadequate levels of calcium, niacin, thiamin, zinc, magnesium, and vitamins A, C, and B6 compared to women.

While patterns of micronutrient inadequacy emerged more clearly on the basis of sex, the researchers also observed that males and females ages 10–30 were most prone to low levels of calcium intake, especially in South and East Asia and sub-Saharan Africa. Calcium intake was also low across North America, Europe, and Central Asia.

"These results are alarming," said Ty Beal, senior technical specialist at GAIN. "Most people—even more than previously thought, across all regions and countries of all incomes—are not consuming enough of multiple essential micronutrients. These gaps compromise health outcomes and limit human potential on a global scale."

"The public health challenge facing us is immense, but practitioners and policymakers have the opportunity to identify the most effective dietary interventions and target them to the populations most in need," added senior author Christopher Golden, associate professor of nutrition and planetary health at Harvard Chan School.

The researchers noted that a lack of available data, especially on individual dietary intake worldwide, may have limited their findings.

Simone Passarelli, former doctoral student and postdoctoral research fellow in the Department of Nutrition at Harvard Chan School, served as co-lead author.

More information: Global estimation of dietary micronutrient inadequacies: a modeling analysis, *The Lancet Global Health* (2024).
[DOI: 10.1016/S2214-109X\(24\)00276-6](https://doi.org/10.1016/S2214-109X(24)00276-6)

Provided by Harvard T.H. Chan School of Public Health

Citation: Billions worldwide consume inadequate levels of micronutrients critical to human health, new study finds (2024, August 29) retrieved 30 August 2024 from <https://medicalxpress.com/news/2024-08-billions-worldwide-consume-inadequate-micronutrients.html>

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