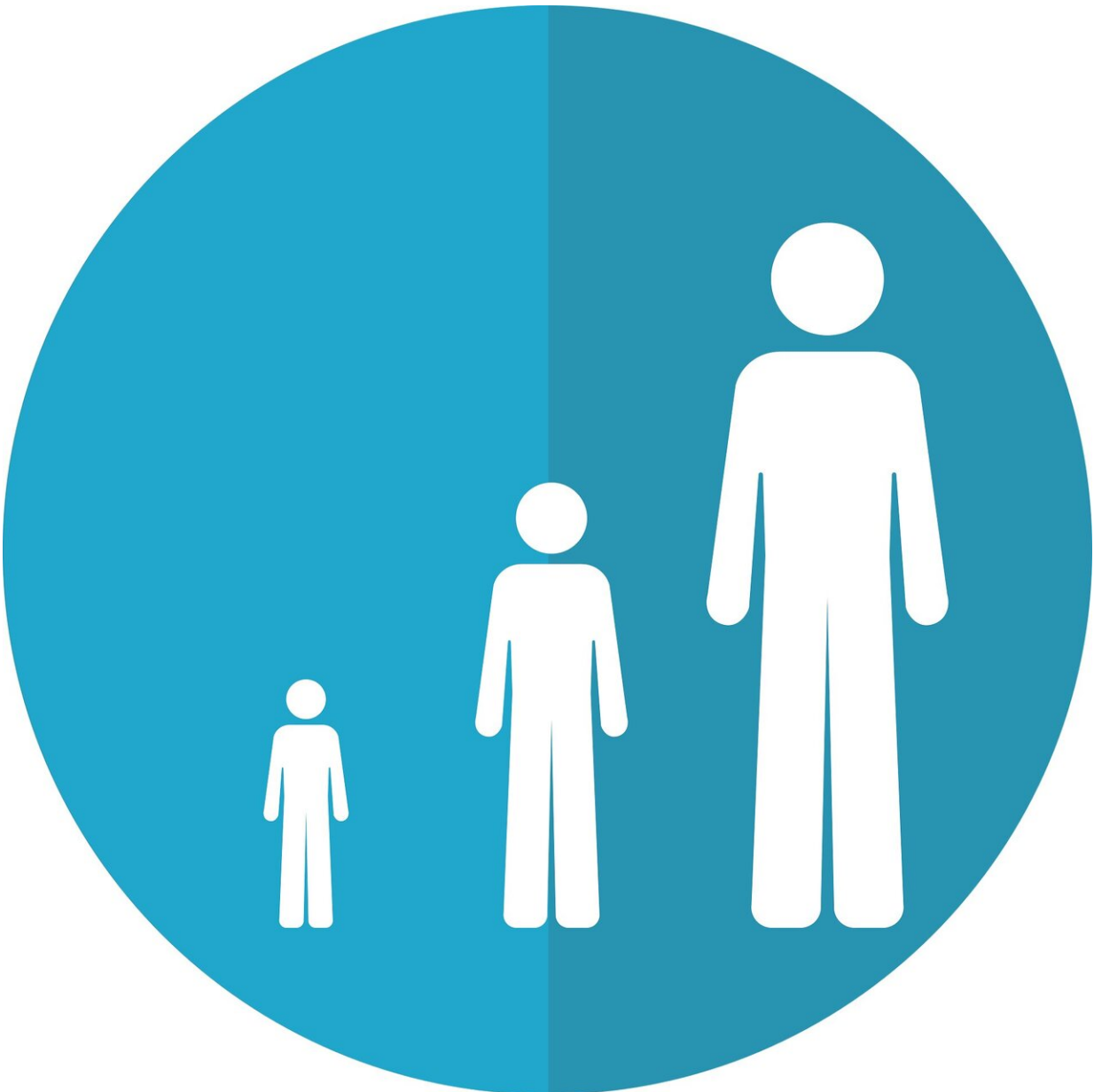


National supplies of protein, carbs and fats can predict your lifespan

November 16 2020



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A new global study from the University of Sydney has looked at how macronutrient supplies (proteins, carbohydrates and fats) of different countries are associated with the risk of death at different ages. It is the most extensive analysis to date of corresponding national macronutrient supplies, survival statistics and economic data.

The research led by Dr. Alistair Senior, a researcher in the Charles Perkins Centre and Faculty of Science at the University of Sydney, found evidence for undernutrition is prevalent in the global data even as recently as 2016; particularly in terms of protein supplies and that the "optimal" supply changes with age.

"We found that the risk of death in [early life](#) is minimised where the supply is relatively high in fats and proteins (around 40 and 16 percent of energy, respectively)," Dr. Senior said. "However, in later life reducing the supply of energy from fats and substituting it for carbohydrates has the lowest [mortality](#)."

The study is published today in the high-impact *Proceedings of the National Academy of Sciences*.

"It is a fascinating story, which reflects at the level of national food supplies the fact that macronutrient requirements change with age. It is also likely to be of interest when considering the food security of nations, and how changes in supply might translate to patterns of mortality," Dr. Senior said.

Co-author Professor Stephen Simpson, the director of the Charles Perkins Centre and co-author of the recent book *Eat Like The Animals*

added: "The study is fascinating. It was intriguing to see that the pattern of reduced rates of mortality in mid- to later-life with an increase in the ratio of carbohydrate-to-protein in the diet reflected studies in the laboratory on the biology of ageing."

Team member Professor David Raubenheimer, who co-authored *Eat Like the Animals* with Simpson and is the Nutrition Theme Leader at the Charles Perkins Centre, noted: "While food supply data are not a direct indicator of diets, they provide a good measure of differences in national food environments. It is incredible that we are seeing at that level effects also seen in detailed studies of individual diets. This attests to the power of food environments to influence diets and health, a topic that is a central theme of our new book"

Nutrition is a guiding research theme at the Charles Perkins Centre. This theme unites researchers across disciplines in unexpected collaborations, providing unique insights into nutritional ecology.

Why macronutrients matter

Macronutrients are the primary source of energy in the foods we eat, and are categorised into three major groups: proteins, fats and carbohydrates.

The study found the total calorie supply per person associated with minimal mortality is relatively stable (around 3500kcal/cap/day) with age, but the composition of calorie intake in terms of dietary proteins, fats and carbohydrates is not.

Before the age of 50, 40 to 45 percent of energy from each of fat and carbohydrates and 16 percent from protein minimises mortality. However, for later life lower fat and protein supplies at 22 percent and 11 percent, respectively, and replacing these with carbohydrates is associated with the lowest rate of mortality.

"What was really neat was that we saw a clear shift in the supply that minimised mortality at above age 50, where it looked like a high carbohydrate supply becomes important," said Dr. Senior. "I think it's important to note though that this is not a guide to what an individual should be eating—we looked at the supply that a country is providing at a per capita level. This theoretically sets the upper limit to what people are eating, but there are a whole range of factors that translate a country's food supply into what ends up actually being consumed; this is something that we are really interested in looking at going forward."

Method

From a methodological perspective the paper is also interesting. Using global supply data and 1,879 lifetables from 103 countries, the researchers tested energy intake (number of calories) and the balance of macronutrients at a macro-level: between the nutrient supplies of nations and their patterns of age-specific mortality. They found that macronutrient supplies are strong predictors of age-specific mortality even after correction for time and economic factors.

"The same statistical approach that we have applied here can be reapplied to look at patterns of the risk of death and all kinds of dietary aspects including different food types (e.g. plant vs animal proteins), or broader dietary patterns (e.g. 'a Mediterranean diet')," said Dr. Senior, who is also affiliated with the School of Life and Environmental Sciences and the School of Mathematics and Statistics.

The study found, globally, under-nutrition is evident, even as recently as 2016. However, in wealthy countries the effects of over-nutrition are prominent, where high supplies particularly from fats and carbohydrates are predicted to lead to high levels of mortality.

More information: Alistair M. Senior et al., "Global associations

between macronutrient supply and age-specific mortality," *PNAS* (2020).
www.pnas.org/cgi/doi/10.1073/pnas.2015058117

Provided by University of Sydney

Citation: National supplies of protein, carbs and fats can predict your lifespan (2020, November 16) retrieved 27 April 2024 from <https://medicalxpress.com/news/2020-11-national-protein-carbs-fats-lifespan.html>

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