

mortality, which enables associations to be observed in a broad framework; however, the data need to be interpreted cautiously. For example, people in the lower quintiles of fat intake might have been malnourished and thus high mortality in this group would not be surprising. The social, demographic, and anthropometric characteristics of the population in each quintile should therefore be reported. Furthermore, in countries such as India, the intake of fat and other macronutrients is highly heterogeneous, varying by geographical region, socioeconomic stratum, and season.⁸ Hence, advice on dietary fats cannot be easily generalised.

We propose three principles that might guide policy makers and practitioners. First, the development and revision of public health recommendations on the basis of observational data should be avoided. Revisions should be made on the basis of comprehensive assessment of all evidence, from animal studies to randomised, or quasi-randomised, interventions in human populations, with emphasis on studies in human beings. Second, the development of cardiovascular disease is complex. Factors that lead to low mortality (eg, increased nutrition) with cofactors such as obesity, physical inactivity, and tobacco use, could in fact increase the risk of developing chronic diseases, including type 2 diabetes and coronary heart disease. Low-income countries are changing,⁸ and associations between nutrition and disease outcomes might also change—eg, epidemics of cardiovascular diseases and type 2 diabetes start in populations with high socioeconomic status before affecting populations with lower socioeconomic status. Third, various types of dietary fat exist, some (such as olive oil) have established cardiovascular benefits and others (such as trans fatty acids) can be harmful.⁹ The method of producing, storing, and heating fats is also likely to be important.⁵ Given such complexity, simple guidelines will not suffice.

In conclusion, we applaud the PURE investigators for providing extensive data for discussion, but we think that altering strategies and guidelines, especially in countries such as India, is premature.

We declare no competing interests.

*Raj S Bhopal, Anoop Misra
raj.bhopal@ed.ac.uk

Edinburgh Migration, Ethnicity, and Health Research Group, Centre for Population Health Sciences, Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, Edinburgh EH8 9AG, UK (RSB); and Fortis-C-DOC Centre of Excellence for Diabetes, Metabolic Diseases and Endocrinology, National Diabetes, Obesity, and Cholesterol Foundation, New Delhi, India (AM)

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The Prospective Urban Rural Epidemiological (PURE) study¹ investigators did outstanding work, but

we have concerns regarding data presentation and interpretation.

First, it is questionable whether the low median dietary fat intake (10.6% of energy) in quintile 1 results in adequate consumption of essential fatty acids and fat-soluble vitamins. Therefore, using this quintile as the reference distorts the effect estimates of higher fat intake, since the decreased mortality associated with higher fat intake is likely to reflect a reduced risk of malnutrition. If quintile 3 was used as the reference, for example, no significant difference in total mortality would be identified over a range of around 20–35% energy from total fat.

Second, the authors considered energy intakes of 500–5000 kcal/day to be plausible; if the lower limit of energy intake was indeed so low, re-analysis would be required in which participants with extremely low energy intakes are excluded to avoid bias as a result of undernutrition.

Third, carbohydrate quality should have been considered because high carbohydrate intake is not necessarily associated with a high prevalence of cardiovascular disease.² The supplemental data indicate that participants from countries with high carbohydrate intake consumed mostly processed carbohydrates (eg, white bread or white rice). Previous studies have already shown that replacing refined carbohydrates with unsaturated fatty acids^{3,4} and dietary fibre⁵ is beneficial, whereas replacement with saturated fat is ineffective.^{3,4}

Therefore, we believe that questioning current dietary recommendations on the basis of the PURE study would not be justified. Instead, well designed, large-scale studies are required in the future.

JL, SL, and BW are members of the Scientific Board of the German Nutrition Society. SL and JL are coauthors of the evidence-based guideline Fat Intake and Prevention of Nutrition-Related Diseases published by the German Nutrition Society. JL is coauthor of the evidence-based guideline Carbohydrate Intake and Prevention of Nutrition-Related Diseases of the German Nutrition Society. MR is an employee of the German Nutrition Society.

*Stefan Lorkowski, Margrit Richter, Jakob Linseisen, Bernhard Watzl, on behalf of the German Nutrition Society stefan.lorkowski@uni-jena.de

Institute of Nutrition, Friedrich Schiller University Jena, 07743 Jena, Germany (SL); Competence Cluster for Nutrition and Cardiovascular Health (nutriCARD), Halle-Jena-Leipzig, Germany (SL); German Nutrition Society, Bonn, Germany (MR); University Center of Health Sciences at Klinikum Augsburg (UNIKA-T), Ludwig-Maximilians University of Munich, Munich, Germany (JL); Helmholtz Zentrum München, Institute of Epidemiology, Neuherberg, Germany (JL); and Department of Physiology and Biochemistry of Nutrition, Max-Rubner-Institut, Karlsruhe, Germany (BW)

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We congratulate Mahshid Dehghan and colleagues on the Prospective Urban Rural Epidemiological (PURE) study.¹ Their results are consistent with evidence suggesting that a diet high in fat might reduce mortality² and incidence of cardiovascular disease.³

However, the results suggesting that intake of unsaturated fatty acids (UFA) and saturated fatty acids (SFA) is associated with reduced mortality are divergent from recommendations to reduce dietary SFA.⁴ This disparity could be attributed to the methods used to estimate UFA. Food Frequency Questionnaires mainly estimated UFA intake from food rather than from vegetable oils, which are a substantial source of UFA. Although foods rich in UFA are often also

rich in SFA (eg, dairy products and beef), vegetable oils (eg, olive oil) are extremely rich in UFA and low in SFA.

To address this problem, the authors could do multivariate analysis for the primary outcomes, including total UFA and SFA intake. In our previous study,⁵ in multivariate analysis, only UFA was independently associated with our outcome of interest (peak oxygen consumption in patients with heart failure with preserved ejection fraction), although SFA was significantly associated with the outcome in univariate analysis. Additionally, the association between total UFA (monounsaturated and polyunsaturated fatty acids)^{2,5} and the primary outcomes could be repeated.

In conclusion, the PURE study has provided important information for nutritional research, further supporting the beneficial effects of diets high in fat, and has established an evidence base to inform future targeted randomised controlled trials investigating whether a diet high in UFA improves clinical outcomes.

We declare no competing interests.

Salvatore Carbone, Hayley Billingsley, *Antonio Abbate
antonio.abbate@vcuhealth.org

Virginia Commonwealth University Pauley Heart Center, Virginia Commonwealth University, Richmond, VA 23298, USA (SC, HB, AA); and Department of Experimental Medicine, Sapienza University of Rome, Rome, Italy (SC)

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The Prospective Urban Rural Epidemiological (PURE) study¹ has attracted considerable attention in both academia and the public domain. The conclusions of the study challenge the dietary advice and guidelines people have adhered to for decades. Scholars have questioned the accuracy of macronutrient distribution data reported in the PURE study for the Chinese population. The study reported that about 77% of the population in China consume at least 60% of energy from carbohydrate and 43% of individuals consume at least 70% of energy from carbohydrate, with a mean of 67.0% energy derived from carbohydrate and 17.7% from fat. However, these percentages differ from national data collected using the China Health and Nutrition Survey (CHNS).

The CHNS was the first reliable, large-scale survey dataset collected in China. Between 1991 and 2001² a rapid decline in energy intake from carbohydrate and an increase in energy intake from fat were observed. The basement survey³ of the PURE study was done in September, 2005. In view of the CHNS dataset from 2000 to 2011,² it is reasonable to infer that Chinese participants in the PURE study during the basement survey period obtained 54.3–59.8% energy from carbohydrate and 27.8–32.0% energy from fat, which differs from the percentages reported in the PURE study.

Several factors could account for these discrepancies. The PURE study and the CHNS used different methods to collect dietary survey data. In the PURE study, food intake was recorded using Food Frequency Questionnaires at baseline with multiple 24 h dietary recalls as the reference method for validation, whereas the 2002 CHNS used 3 day, 24 h dietary recalls, combined with food weighing and Food Frequency Questionnaires. Furthermore, the measurement of edible oils (eg, cooking oils) is important. The five main sources of total fat for the Chinese population in the PURE study are highly controversial because edible oils were not listed, which are the main source of fat among



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