

A NEW HOLISTIC FRAMEWORK FOR SUSTAINABILITY ASSESSMENT: AN ECOLOGICAL STUDY OF THE 3V RULE APPLIED TO FRANCE, CHINA AND INDIA

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INTRODUCTION

Excess consumption of animal-derived and ultra-processed food together with monotonous diets have been associated with deteriorating global health. To address this issue, we developed the holistic 3V rule for Vrai (Real, i.e. max. 15 % ultra-processed calories/day), Végétal (Vegetal, i.e. max. 15 % animal calories) and Varié (Varied) foods. The objective of this ecological study was to assess the sustainability of French, Chinese and Indian diets through the lens of the 3V rule during the period 1990-2019.

METHODOLOGY

For China and India, metadata on food groups, industrially processed/ultra-processed food (IPF/UPF) and animal product consumption at population level were retrieved from the OECD.Stat, Statista, FAO.Stat, Our World in Data, Helgi Library and Commoditiescontrol web platforms. For France, data were collected from the three French National Individual Study of Food Consumption surveys (INCA), representative of the French population. When expressed in g/day, consumption from food groups was converted into calories based on the median calorie content of all representative ready-to-eat products (as retrieved from French Ciquel and Indian tables). Then, for the period 1990-2019, IPF (Rule 1) and animal (Rule 2) calorie shares were calculated based on total calorie consumption. For the Rule 3 (Varied) calorie share, the adequacy to dietary recommended intakes, the protein/lipid/carbohydrate calorie ratio and the food group calorie shares were assessed for each country. Finally, the evolution in prevalence of overweight/obesity, type 2 diabetes and cardiovascular disease were correlated to the 3V rule; and results were compared to those of published epidemiological studies in each country.

RESULTS

During the period 1997-2015, total, UPF and animal daily calories decreased in the French population from 2285 to 2114 kcal, from 39 % to 35 %, and from 40 % to 36 %, respectively, with fibre, EPA/DHA, magnesium, retinol and vitamin C deficiencies in 2015. In China, during the period 1990-2019, the total calorie intake decreased by 9 %, and percentages of IPF and

animal calorie intake shifted from 9 % to 30 % and 2 % to 30 %, respectively, with deficiencies still in 2019. In India, the total calorie intake increased by 31 % over thirty years, mainly from dairy products and IPF; IPF and animal calorie shares also increased from 4 % to 12 % and from 15 % to 24 %, respectively. While adequacy in terms of RDA for fibre and micronutrients improved in 2019, there were still relevant deficiencies in vitamin B6, A, E and C, and in fibre, iron, potassium, zinc and, to a lesser extent, copper. In India and China, the evolution of IPF/UPF and animal calorie shares during the period 1990-2019 was strongly correlated with the prevalence of overweight/obesity, type 2 diabetes and cardiovascular disease; while in France, overweight, obesity and type 2 diabetes prevalence almost doubled in adults from 1997 to 2015.

DISCUSSION

Results showed that despite 1) a decreased calorie intakes or an intake still below the recommended level, and 2) the improvement in adequacy in terms of recommended nutrient intakes, the prevalence of chronic diseases prevalence continued to increase significantly during the period 1990-2019, indirectly suggesting that calorie and nutrient intakes are not sufficient indicators of a healthy diet. IPF and animal calories appear to be more relevant potential determinants of health impact, i.e. the quality and sources of calories rather than the quantity. Addressing one's nutritional needs is therefore not sufficient to stay healthy if the quality of the calories is degraded. More generally, the more the dietary patterns move away from the 3V rule, the more global health (including as measured by chronic disease prevalence) deteriorated. Since China and India account for >34 % of the global population and France is representative of Western countries, these results strongly underline the unsustainability of the dietary patterns of a huge proportion of the global population. Future analyses of food transitions would therefore be better assessed by focusing on the sources/quality of calories (Rules 1 and 2), rather than strictly on nutrient composition (Rule 3).