



HAL
open science

The Health Value of Modelled Healthy Eating Patterns Is Largely Constrained by the Current Reference Values for Bioavailable Iron and Zinc

Alison Dussiot, H el ene Fouillet, Juhui Wang, Marion Salom e, Jean-Fran ois Huneau, Emmanuelle Kesse-Guyot, Fran ois Mariotti

► To cite this version:

Alison Dussiot, H el ene Fouillet, Juhui Wang, Marion Salom e, Jean-Fran ois Huneau, et al.. The Health Value of Modelled Healthy Eating Patterns Is Largely Constrained by the Current Reference Values for Bioavailable Iron and Zinc. Nutrition 2021 Live Online, American Society for Nutrition, Jun 2021, online, United States. pp.119, 10.1093/cdn/nzab035_027 . hal-03281211

HAL Id: hal-03281211

<https://hal.science/hal-03281211>

Submitted on 30 Jun 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destin ee au d ep ot et  a la diffusion de documents scientifiques de niveau recherche, publi es ou non,  emanant des  tablissements d'enseignement et de recherche fran ais ou  trangers, des laboratoires publics ou priv es.

The Health Value of Modelled Healthy Eating Patterns Is Largely Constrained by the Current Reference Values for Bioavailable Iron and Zinc

Alison Dussiot,¹ H el ene Fouillet,¹ Juhui Wang,² Marion Salom e,¹ Jean-Fran ois Huneau,¹ Emmanuelle Kesse-Guyot,³ and Fran ois Mariotti¹

¹Universit e Paris-Saclay, AgroParisTech, INRAE, UMR PNCA, France; ²AgroParisTech; and ³Sorbonne Paris Nord University, Inserm, Inrae, Cnam, Nutritional Epidemiology Research Team (EREN), Epidemiology and Statistics Research Center - University of Paris (CRESS), Bobigny, France

Objectives: We aimed to study if, and to what extent, the current nutrient reference values for bioavailable iron and zinc limit the identification of healthier dietary patterns.

Methods: Using observed diets from a representative French survey (INCA3) and multi-criteria optimization, we identified diets that comply with all nutrient reference values and maximize a health criteria based on food-based dietary guidelines while minimally departing from the observed diet. Nutrient reference values included absorbed iron and zinc. This non-linear diet optimization problem was solved in men and women with higher (Fe⁻) and lower (Fe⁺) iron requirements separately, either strictly (Non Flexible model, NF) or by allowing

some tolerance on absorbed iron and zinc using goal programming to minimize their decreases below reference values (Flexible Model, F). Using a comparative risk assessment framework and a probabilistic approach, we estimated changes in risks of cardiovascular diseases, diabetes and colorectal cancer, and changes in estimates of the prevalence of iron-deficiency anemia for the diets optimized using each model.

Results: With the NF model, the reference values for absorbed iron and zinc were the most binding constraints (over 34 constraints). Compared to the observed diets, the NF-optimized diets showed large redistributions within cereals and meats, with total meat consumption remaining similar in men and Fe⁻ women and doubling in Fe⁺ women. In contrast, the F-optimized diets had higher value for the health criteria objective, being systematically lower in meat, especially red meat, and higher in whole grain products. We estimated that the reduction in mortality risk would be 17.7% with the NF-optimized diets and 21.5% with the F-optimized diets. However, the later diets would increase the prevalence of iron-deficiency anemia from 2.1% currently to 5.6%.

Conclusions: We evidenced that the reference values for iron and zinc with regard to their bioavailability are critical factors when modelling healthy eating patterns. Considering lower references for iron and zinc leads to identify diets with an apparent higher benefit for the population health with regards long-term health.

Funding Sources: None.