

Supplementary Information

Supplementary Materials and Methods

Data collection and processing

Food allergy prevalence data were curated from the original studies^{1,2} and were logit transformed for analysis. Nutritional compositions of food allergens were obtained from the U.S. Department of Agriculture (USDA) FoodData Central database (<https://fdc.nal.usda.gov/index.html>). Each macronutrient (protein, carbohydrate and fat) was calculated as g content per 100g of food and the remaining was grouped as other.

Modelling and analysis

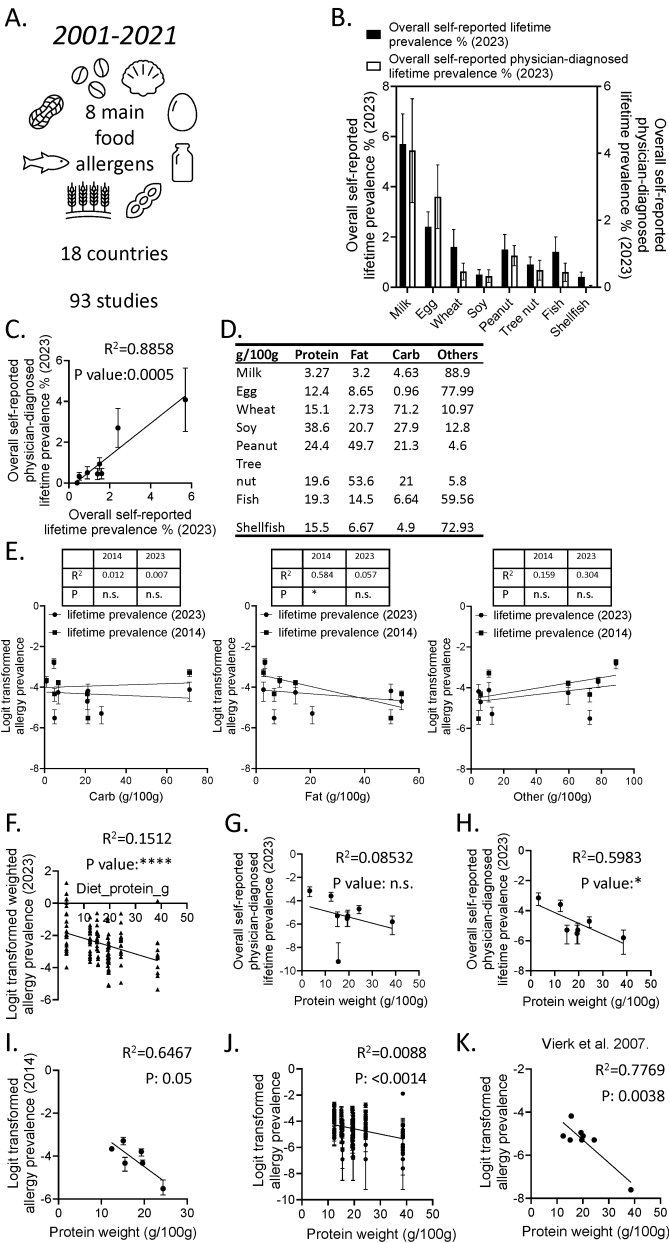
Data analyses were run in RStudio (v4.1.2.) or in GraphPad PRISM.

GraphPad PRISM was also used for the correlation analyses for logit transformed food allergy prevalence and the corresponding macronutrient content and amino acid content.

lmer() function in *lme4* package was used for the linear mixed-effects modelling of logit transformed food allergy prevalence and the corresponding macronutrient compositions, with foods and countries that the prevalence data was based on adjusted as random effects. The macronutrient compositions and their potential interactions were used as predictors, and a null model considering only the random effects from foods and countries was included as well. Akaike information criterion (AIC) was used for model evaluation and the one with the lowest AIC was favoured.

Supplementary Figure

Online data



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| Amino acid (mg/100g) | Peanut | Tree nut | Egg | Milk | Wheat | Soy | Fish | Shellfish |
|----------------------|--------|----------|------|------|-------|------|------|-----------|
| Tryptophan | 332 | 170 | 163 | 46 | 191 | 204 | 270 | 186 |
| Threonine | 1156 | 620 | 580 | 164 | 350 | 874 | 960 | 886 |
| Isoleucine | 1256 | 440 | 686 | 204 | 430 | 1024 | 1070 | 929 |
| Leucine | 2455 | 810 | 912 | 341 | 780 | 1822 | 1790 | 1527 |
| Lysine | 1748 | 450 | 745 | 292 | 340 | 1321 | 1960 | 2031 |
| Methionine | 493 | 200 | 392 | 83 | 190 | 311 | 590 | 520 |
| Cystine | 316 | 170 | 292 | 27 | 290 | 327 | 240 | 176 |
| Phenylalanine | 1559 | 540 | 673 | 172 | 530 | 1033 | 790 | 778 |
| Tyrosine | 1099 | 310 | 534 | 169 | 350 | 703 | 690 | 634 |
| Valine | 1614 | 580 | 766 | 240 | 550 | 1054 | 1130 | 964 |
| Arginine | 3448 | 2430 | 686 | 89 | 540 | 2095 | 1250 | 1454 |
| Histidine | 788 | 330 | 232 | 116 | 280 | 590 | 550 | 333 |
| Alanine | 997 | 530 | 667 | 138 | 410 | 983 | 1180 | 1191 |
| Aspartic acid | 3248 | 1440 | 966 | 292 | 740 | 2458 | 1970 | 1925 |
| Glutamic acid | 6930 | 3340 | 1323 | 707 | 4320 | 4733 | 3120 | 2943 |
| Glycine | 1326 | 710 | 397 | 85 | 440 | 908 | 990 | 1385 |
| Proline | 1137 | 580 | 298 | 355 | 1310 | 933 | 650 | 599 |
| Serine | 1381 | 660 | 840 | 186 | 570 | 1104 | 810 | 819 |

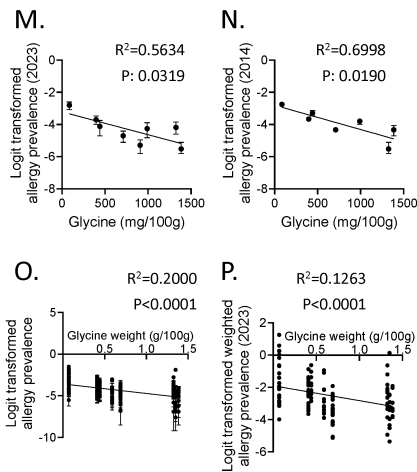


Figure S1. A-B. Overview of allergy studies for the eight common food allergens (milk, egg, wheat, soy, peanut, tree nut, fish and shellfish, **A**) and the pooled estimates for overall self-reported lifetime prevalence (black) and overall self-reported physician-diagnosed lifetime prevalence (white) (**B**) described in Spolidoro *et al.* 2023. **C.** Correlation analysis for the pooled estimates for overall self-reported lifetime food allergy prevalence and overall self-reported physician-diagnosed food allergy prevalence for the eight common food allergens described in Spolidoro *et al.* 2023. **D.** Overview of the nutrient compositions (g content/100g food) of the eight common food allergens. **E.** Correlation analyses for the carbohydrate (carb), fat, and other contents in food allergens and their corresponding logit transformed pooled estimates for overall self-reported lifetime prevalence in 2023 and 2014. **F.** Correlation analysis for the protein content in food allergens and their corresponding logit transformed self-reported lifetime food allergy prevalence reported in 93 individual studies reviewed in Spolidoro *et al.* 2023 after adjusting by weight reported in the original meta-analysis. **G-H.** Correlation analyses for the protein content in food allergens and their corresponding logit transformed pooled estimates for overall self-reported physician-diagnosed lifetime prevalence including (**G**) and excluding shellfish (**H**)

reported in Spolidoro *et al.* 2023. **I.** Correlation analyses for the protein content in food allergens and their corresponding logit transformed pooled estimates for overall self-reported lifetime prevalence excluding milk. **J.** Correlation analyses for the protein content in food allergens and the corresponding logit transformed self-reported lifetime food allergy prevalence in 93 individual studies reviewed by Spolidoro *et al.* excluding milk. **K.** Correlation analyses for the protein content in food allergens and their corresponding logit transformed pooled estimates for overall self-reported lifetime prevalence from studies Vierk *et al.* 2007. **L.** Overview of the amino acid compositions (mg content/100g food) of the eight common food allergens. **M-N.** Correlation analyses for the glycine content (mg/100g food) in food allergens and their corresponding logit transformed pooled estimates for overall self-reported lifetime prevalence in 2023 (**M**) and 2014 (**N**). **O.** Correlation analyses for the glycine content in food allergens and the corresponding logit transformed self-reported lifetime food allergy prevalence in 93 individual studies reviewed by Spolidoro *et al.*. **P.** Correlation analysis for the glycine content in food allergens and their corresponding logit transformed self-reported lifetime food allergy prevalence reported in 93 individual studies reviewed by Spolidoro *et al.* after adjusting by weight reported in the original meta-analysis.

Supplementary Table

Table S1. Akaike information criterion (AIC) results for the linear mixed-effect modelling for logit transformed food allergy prevalence (logit.pre) and the corresponding nutrient compositions (protein, carbohydrate (carb), fat, and other), with the corresponding foods and countries that the data was based on adjusted as random effects.

| Models | AIC |
|--|-----------------|
| lmer(logit.pre ~ 1+ (1 Food) + (1 Country)) | 396.3631 |
| lmer(logit.pre ~ 1+ (1 Food)) | 407.4841 |
| lmer(logit.pre ~ 1+ (1 Country)) | 431.8854 |
| lmer(logit.pre ~ 1+ Protein + (1 Food) + (1 Country)) | 388.1100 |
| lmer(logit.pre ~ 1+ Protein + (1 Food)) | 400.1929 |
| lmer(logit.pre ~ 1+ Protein + (1 Country)) | 391.4684 |
| lmer(logit.pre ~ 1+ Fat + (1 Food) + (1 Country)) | 395.4642 |
| lmer(logit.pre ~ 1+ Fat + (1 Food)) | 406.3059 |
| lmer(logit.pre ~ 1+ Fat + (1 Country)) | 423.2048 |
| lmer(logit.pre ~ 1+ Carb + (1 Food) + (1 Country)) | 395.7735 |
| lmer(logit.pre ~ 1+ Carb + (1 Food)) | 407.1841 |
| lmer(logit.pre ~ 1+ Carb + (1 Country)) | 426.9792 |
| lmer(logit.pre ~ 1+ Other + (1 Food) + (1 Country)) | 394.9930 |
| lmer(logit.pre ~ 1+ Other + (1 Food)) | 406.5240 |
| lmer(logit.pre ~ 1+ Other + (1 Country)) | 410.4373 |
| lmer(logit.pre ~ 0+ Protein + Fat + Carb + Other + (1 Food) + (1 Country)) | 388.8317 |

| | |
|--|----------|
| lmer(logit.pre ~ 0+ Protein + Fat + Carb + Other + (1 Food)) | 400.7301 |
| lmer(logit.pre ~ 0+ Protein + Fat + Carb + Other + (1 Country)) | 394.1248 |
| | |
| lmer(logit.pre ~ 1+ Protein + Fat + Carb + (1 Food) + (1 Country)) | 388.8317 |
| lmer(logit.pre ~ 1+ Protein + Fat + Other + (1 Food) + (1 Country)) | 388.8317 |
| lmer(logit.pre ~ 1+ Protein + Carb + Other + (1 Food) + (1 Country)) | 388.8317 |
| lmer(logit.pre ~ 1+ Fat + Carb + Other + (1 Food) + (1 Country)) | 388.8317 |

References

1. Spolidoro GCI, Ali MM, Amara YT, et al. Prevalence estimates of eight big food allergies in Europe: Updated systematic review and meta-analysis. *Allergy*. 2023;78(9):2361-2417.
2. Nwaru BI, Hickstein L, Panesar SS, et al. Prevalence of common food allergies in Europe: a systematic review and meta-analysis. *Allergy*. 2014;69(8):992-1007.