



## Development of a web-based food frequency questionnaire optimized for dietary assessment of adults in Switzerland (StudyCH)

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### Key words

Food frequency questionnaire, digital dietary assessment, National Nutrition Survey, menuCH

### Aim of the study

The project aimed to develop and validate a web-based Food Frequency Questionnaire (FFQ) for the assessment and semi-automated processing of dietary intake data of adults in Switzerland.

### Material and methods

A data-driven approach was used to develop the electronic "Swiss eFFQ". Using 24 h dietary recalls from the first Swiss National Nutrition Survey menuCH, stepwise regression analysis was conducted to identify foods contributing to >90% of the variance in intakes of energy and six nutrients (carbohydrates, fiber, fat, saturated fatty acids, protein and vitamin C). With support from ZHAW Institute of Computational Life Sciences, the open-source content management system and PHP framework Drupal was used to set up the eFFQ web platform with linking to the Swiss and German food composition databases to enable automatic calculation of daily dietary intakes. Pilot testing, translation and revisions lead to the final eFFQ, adapted for the German- and French-speaking linguistic regions of Switzerland. The relative validity and reproducibility of the Swiss eFFQ were evaluated by collecting dietary data from a convenience sample of adults, at two study centers (Zurich and Geneva, in collaboration with Romandy researchers). Study participants gave electronic consent, provided baseline demographic data and completed the Swiss eFFQ at baseline and after three months. To assess the relative validity, baseline Swiss eFFQ dietary data was compared with 4-day food record (4-d FR) data collected two weeks after baseline, and reproducibility of the Swiss eFFQ was evaluated by comparing the first and second Swiss eFFQ assessment.

### Results and significance

The data analysis led to the identification of 118 foods, which were used to define 83 food-items in the Swiss eFFQ, each with one standardized portion size, and ten frequency categories as possible responses. The validation study included 183 study participants (52.5 % female) with a median (IQR) age of 48 (31.0, 61.5) and a body mass index (BMI, kg/m<sup>2</sup>) of 22.9 (21.1, 26.0). Analysis of relative validity showed, for most nutrients and food groups, lower total intakes estimated by the Swiss eFFQ than those by the 4-d FR. Results revealed an acceptable strength of association for most nutrient and food group intakes (Spearman's correlation coefficient  $\geq 0.20$ ), and a good agreement in cross-classification analysis at the individual level for most of the studied nutrients. Comparison of the first and second Swiss eFFQ showed moderate to good reproducibility (mean Lin's correlation coefficient 0.7 and 0.6 for nutrients and food groups, respectively). Overall, the Swiss eFFQ showed good usability, acceptable reproducibility and relative validity for most of the nutrient and food group intake parameters in the German- and French-speaking Swiss study population. The Swiss eFFQ provides the first dietary assessment tool that can be used in nutritional and epidemiological studies for rapid and cost-effective, real-time, semi-automatic dietary assessment of adults, therefore harmonizing dietary assessment in the German- and French-speaking parts of Switzerland. The resulting nutritional data will be valuable for intervention

strategies and dietary recommendations at an individual and population level in Switzerland. The project also led to the training of students (Bachelor/Master/Intern/PhD), conference presentations and peer-reviewed publications in international journals.

### **Publications, posters and presentations**

- Pannen S, Steinemann N, Sych J, Rohrmann S. Data-driven design of a web-based, self-administered food frequency questionnaire for adults in Switzerland (eFFQ-CH). Poster presentation: 16. Jahrestagung der DGEpi online 2021.
- Pannen S, Menth M, Rohrmann S, Steinemann N, Sych J. Usability of a web-based, self-administered food frequency questionnaire for adults in Switzerland. Poster presentation: 17. Jahrestagung der DGEpi. Greifswald 2022.
- Pannen S, Menth M, Rohrmann S, Steinemann N, Sych J. Development of a web-based food frequency questionnaire for adults in Switzerland. Poster presentation: Swiss Public Health Conference 2022. Bern 2022.
- Pannen S, Gassmann R, Vorbürger R, Rohrmann S, Sych J, Steinemann N. A web-based Swiss Food Frequency Questionnaire: An example of semi-automated real-time dietary data processing. Oral presentation: 60. Wissenschaftlicher Kongress der DGE. Bonn 2023.
- Pannen S, Gassmann R, Chevillard E, Vorbürger R, Marques-Vidal P, Rohrmann S, Chatelan A, Steinemann N, Sych J. Development of a web-based food frequency questionnaire (FFQ) - experiences from developing a multi-language FFQ adjusted for the culturally diverse Swiss population. Oral presentation: International Conference on Diet and Activity Methods 2023 (ICDAM 2023). Limerick 2023.
- Pannen S, Chevillard E, Chatelan A, Marques-Vidal P, Stringhini I, Guessous I, Vorbürger R, Rohrmann S, Steinemann N, Sych J: Validation of a newly developed semiquantitative Food Frequency Questionnaire for dietary assessment of adults in Switzerland. Oral presentation: 1. Swiss Nutrition Research Symposium Sustainable Diet and Metabolic Health. Bern 2023.
- Pannen S, Gassmann R, Vorbürger R, Rohrmann S, Sych J, Steinemann N. Development of a multilingual web-based Food Frequency Questionnaire for adults in Switzerland. *Nutrients* 2023 Oct 13;15 (20) 4359. doi: 10.3390/nu15204359.
- Pannen S, Chevillard E, Chatelan A, Marques-Vidal P, Stringhini I, Guessous I, Vorbürger R, Rohrmann S, Steinemann N, Sych J: Relative validity and reproducibility of a semiquantitative web-based food frequency questionnaire for Swiss adults. *Manuscript in preparation*.

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