National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Ingredient tool

a tool to assist in micronutrient estimation using food label data

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Introduction

- Dutch Food Composition Database NEVO
  - > 2000 food items
- Used for research, dietetics, labeling
- Increasing number of packaged foods
- Chemical analysis is expensive
- Label information can be used for macronutrients
  - micronutrients need to be estimated

Estimation of micronutrients

Current procedure

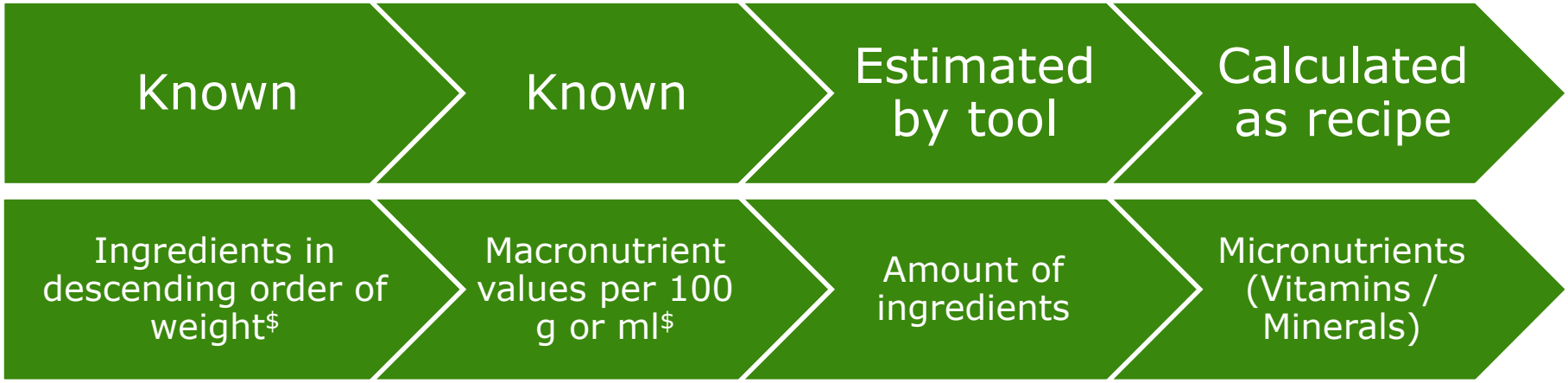
- Use label information on ingredients and nutrients
- Trial and error to find best fitting amounts of ingredients
- Time consuming, difficult to take into account all micronutrients

How to improve this procedure?

- Literature search
  - Westrich (1994) developed a tool based on mathematical optimization steps for US

- Similar approach was developed for Dutch situation
  - Using state of the art software
  - Linking to Dutch NEVO food comp database
  - User friendly tool

Rational behind the tool



- Find ingredient proportions that fit best with nutrient label information
- Minimize differences between known and calculated macronutrients
- When ingredient amounts are okay, calculated micronutrients are assumed to be okay

$ on labels according to EU1169/2011 regulation

Nutrient tolerances

- Nutrient tolerances (EU commission) to check on label data
- Tool assigns weights related to the EU nutrient tolerances
- To prioritize which nutrient deviations to minimize
- Smaller nutrient amounts should have smaller deviations between label- and calculated data; higher weights are given to reach this
- With larger nutrient amounts it is less important to minimize the deviations

Applies to	Allowed deviation	
Carbohydrate, Sugars, Protein and Fibre	<10g per 100g: 10-40g per 100g: >40g per 100g:	±2g ±20% ±8g
Fat	<10g per 100g: 10-40g per 100g: >40g per 100g:	±1.5g ±20% ±8g
Saturated, Mono and Poly unsaturated fatty acids	<4g per 100g: ≥4g per 100g:	±0.15g ±20%
Salt	<1.25g per 100g: ≥1.25g per 100g:	±0.375g ±20%

Validation of ingredient tool

Developed in Excel Solver and validated using Fico Xpress 8.0

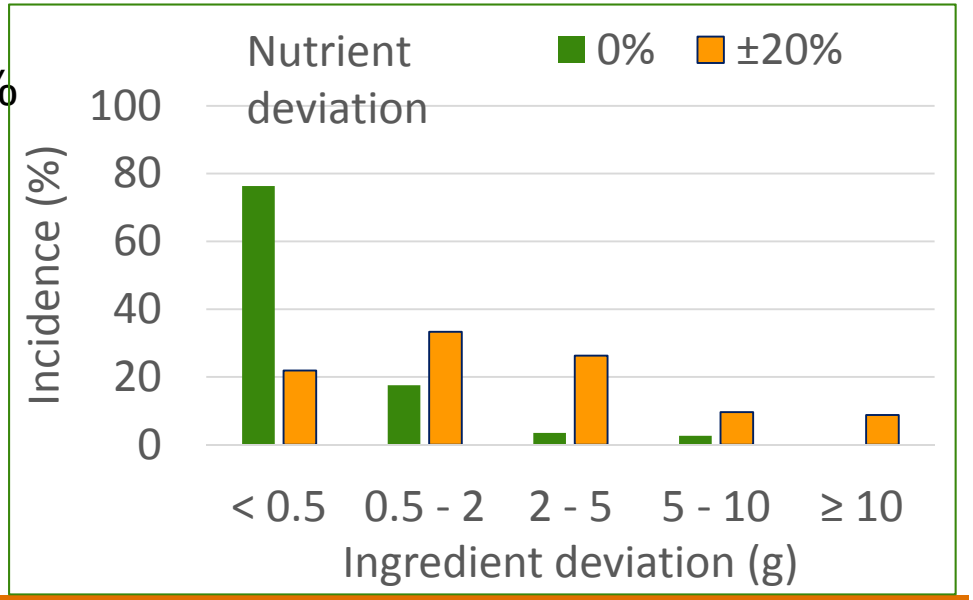
- Recipes from NEVO food comp database vs label data (n=36)
  - With known ingredient amounts and known composition
  - With partly or unknown ingredient amounts and known composition

Calculated as:

- Simple recipes
  - E.g. yoghurt with fruit and muesli
- Multicomponent recipes
  - E.g. ingredient is vegetables (lettuce, spinach, rockets)
- Nested recipes
  - With separate ingredient lists and preparation steps: e.g. lasagna with tomato- and Bechamel sauce and cheese

Results (1)

- Accuracy depends on resemblence of label information to information provided to the tool
- Deviations due to data inconsistencies
  - Different food comp tables used to calculate nutrients
  - Different entries chosen from same food comp table
- All info known: deviation in ingredient amount <0,5 g in 75% of the tests



Results (2)

- Multi level recipes: Adjustments needed to the order constraint
  - Resulting in more accurate results
  - Requires separate version of the tool
- Tools build in Excel Solver and Fico Xpress 8.0 gave same results

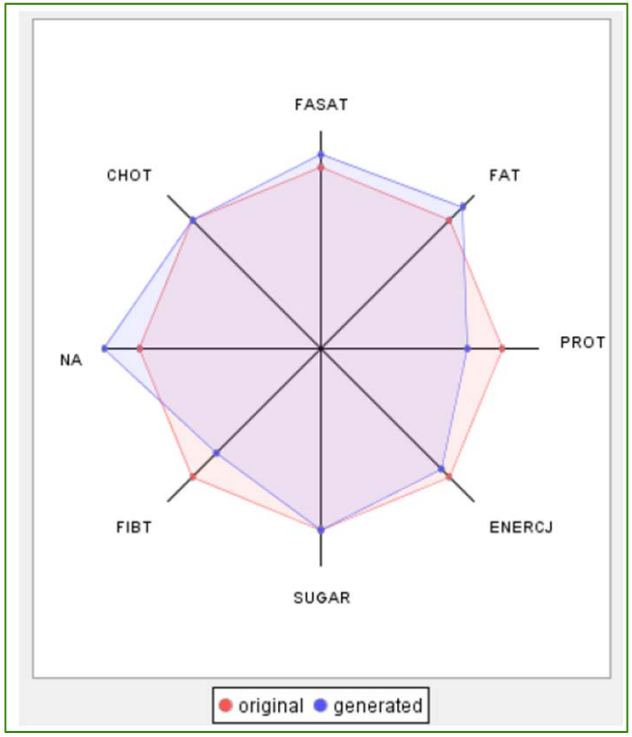
Pasta dish	Pasta 60 g	Pasta 60 g
	Vegetables 25 g	Leek 10 g, carrot 8 g, broccoli 7 g
	Meat 15 g	Pork 15 g

Challenges

Test on the job	• Deal with multiple optimal solutions? • How much trial and error needed?
Develop procedures	• How to aggregate brands? Before or after applying the tool? • Multi-component and nested recipes
Compare results with analytical values	• Validate results of tool with food analyses
Take into account	• Weight yield and nutrient retention • Processing, storage and home cooking
Industrial ingredients	• Needed in food comp database

Cooperation with ETH Zurich

- ETH Zurich started similar project
- Focused more on algorithmic aspects
  - Comparison of own algorithm with the one from Westrich
  - Consider yield factor and retention factors
  - Graphical representation of outcome
- Implementation was done in FoodCASE



Conclusions

- User friendly tool for Dutch situation
- Time saving compared to trial and error method
- Model is sensitive to data inconsistencies
- Expert view needed, e.g. correct choice of foods
- Results are estimations, no analytical precision
- Details food industry missing: Trial and error or tools best available methods
- International cooperation: FoodCASE / Include other food comp tables

Thank you for your attention

More information
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http://www.rivm.nl/en/Topics/D/Dutch_Food_Composition_Database