"A science based approach for the validation of nutrient profiles (ILSI workshop on nutrient profiles)"

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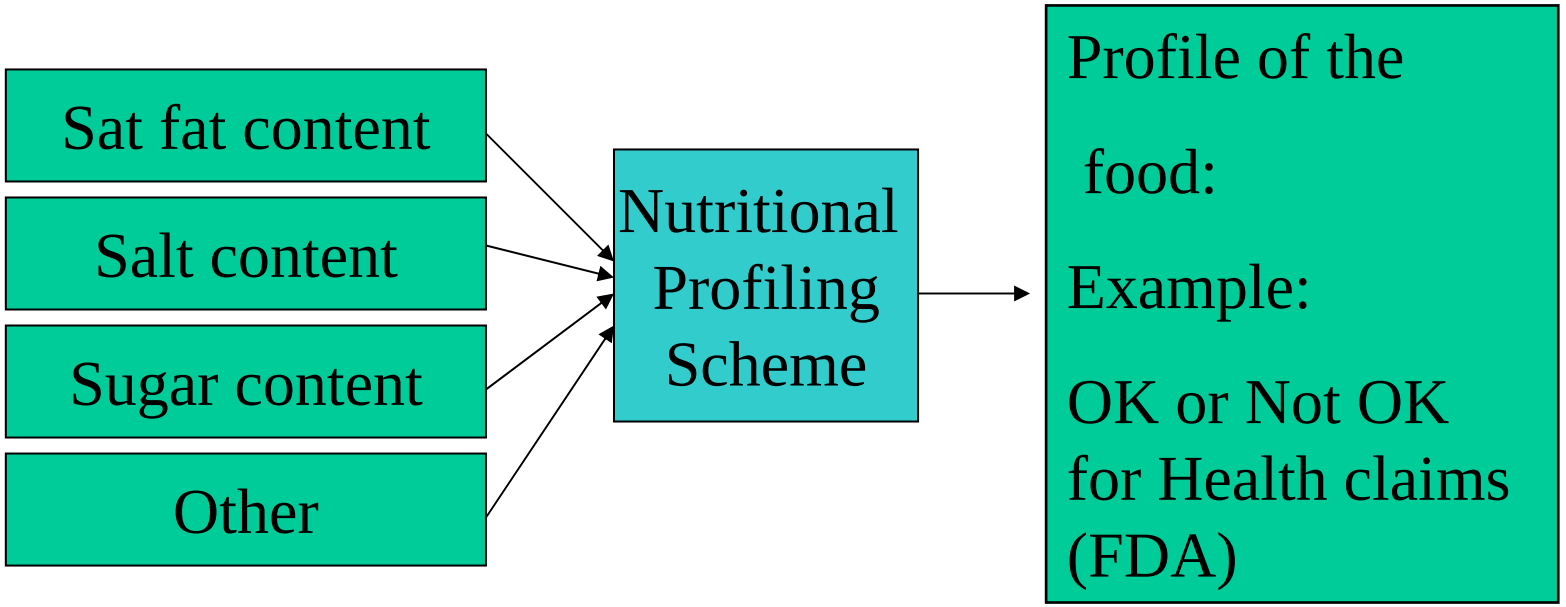
What is a nutritional profiling (NP) scheme?

- « The categorisation of foods for specific purposes based on an assessment of their nutrient composition according to scientific principles » (O'Neill, 2004)



Criticisms usually addressed to Nutritional Profiling (NP) schemes

- Lack of objective arguments to choose the nutrients, the thresholds, the weighting system
- No scientific validation
- Results depend on the profiling method chosen
- There are no « good » and « bad » foods on a nutritional point of view but only favourable or unfavourable diets

Examples of differences in food characterisation according to different profiling schemes

- *Corn flakes:*
  - FDA Health claims « OK »
  - FSA WXY « less healthy »
  - Dutch Tripartite « exceptional »

- *Boiled potatoes, not salted:*
  - FDA Health claims « OK »
  - FSA WXY « healthier choice »
  - Dutch Tripartite « exceptional »

  (because fibre content lower than 2%)

Questions addressed by the 2006 ILSI Workshop trying to bring more “science based information” in NP

CONTEXT: EU proposed regulation on nutrition and health claims

Should NP be set for foods in general and/or for categories of foods? In what way should the reference quantity/basis for NP be defined?

How can the choice and balance of food properties be taken into account when profiling foods?

How can the calculation of profiles be carried out?

How can the testing/validation of the proposed systems be carried out?

General conclusions of the ILSI workshop

- By food categories rather than « across the board » system
- There are strengths and weaknesses for the per 100 g or per 100 kcal/kJ Reference amount
- Focus on disqualifying nutrients but also take into account qualifying nutrients
- No clear decision about thresholds vs scoring system, if a scoring system is used, thresholds will be applied to the score

How can the testing/validation of the proposed systems be carried out?

Four types of validation proposed:

- Nutritionist panels (most frequent)
- Nutritionist surveys
  - (FSA, UK, Scarborough P, Rayner M, Stockley L 2005)
  - (Braesco V et al, 2006 Public Health Nutrition)
- Mathematical modelling of nutrition survey data (agreement with nutritional risk assessment)
  → **this presentation**
- Stakeholder-related validation (feasibility)

Possibility to combine different validation types

Is it possible to define
a reference classification of indicator foods
in order to validate nutrient profiles ?
« Gold standard » ?

Proposal of a new method in three steps by the *ILSI Europe Working group*
« Nutritional characterisation of foods »

First step : Definition of the nutritional status considered as « healthy »
and of associated « healthy diets »

↓

Second step : Identification of indicator foods associated positively
or negatively to this « healthy diet »

↓

Third step : Characterisation of these indicator foods according to
3 different profiling schemes tested : FSA WXY, Dutch Tripartite, FDA

« Gold Standard »

First step:
Definition of the « healthy eating pattern »

Harmonised approach in 5 different countries (Belgium, Denmark, France, Ireland, Italy) → European criteria

Eurodiet criteria (2000) :

- Lipids in % of Energy <30%
- Saturated fatty acids in % of Energy <10%
- Total carbohydrates in % of Energy >55%
- Fruit and vegetables intakes > 400 $g.d^{-1}$
- Dietary fibre > 25 $g.d^{-1}$
- Sodium (expressed as Sodium Chloride) < 6 $g.d^{-1}$

Possible to add other criteria, including biomarkers of exposure or nutritional status indicators like the BMI

First step: Identification of real diets close or far from this « healthy eating pattern »

• National dietary surveys + national food composition databases
N=10600

•Belgian Food Consumption Survey 2004
(Repeated 24h recalls, n=3083 adults 15 y +)

•Danish National Continuous Dietary Survey 2000-2002
(Precoded 7 days records, n=3151 adults, 18-75 years old)

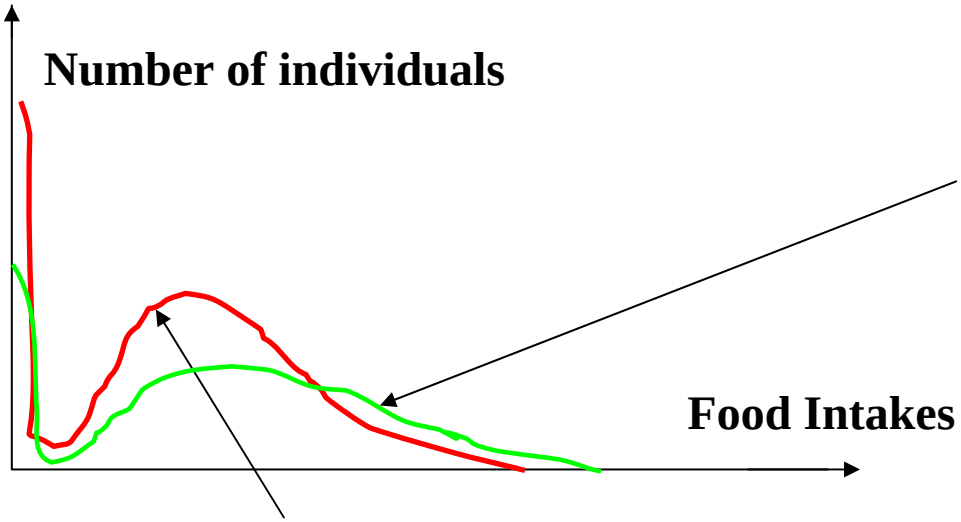
French National Dietary Survey INCA99
(Open-ended 7 days records, n=1474 adults, 15-80 years old)

North-South Irish survey 1997-1999
(Open-ended 7 days records, n=1379 adults, 18-64 years old)

Italian INN-CA survey 1995
(Open-ended 7 days records, n=1513 adults 15 y +)

For each country, Healthy Eating Index : sum of the distances to the different nutritional endpoints (in percentage), the fifth quintile of this healthy eating index is the « healthy eating » population

Step 2: comparison of the differences in the foods consumed between the first and the fifth quintiles of the « healthy eating index »



Statistical distribution of intakes of the food studied,
For the fifth quintile of the « Healthy eating index »

Statistical distribution of intakes of the food studied, for the first quintile of the « healthy eating index »

→In this case, the indicator food is classified as « positively associated » to the « healthy diet »

Step 2: Description of the indicator foods

- There is a limited number of foods positively or negatively correlated to the « healthy diet »

  For 5 countries among 1768 foods tested :

  - Foods positively associated : n= 428 with p=0.05, n=314 with p=0.01 (Wilcoxon Mann-Whitney test)
  - Foods negatively associated : n= 250 with p=0.05, n=159 with p=0.01
- In each country, there are more indicator foods positively associated with the « healthy diet » than indicator foods negatively associated with the « healthy diet »
- There are some but limited changes in the lists of indicator foods if a criteria is changed in the definition of « healthy eating »
  - Ireland : addition of the « sugary food consumption »
  - Italy : addition of the BMI
  - France : national criteria (salt, fibre, SFA, Complex carbohydrates, Calcium)

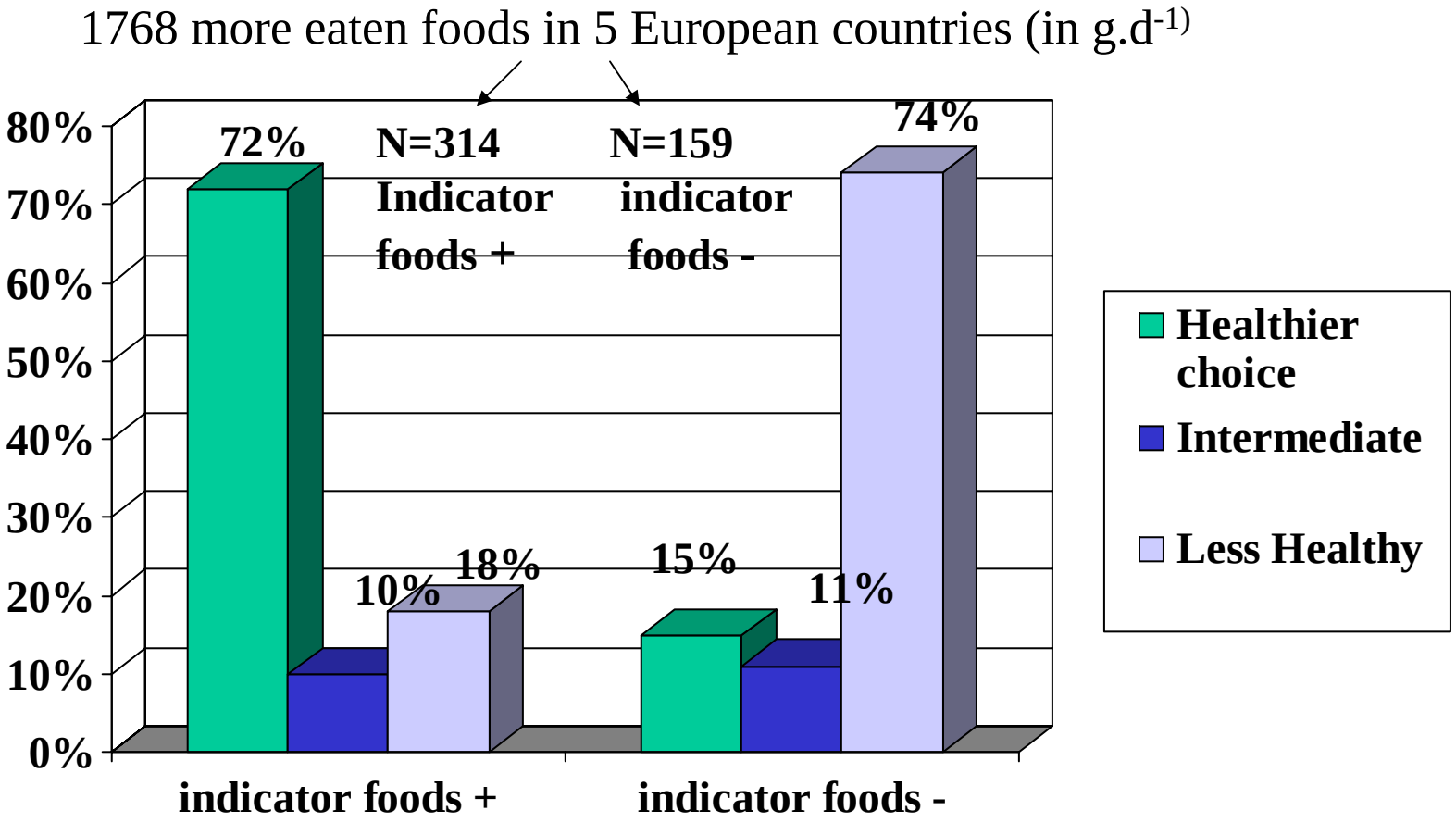
Step 2: Description of the indicator foods positively associated to the « healthy diet »

- **Belgium (n=91) : Fruit and vegetables (39%), dairy products (14%)**
- **Denmark (n=112) : Fruit and vegetables (38%), bread and cereal products (13%)**
- **France (n=78) : Fruit and vegetables (51%), bread and cereal products (9%), dairy products (9%)**
- **Ireland (n=93) : Fruit and vegetables (43%), bread and cereal products (14%)**
- **Italy (n=54) : Fruit and vegetables (61%), potatoes, pasta, rice and pulses (18%)**

Step 2: Description of the indicator foods negatively associated to the « healthy diet »

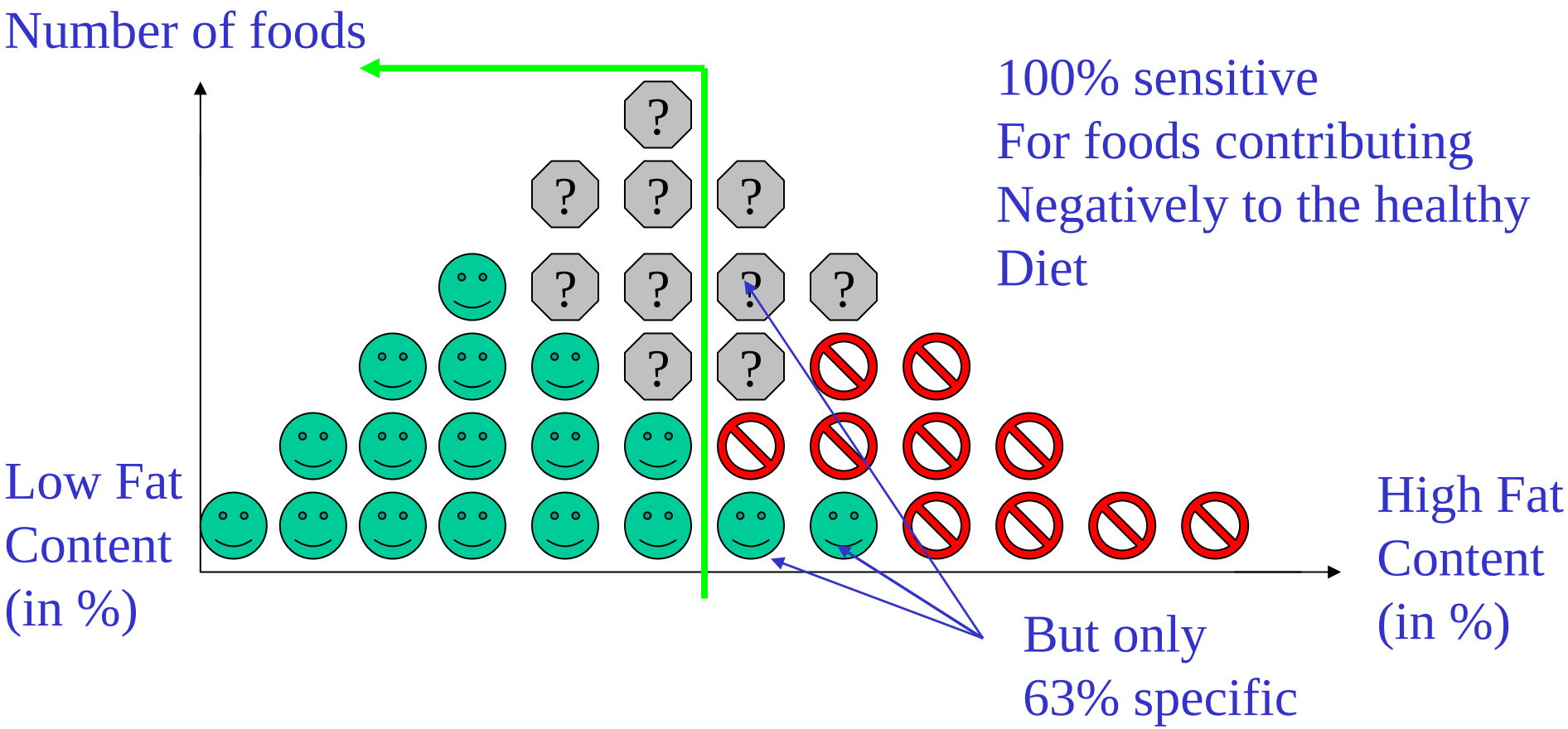
- Belgium (n=65) : Meat and meat products (29%), fats (12%), cheese (11%)
- Denmark (n=39) : Meat and meat products (40%), fats (16%)
- France (n=52) : Meat and meat products (48%), cakes and pastries (17%)
- Ireland (n=26) : Meat and meat products (46%), cakes and pastries (12%)
- Italie (n=68) : Meat and meat products (24%), potatoes, pasta rice and pulses (15%)

Step 3: Characterisation of the indicator foods according to the different profiling schemes : FSA WXY model

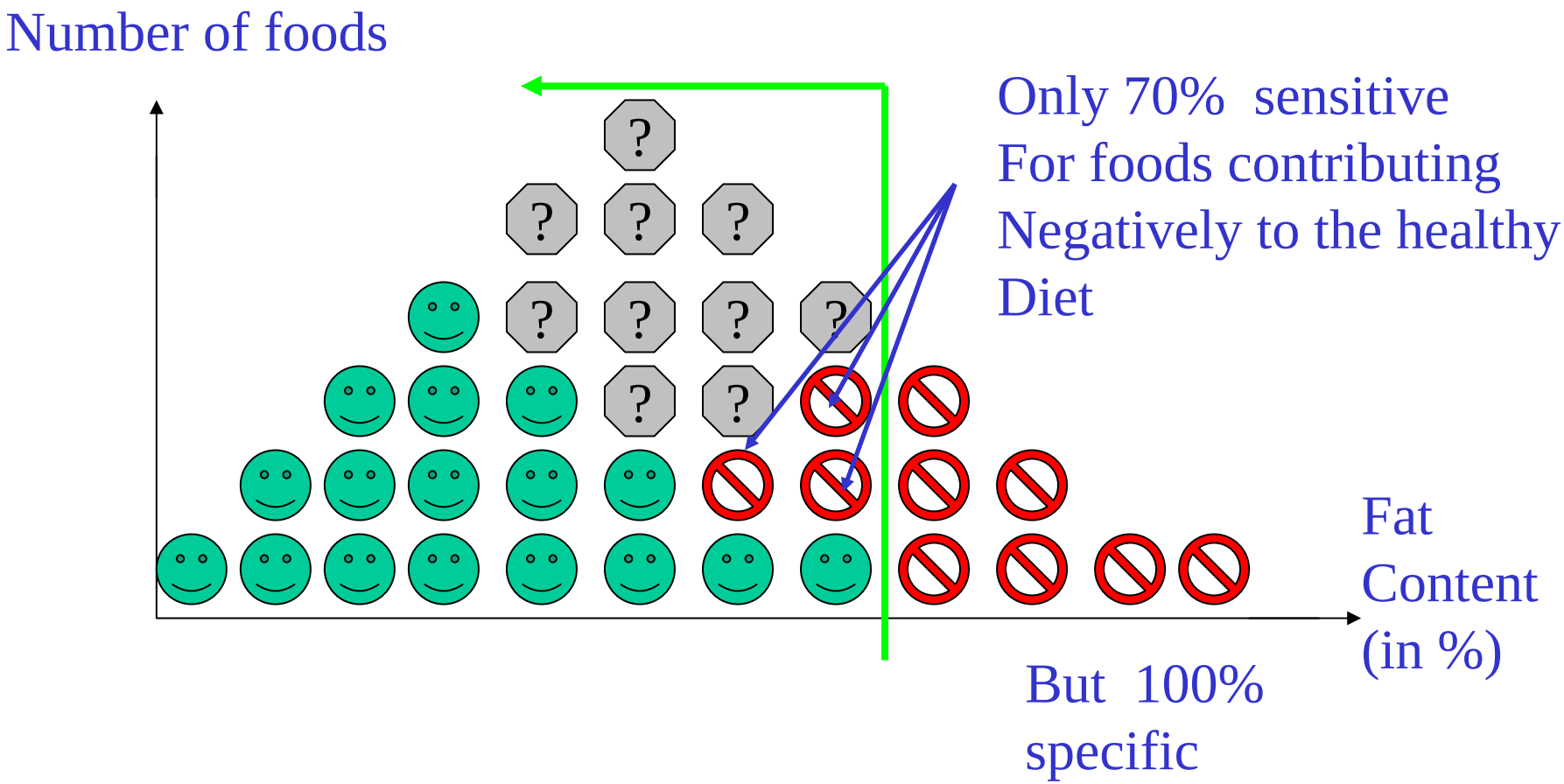


Test X2 : p<0.01

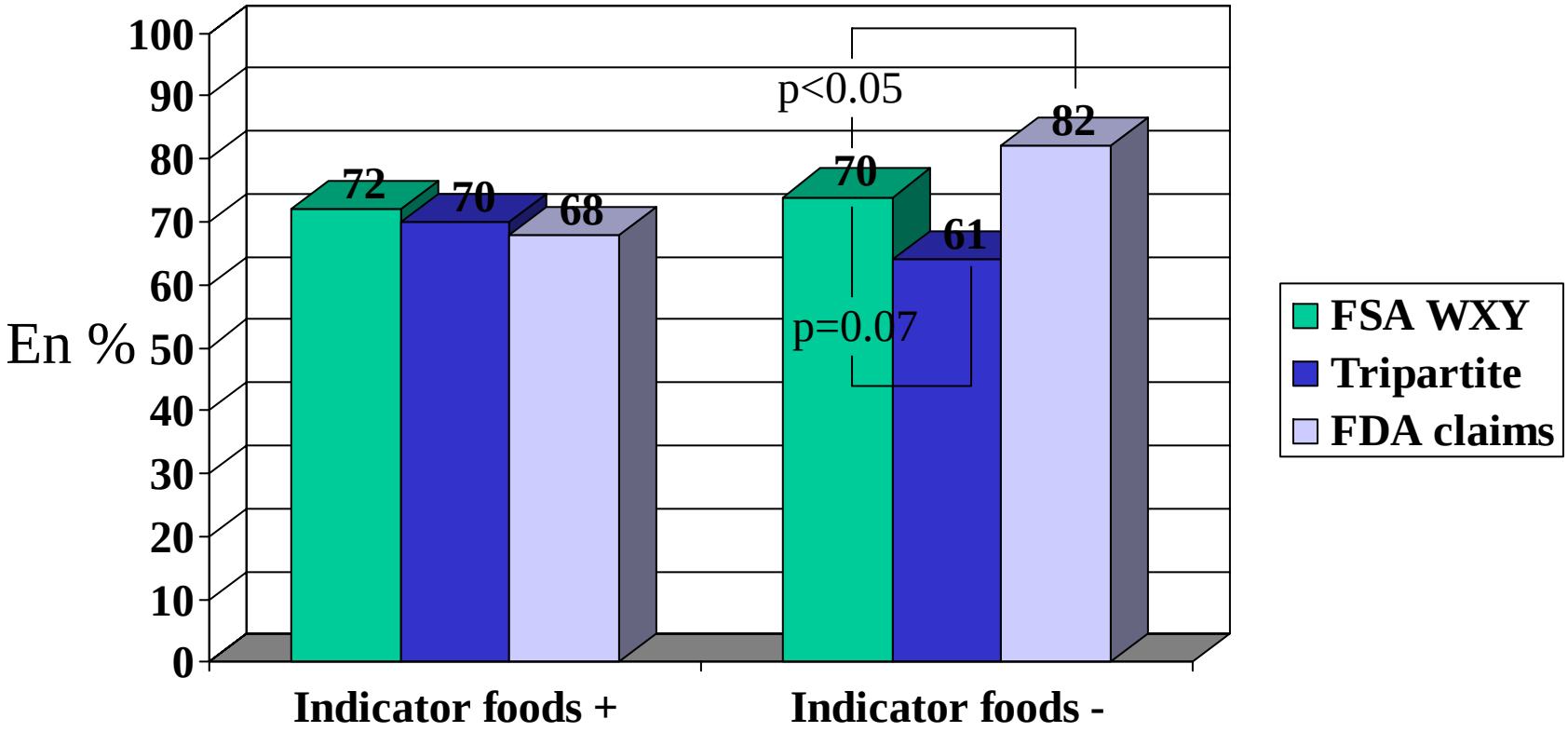
The sensitivity/specificity dilemma

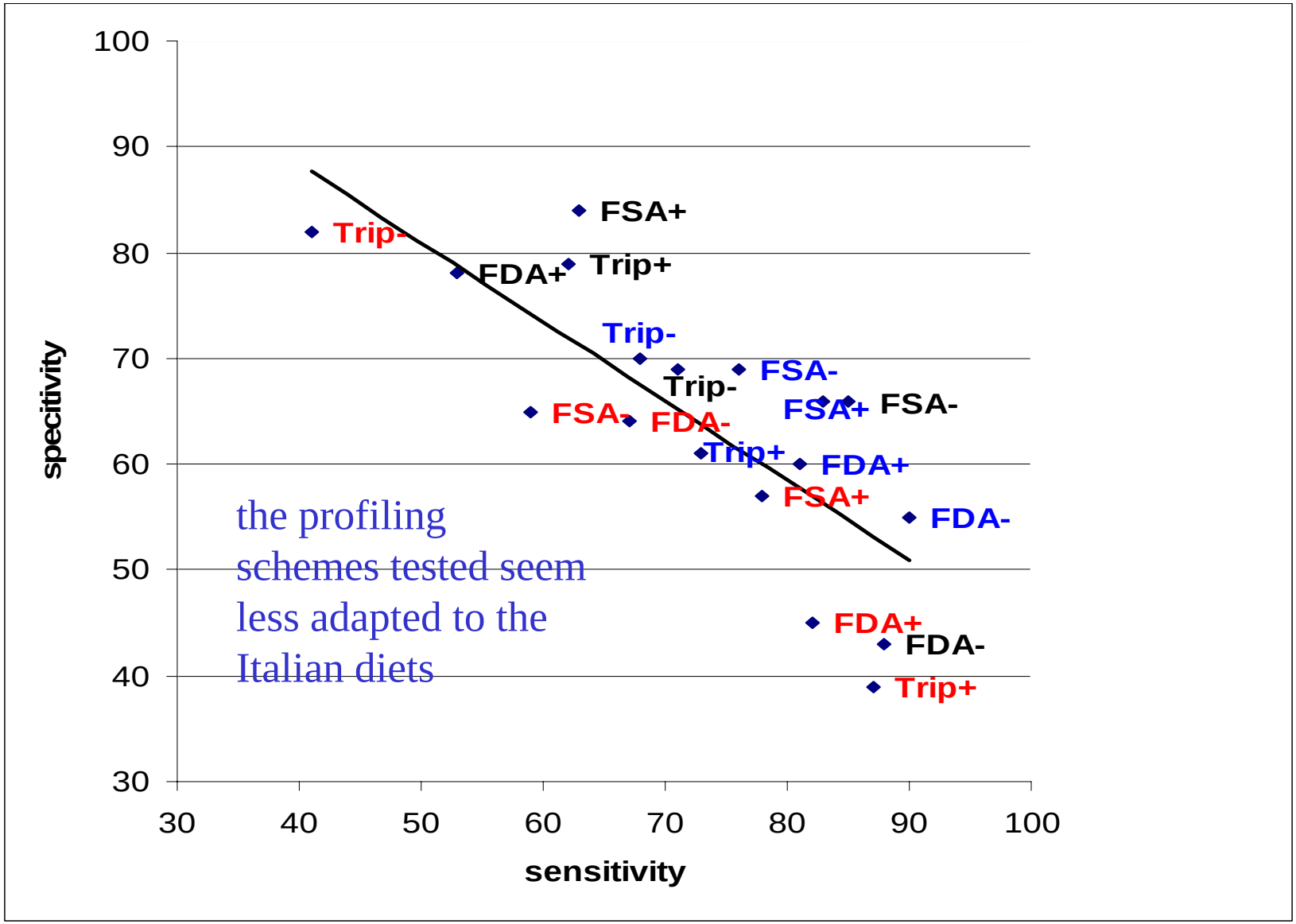


The sensitivity/specificity dilemma



Sensitivity of the different profiling schemes according to the indicator foods for 5 countries (Belgium, Denmark, France, Ireland, Italy)





Red: Italy, Blue: France, Black: Denmark

Conclusions

- **A new validation method of nutrient profiles was developed within the ILSI working group of nutritional characterisation of foods**
- **The very first results show an overall good agreement between this method based on nutritional intakes and the different models tested (FSA, FDA, Dutch Tripartite)**
- **The FDA model is more sensitive for the foods contributing negatively to the « healthy diet » (but with a low specificity → case by case examination possible for the « not OK » foods according to their nutrient profile)**
- **The reference method to identify indicator foods is not yet valid enough**
  It is difficult to get a « gold standard »

Participants to this validation study

- Belgium : Gent University De Henauw S, Huybrechts I
- Denmark : Danish Institute for Food and Veterinary Research Biltoft-Jensen A, Tetens I
- France : Afssa Quinio C, Volatier J L
- Ireland : Trinity College Gibney M, O'Neill J
- Italy : INRAN Turrini A