

Innovative health-promoting food  
International Workshop, Berlin

# Nutritional ingredients for health and well-being – perspectives and challenges

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# Nutritional ingredients for health and well-being - perspectives and challenges

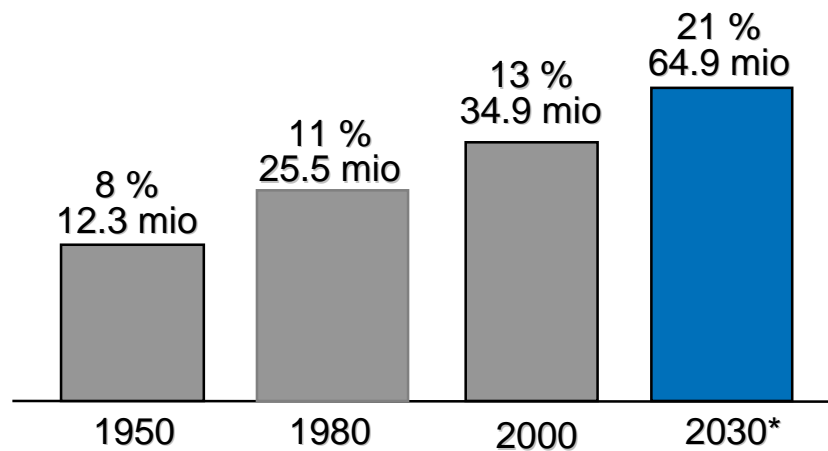
Topics to address:

- Which innovative health-promoting ingredients/foods are currently on the market?
- To what extent can nutrition be health promoting?
- What are perspectives in this field and challenges to be overcome?

Nutrition is the most important challenge in the 21. century

# In the industrialized world the increased life expectancy will change the needs in nutrition

## Elderly People as a Percent of Total Population



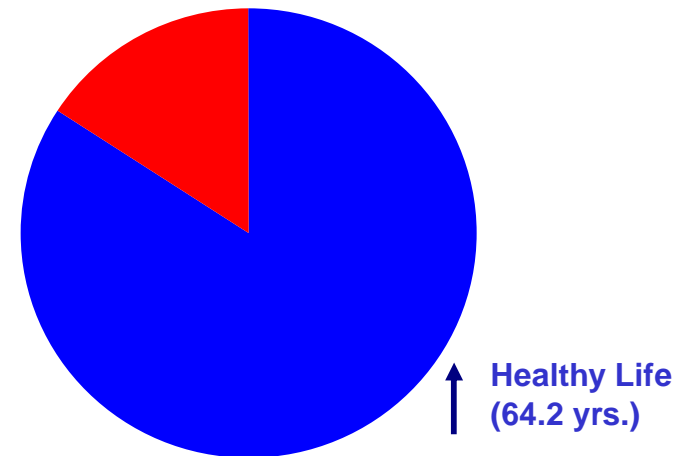
Top 10 countries with highest LE: 8% lost due to disability  
 Bottom 8 countries with lowest LE: 18% lost due to disability

Manton et al (1997)  
 PNAS 94:2593.

\*Projected

Life Expectancy: 77 years  
*Healthy vs. Dysfunctional Life*

Dysfunctional Life (12.8 yrs.) ↓



1985-2050 Number of disabled older persons in and out of institutions will approximately triple.

National Vital Statistics System and  
 National Health Interview Survey (CDC)  
 Healthy People 2010

## ..and often food does not provide adequate micronutrients

- Foods rich in fruits and vegetables are widely perceived to be sufficient for ensuring a healthy vitamin and mineral status
- However due to lifestyles and other factors we (and especially risk groups like children, elderly, ...) do not have adequate access to balanced nutrition to get enough micronutrients

We face the challenge of too much macro- and too low micronutrient intake

# Around forty micronutrients are essential ...

## Vitamins

Biotin  
Folic acid  
Niacin  
Pantothenate  
Riboflavin  
Thiamine  
Vitamin A  
Vitamin B6  
Vitamin B12  
Vitamin C  
Vitamin D  
Vitamin E  
Vitamin K

## Minerals

Calcium  
Chloride  
Chromium  
Cobalt  
Copper  
Iodide  
Iron  
Magnesium  
Manganese  
Molybdenum  
Phosphorus  
Potassium  
Selenium  
Sodium  
Zinc

## Pufas

linolenic acid/DHA  
[ $\omega$ -3]  
linoleic acid  
[ $\omega$ -6]

## Carotenoids








B-carotene  
Lutein  
Zeaxanthine

## Amino acids

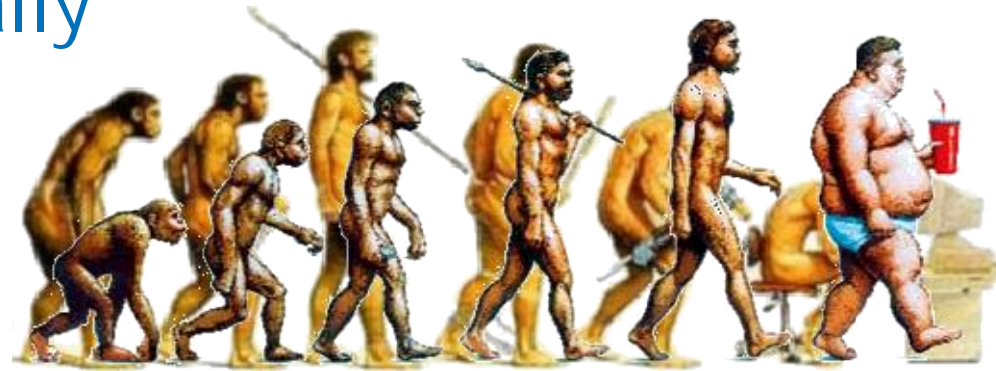
Isoleucine  
Leucine  
Lysine  
Methionine  
Phenylalanine  
Threonine  
Tryptophan  
Valine  
Histidine  
Choline

**... so we should care not for single ingredients however how they act in concert!**

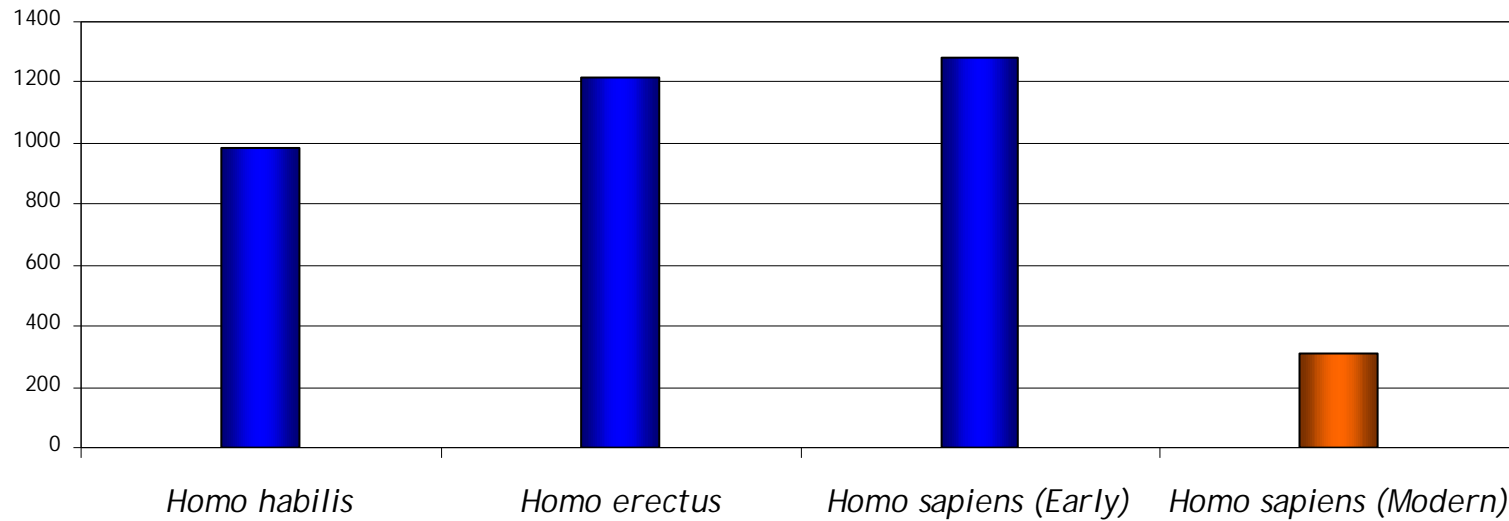
# ... complemented by new ingredients with promising health benefits

Ingredient	Focus	Activity / Benefit
 resVida	Aging	Resveratrol; mimics a calorie-restricted diet to slow the aging process.
 geniVida	Bone health	Genistein; demonstrated reduction in hot flashes and improvement in mood in postmenopausal women.
 HyD	Bone health	25-hydroxycholecalciferol; much higher bioavailability in animals and humans than Vitamin D3.
 FruitFlow	Heart health	Tomato extract; reduces platelet aggregation and improve blood flow.
 eoVida	Cognitive function	Extract; inhibits re-uptake of neurotransmitters and enzyme, responsible for breaking neurotransmitters.
 Olive II	Energy / Endurance	Provides protection against oxidative stress, increases cellular energy production and endurance.
 broccoVida	Aging	Derived from Broccoli seeds; helps to boost immune response and to detoxify the body.

# Energy needs for physical activity changed dramatically



Energy expenditure attributed to physical activity [kcal/ d]



Early hominoid hunter-gatherers

Office worker

# Food and diets to be tailored to requirements

Energy expenditure is reduced



Energy intake has to decrease

Vitamin & mineral requirements remain the same




Nutrient density of food has to increase



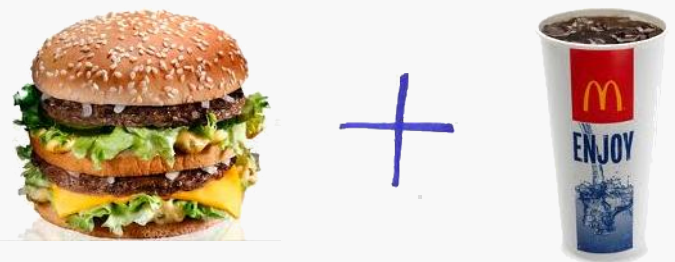


# Dietary recommendations vs. actual food intake

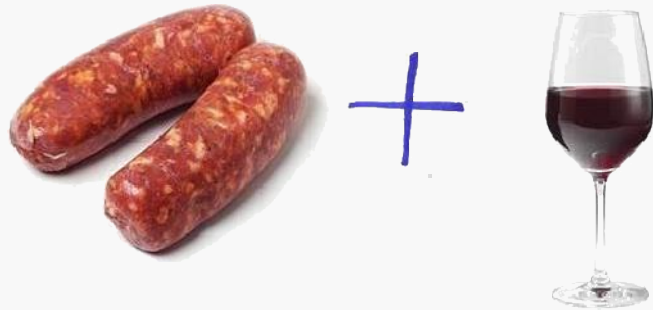
Man, 75 kg, 175 cm, 45 yrs: ~2'400 kcal/d



→ 100% of recommended folate intake covered



If calorie intake remains at 2'400 kcal  
→ Folate intake down to 80%



→ Folate intake down to 85%

# Our approach in evaluating healthy nutrition

Develop country specific data on food intake  
and micronutrient status (based on available data)

... for all micronutrients and minerals

... differentiating according gender, risk groups, ..

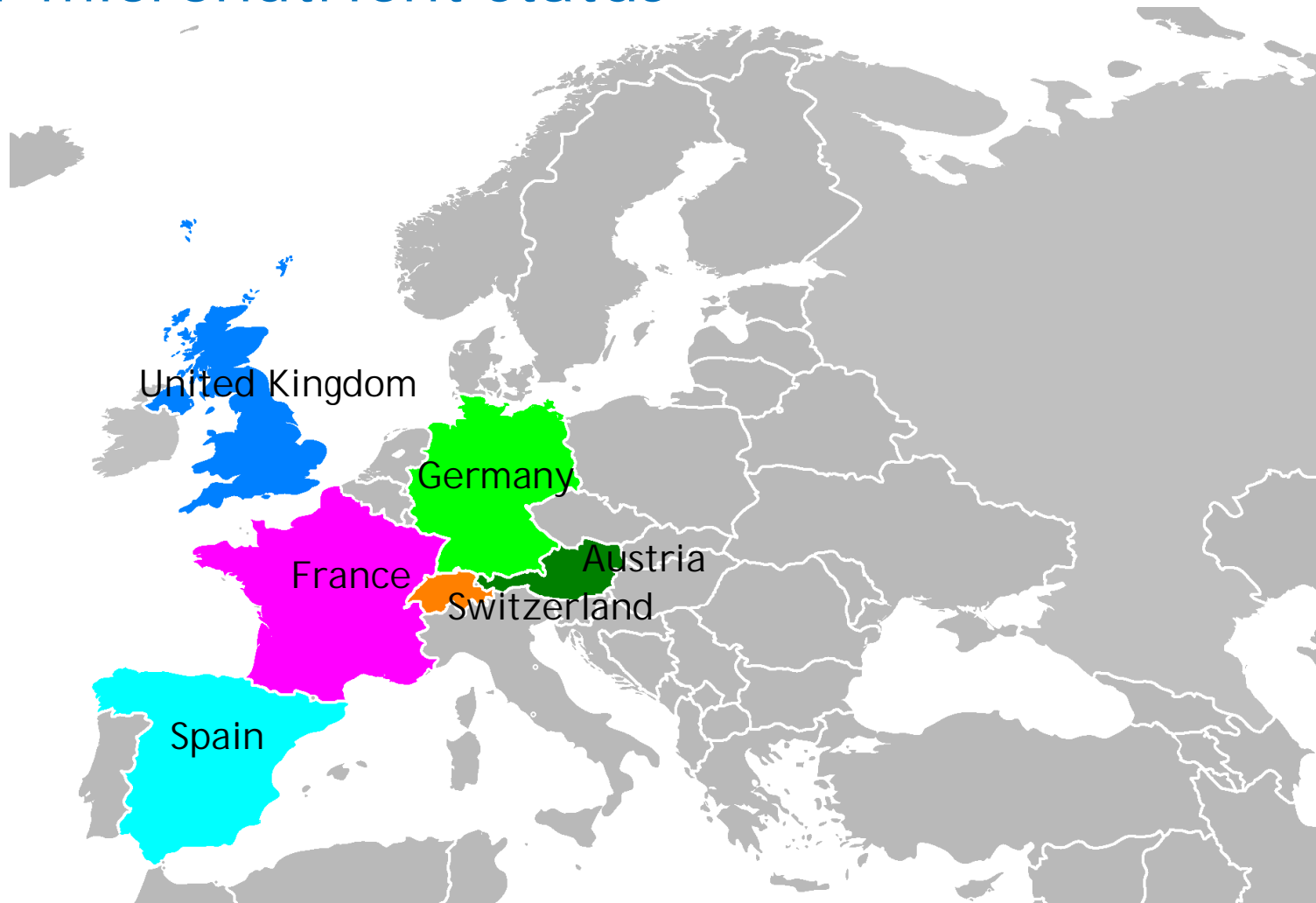
And longer term:

Connect these data with prevalence for chronic diseases,  
health care costs and other relevant parameters.

Countries in scope:

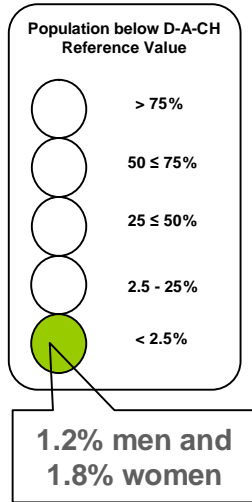
Europe, US, Canada, Latin America, Asia

# Countries assessed (so far) in Europe for micronutrient status

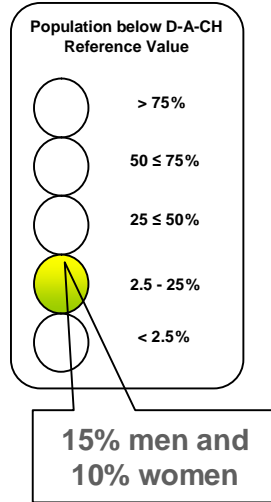


# Germany: for a number of vitamins the intakes are below recommendation! (NVZ 2008)

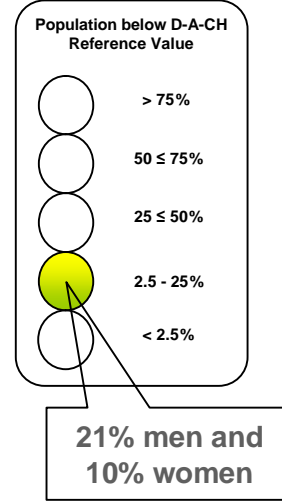
## Niacin



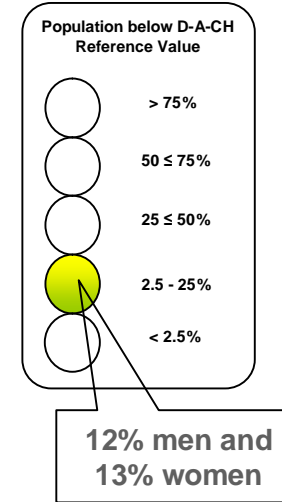
## Vitamin A



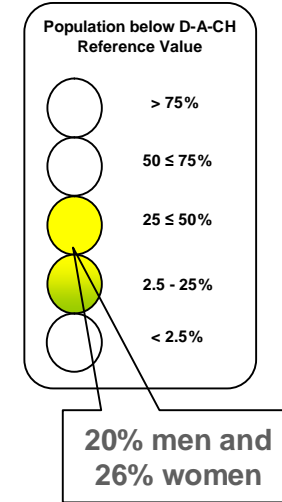
## Vitamin B1



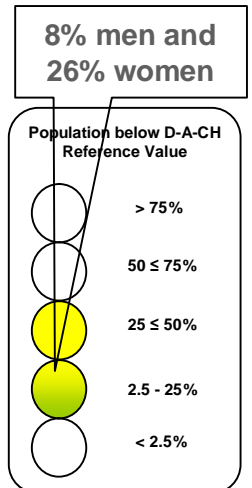
## Vitamin B6



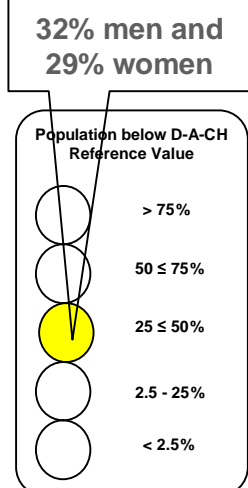
## Vitamin B2



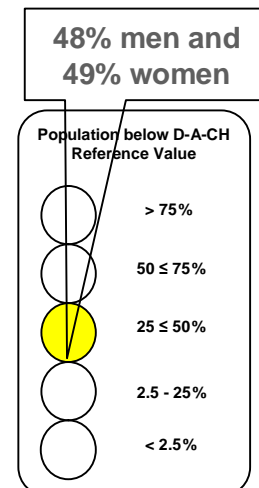
% Below Reference Value



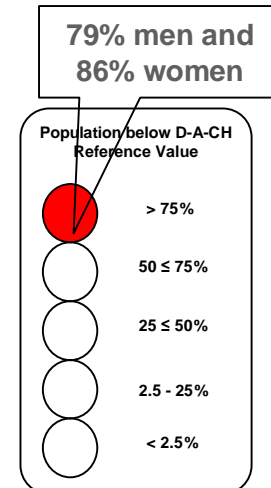
## Vitamin B12



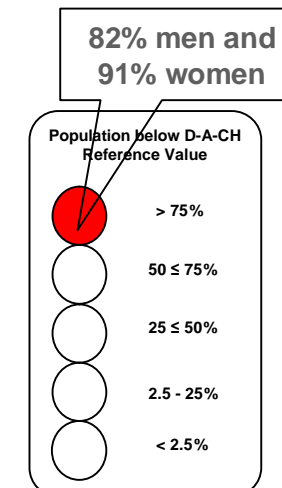
## Vitamin C



## Vitamin E

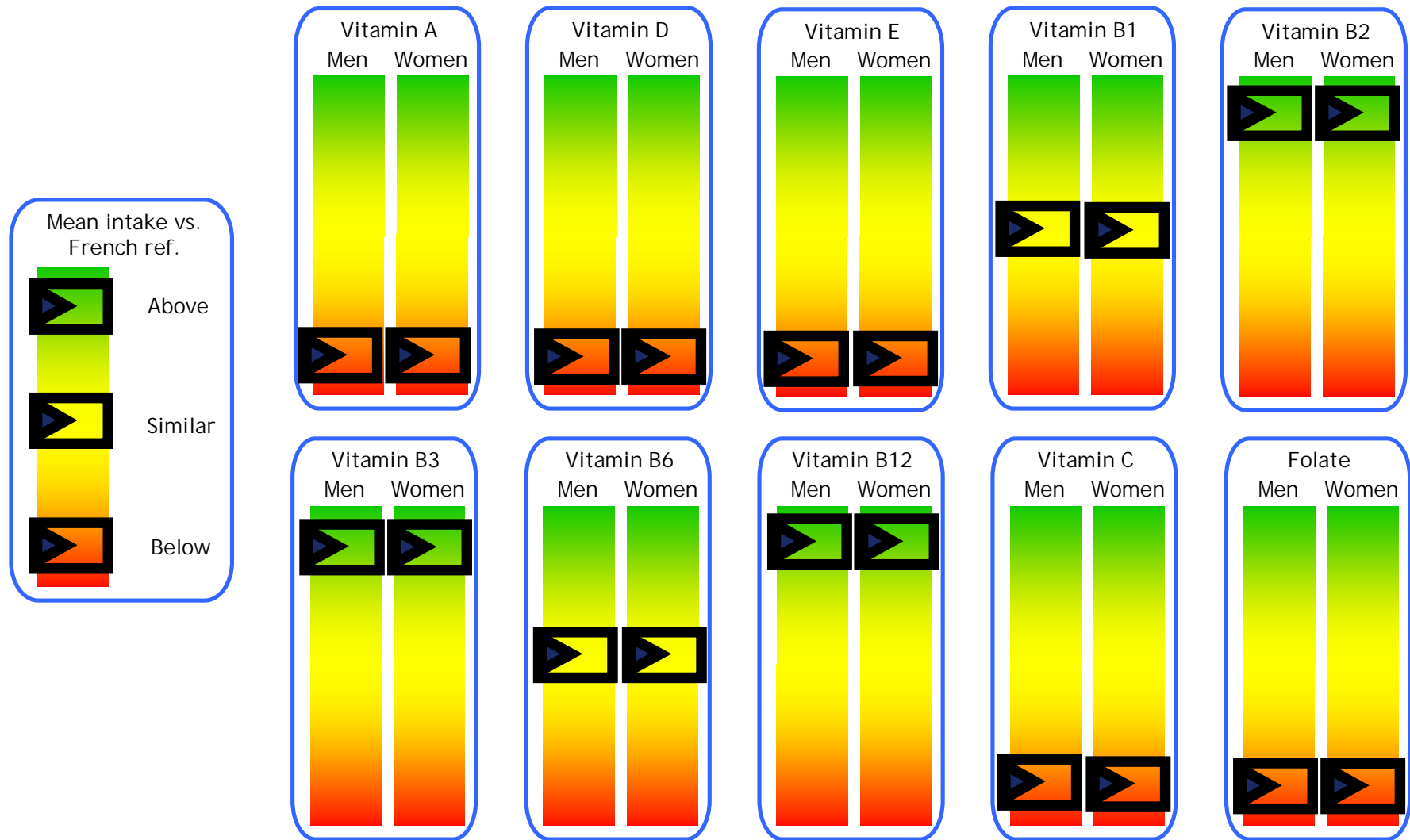


## Folic acid



## Vitamin D

# France: Available data indicate inadequate intake for a number of vitamins



What are the consequences?

**Does an intake of a micronutrient below  
recommendations**

**- without specific clinical signs and  
symptoms of deficiency -**

**have an impact on longterm health and disease  
development?**

# The consequences: Inadequate micronutrient intake and status matters long term

Nutrient status		Metabolic response
Desirable	3rd priority	Long term health, reduced risk for chronic diseases
Insufficient	2nd priority	Impaired physiological functions
Deficient	1st priority Urgent	Severe deficiency symptoms

We require a balanced intake of essential nutrients for long term health and healthy aging

Triage theory published by Bruce Ames, 2006, 2009

# The current population based nutrient intake recommendations (RDAs) have shortcomings

Current existing guidelines are population based and do not take into account the following:

- Socio-demographic factors
- Socio-economic status
- Age related differences
- Country - and ethnical differences
- Individual vitamin needs
- Vulnerable population groups (hospital, nursing home)
- Genetic variations



Identify influencing factors and impact on vitamin status aiming for evidence-based RDA setting



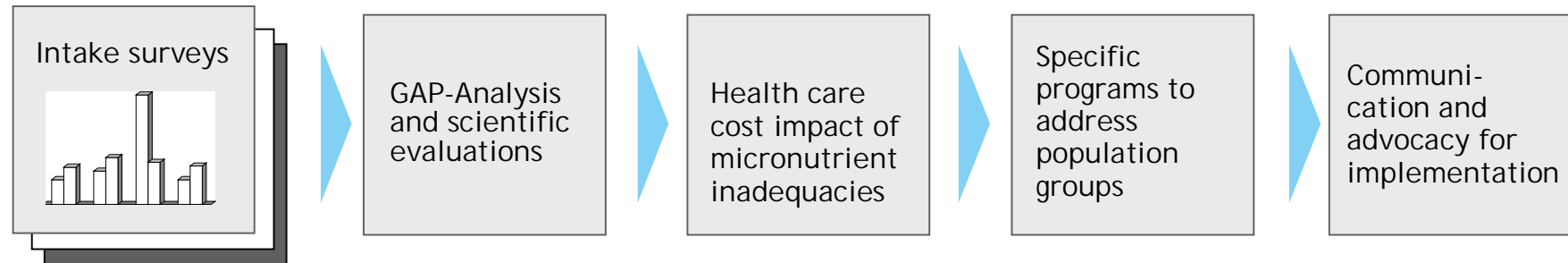
# ... and we should consider the impact of genetic variations on Vitamin metabolism

Several genetic variations for vitamins are known:

- |            |  |
|------------|--|
| Folic acid | <i>MTHFR</i> Ala222Val (MAF 0.242*) and Glu429Ala (MAF 0.358*) are associated with a decreased enzymatic activity for intracellular folate homeostasis and an alteration of intracellular folate distribution  |
| Vitamin D  | <i>DBP</i> SNPs are strongly associated with circulating 25(OH)D concentrations in premenopausal women, <i>DBP</i> rare allele carriers have a different risk of vitamin D-related diseases and may react different from dietary interventions and vitamin D supplementation (Common SNP with MAF: 0.425). |
| Vitamin E  | Strong evidence that vitamin E reduces overall CVD events in Haptoglobin 2-2 carriers with Diabetes mellitus Typ II (Prevalence 36% in the US population, H. Hodis)  |

\*MAF (Minor Allele Frequency) in HapMap Caucasians, adapted from NCBI

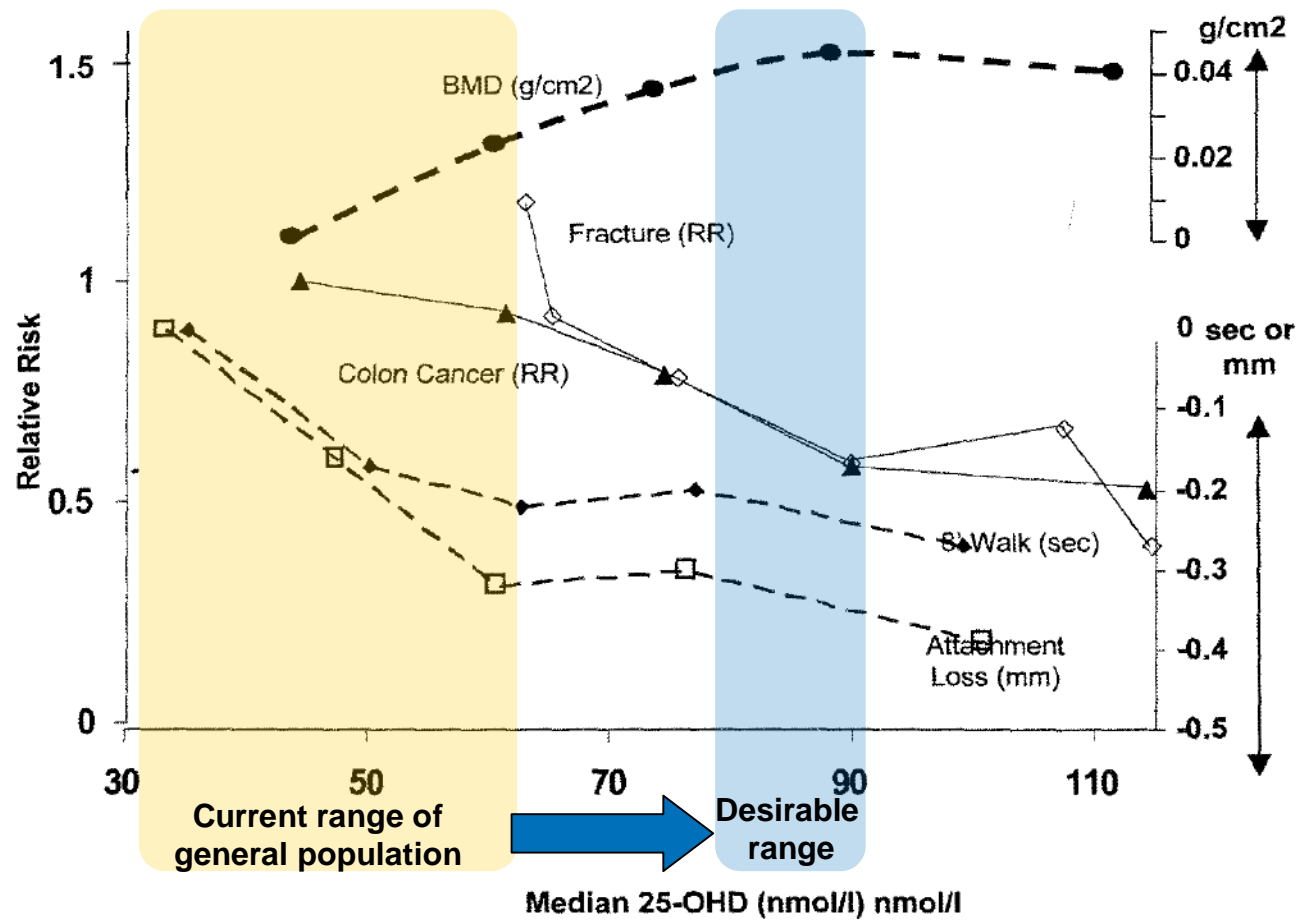
# Adequate global micronutrient intake for a healthy life



- Evaluate national intake surveys with reference to micronutrient intake
- Conduct gap analysis concerning micronutrient intake vs. recommendations
- Analyze and assess impact of micronutrient shortage vs. optimal status (direct and indirect costs)
- Develop nutritional programs to address micronutrient status of population groups
- Identify stakeholders and partner for implementation
- Communicate and advocate for program

Assess status and impact of Vitamin D as a first example and develop a global map on Vitamin D status

# To achieve the full benefits of Vitamin D a blood level above 75 nmol/l is recommended



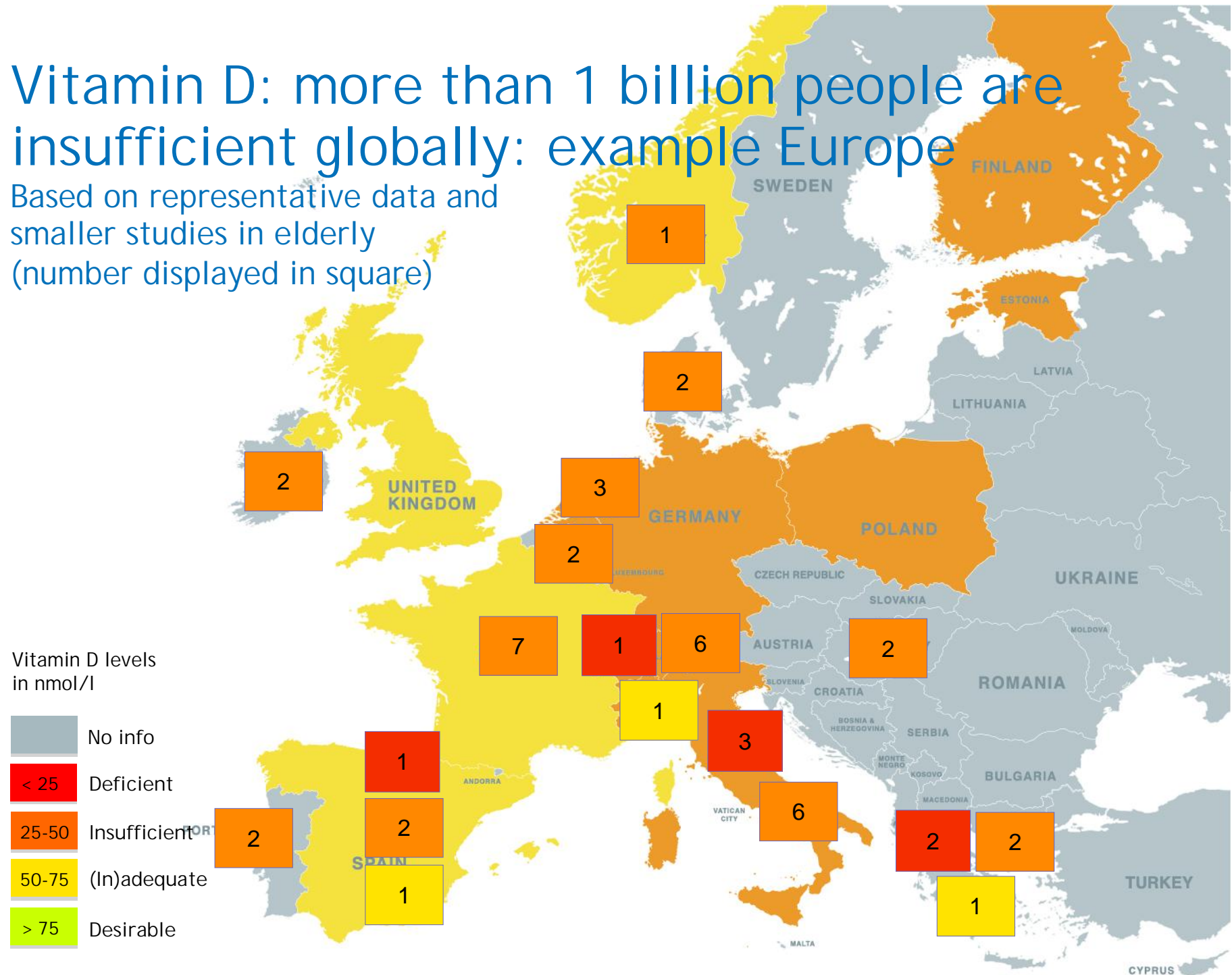
- Major part of the population does not meet the recommendation
- Benefit of supplementation demonstrated in human studies

Supplementation with 1000-2000 IU would bring general population into the desirable range

Source: Optimal Serum 25-Hydroxyvitamin D levels for multiple health outcomes; Heike A Bischoff-Ferrari

# Vitamin D: more than 1 billion people are insufficient globally: example Europe

Based on representative data and smaller studies in elderly (number displayed in square)



# Example Vitamin D: large health care cost savings could be achieved with adequate Vitamin D status

Author(s)		Cost savings in selected studies	
Domarus, Amling	2009	Germany: in oncology in osteological indications	1,5 bio €/year 1,0 bio €/year
Zittermann	2010	Germany: perspective, including direct and indirect costs and implications	37,5 bio €/year overall
Grant, Cross et al	2009	17 countries in Europe: direct and indirect cost savings (= 16,7 % of total health care costs)	187 bio €/year
Grant, Schwalfenberg et al:	2010	Canada:	6.9 % of health care costs

Adequate levels can be achieved with voluntary food fortification and/or supplementation for risk groups with costs of only 20-30 EUR/person, year



# Healthy nutrition for healthy life: the way forward

We require evidence based approaches to foods that promote and/or protect health with the translation into sustainable solutions

- Intake surveys and status of essential micronutrients
- Validated biomarkers to measure the health benefit
- New science including genomics, nutrigenomics and system biology
- New approaches and models to speed up the demonstration of the impact of food on health
- A regulatory framework to provide and inform about health claims related to foods

To achieve a healthy nutrition requires the action and commitment of all stakeholders: academia, food companies, regulatory bodies, NGOs and politicians



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