

DSM Capital Market Days - Media Program

# Vitamin Status - A Global Perspective and Impact on Public Health

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Basel, 27 September 2012

100 YEARS  OF VITAMINS™

# Vitamin status - a global perspective and impact on public health



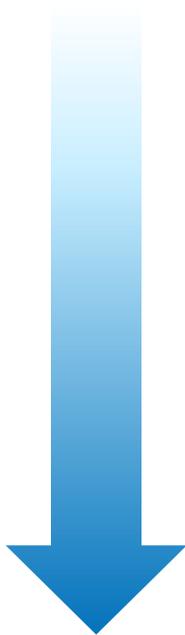
The role and needs for micronutrients (fortification) is recognized in large parts of the world - however more needs to be done.



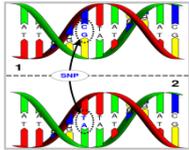
**Provide objective assessment based on publicly available data and studies**

# We want to achieve a healthy diet for all

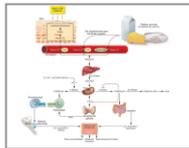
## Current: Inadequate nutrient intake



1. Assess micronutrient intake & status in different regions/population groups



2. Explore impact on health and risk for nutrition-related diseases



3. Assess impact on health care and economic development



4. Advocate and facilitate fortification and supplementation programs

## Future: Improved nutrition and health

# Large-scale population-based dietary intake surveys taken into account

- **Nationale Verzehrsstudie II**

7'093 men & 8'278 women

Max Rubner-Institut; 2008

- **British National Diet and Nutrition Survey**

628 men & 672 women

Henderson L et al. (2003) Volume 3-

Vitamin and Mineral intake and urinary analytes

- **Dutch National Food Consumption Survey 2007-2010**

704 men & 698 women

van Rossum CTM et al. (2011) Diet of children and adults aged 7 to 69 years

- **NHANES 2003-2008**

3'944 men & 3'641 women

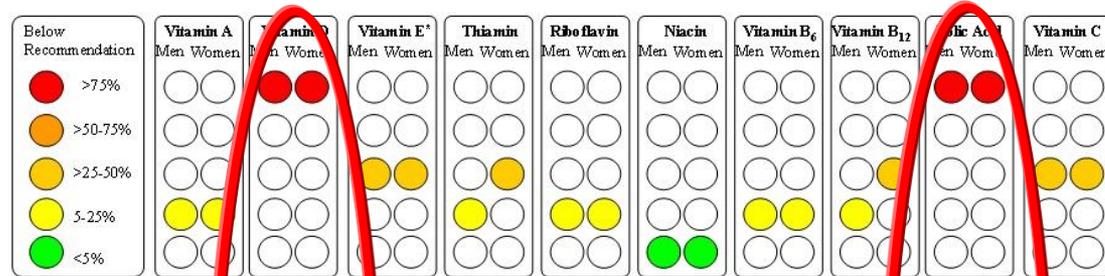
U.S. Department of Health and Human Services & Centers for Disease Control and Prevention; 2009 [cited August 2010]. Available from:

[http://www.cdc.gov/nchs/nhanes/nhanes2003-2004/diet03\\_04.htm](http://www.cdc.gov/nchs/nhanes/nhanes2003-2004/diet03_04.htm)

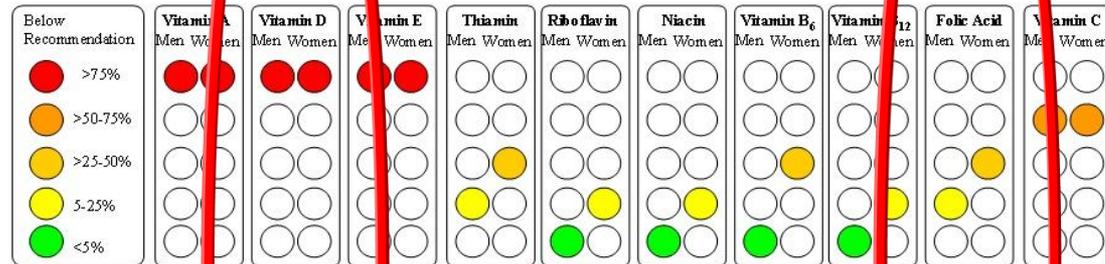


# Reality in micronutrient intake in Western countries

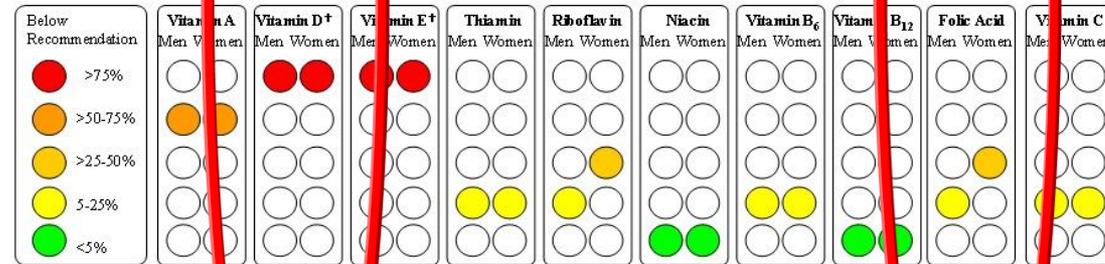
Germany



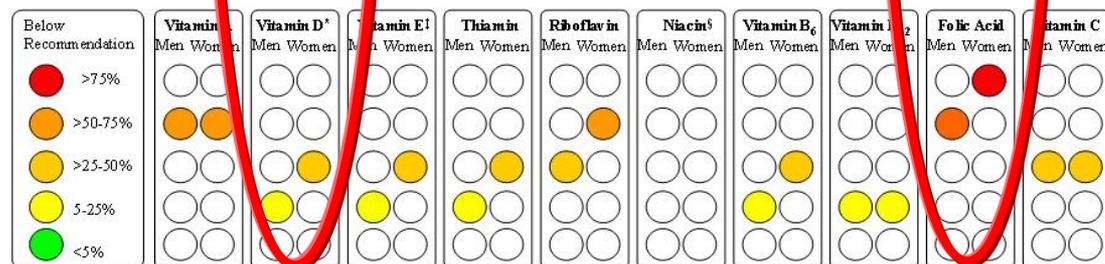
United States



United Kingdom



The Netherlands

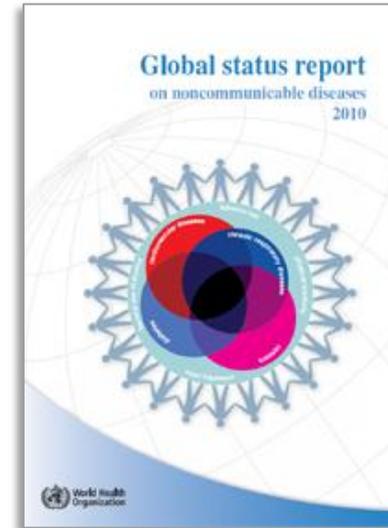


# Nutrition related issues and diseases are on the rise

- 1.6 billion people overweight
- 366 mio with diabetes
- > 200 mio with osteoporosis
- 31 mio new cancer patients every year
- 32 mio new CVD cases every year

## Total NCD mortality

- 36 of the 57 million global deaths in 2008 due to nutrition related diseases



- A major part, especially osteoporosis, diabetes, premature heart disease & stroke can be prevented
- Diet is an important modifiable factor

# Example Folate - different sources and functions

## Food sources:

- Liver, green leafy vegetables, beans, wheat germ and yeast

## Role in metabolic Reactions:

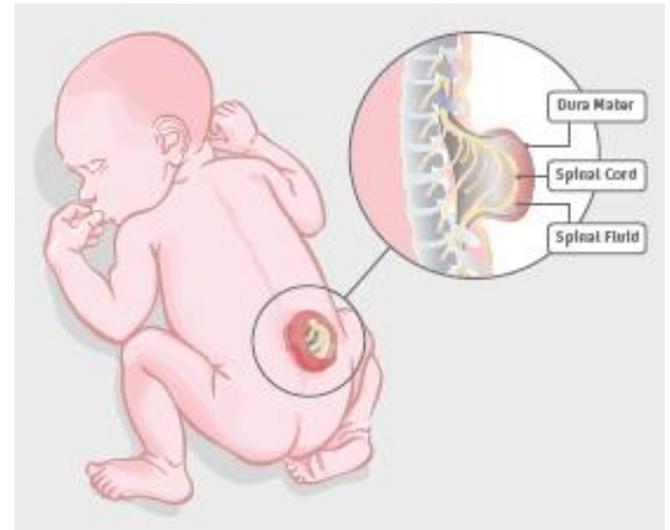
- Metabolism of amino acids
- Synthesis of nucleic acids (DNA and RNA)
- Formation of blood cells

## Folate is essential for:

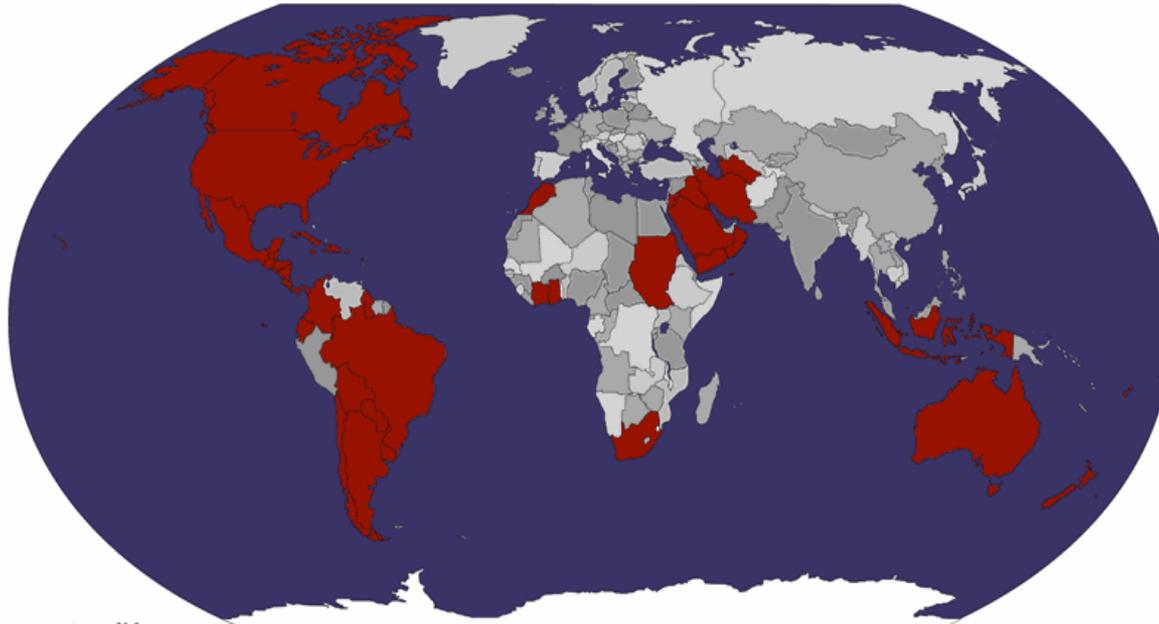
- Cell division
- Growth and functioning of the bone marrow

## Deficiency risks:

- Neural tube defect (NTD)



# Countries having mandatory fortification of food with folic acid (in red)



## The following countries have mandatory fortification of food

Argentina	Ghana	Oman
Australia	Grenada	Palestine, Occupied Territory
Bahrain	Guadelupe	Paraguay
Barbados	Guatemala	Puerto Rico
Belize	Guyana	Qatar
Bolivia	Haiti	Saudi Arabia
Brazil	Honduras	South Africa
Canada	Indonesia	St Vincent
Chile	Iran	Sudan
Colombia	Iraq	Turkmenistan
Costa Rica	Jamaica	Uruguay
Cote d'Ivoire	Jordan	USA
Cuba	Kuwait	Yemen
Dominican Republic	Mexico	
Ecuador	Morocco	
El Salvador	New Zealand	
Fiji	Nicaragua	

<http://www.eurocat-network.eu/preventionandriskfactors/folicacid/folicacidmandatoryfortification>

# The economic burden of Neural Tube Defects

(Figures from recent cost calculations)



## Babies born annually with NTD

- 300,000 to 400,000 worldwide  
(Christianson A, et al., (2006))
- ~4,500 in Europe  
(J Behav Med 25:411-424)
- 100,000 in China  
(N Engl J Med 341:1509-1519)

## The impact and solution

- The average life time costs (including quality of life and life expectancy) for a child with an NTD amounts to : € 242,948
- Food fortification with folic acid is a cost effective and humanitarian countermeasure  
(Jentik et al. (2008))

In light of many countries experiences with folic acid fortification it is timely to advocate in countries with no fortification.

Several hundreds of millions Euros of savings were estimated as cost benefit for folic acid fortification - next to the ethical aspects

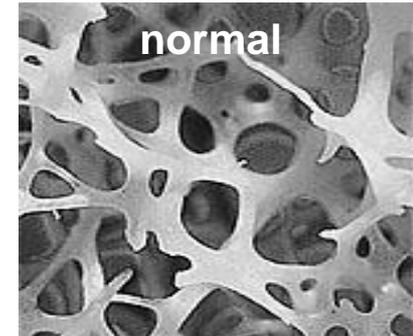
# Example Vitamin D: impact on a number of body functions

## Classical role of vitamin D: bone health

- Improves bone mineral density through calcium absorption and deposition
- Necessary to prevent rickets & osteomalacia

## Emerging health benefits of vitamin D

- Muscle: - Reduces risk of falling by improving muscle strengths
- Immunity: - Strengthens the immune system  
- Reduces risk of multiple sclerosis and diabetes type II
- Cardiovascular: - Lowers blood pressure
- Cancer: - Inhibits cell proliferation



# Cost impact of low vitamin D status on fractures in Germany



## Hip and vertebral fractures have the most „cost-intense“ medical implications

- Number osteoporosis patients: 8-10 mio (2010)\*
- Number of hip and vertebral fractures p.a.: 150.000\*

## Optimized vitamin-D status reduces number of fractures by 20 %

- Reduction of 5.478 hip fractures and 18.420 less vertebral fractures (in osteoporosis-diagnosed population)

**Net socio-economic benefit ranges from\* :** **585 mio €**

Including medical and therapeutic costs for prevention, treatment and supplementation costs vitamin D

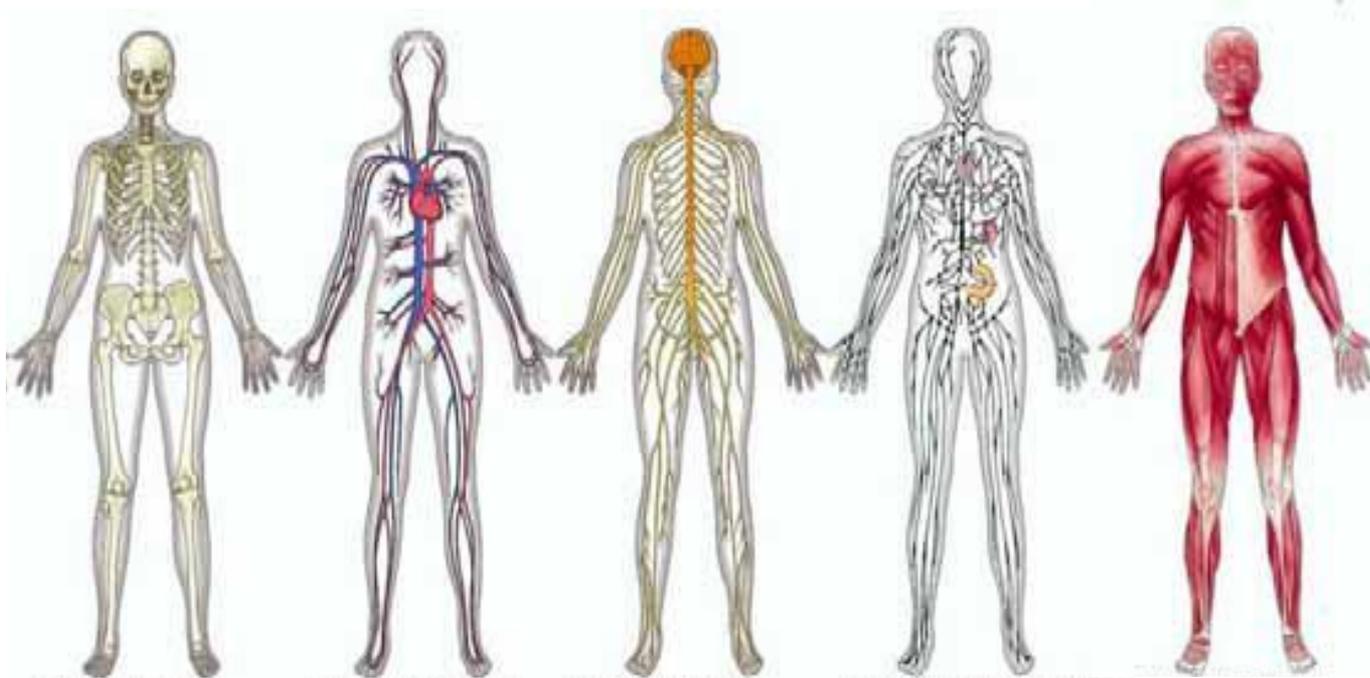
**up to** **778 mio €**

Including societal perspective, e.g. family care, reha costs

Source: \* Sproll 2011



# Magnitude of vitamin D considering additional health benefits



## Risk reduction by optimal vitamin status:

Bone fractures	Cardio Vascular Diseases	Multiple Sclerosis	Diabetes	Cancer and others
20 %	20 %	50%	25%	25 %

# Large health care cost savings could be achieved with adequate vitamin D status



Zittermann	2010	Germany: overall perspective, including direct and indirect costs and implications	€ 37,5 bn/y
Grant et al	2009	17 countries in Europe: direct and indirect cost savings (= 16,7 % of total health care costs)	€ 187 bn/y

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

# A call to act on vitamin D deficiency



- 88 % of the healthy population is below the optimal vitamin D status of 75 nmol/l 25 (OH)D
- 37 % below 50 nmol/l
- Specific groups like pregnant women, infants, elderly can be even more at risk

## Regulatory bodies act

- US RDA tripled
- Europe 4-fold increase proposed
- India evaluation ongoing
- China evaluation ongoing
- Brazil evaluation ongoing
- ...

## Nutritional solutions required

- Communication
- Food fortification
- Supplementation

**DSM is engaged in human studies, with authorities and customers to fight vitamin D deficiency with innovative food solutions**



# In summary



- Vitamin deficiencies and inadequacies (examples folate and vitamin D) have detrimental health effect
- Solutions to address micronutrient deficiency and inadequacy are available and implemented in many countries
- DSM takes leadership in addressing societal needs in micronutrients
- Ensuring micronutrient adequacy is a cost effective approach for a healthy and productive life of billions

**DSM has the competences and ingredients required for improving nutrition and is well positioned to develop this business further**

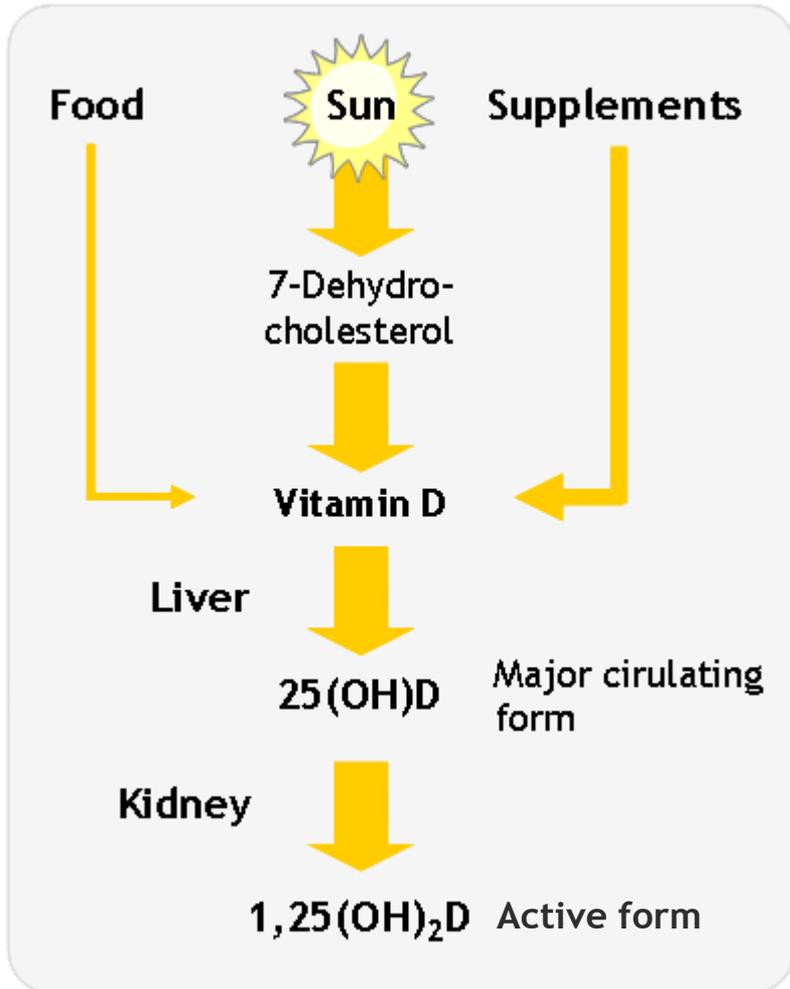




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# Vitamin D comes from different sources

We evolved to make Vitamin D via sunlight (UVB) on the skin  
 UVB wavelength must be between 290-315 nanometer



25(OH)D serum level is the relevant indicator of Vitamin D status (IOM 1997)



nmol/L	< 25	25 - 50	50 - 75	> 75
	<i>deficient</i>	<i>insufficient</i>	<i>inadequate</i>	<i>desirable</i>
ng/ml	< 10	10 - 20	20 - 30	> 30