Nutritional solutions for a healthy life

Nutritional solutions to counteract air pollutions

3rd International Conference on Nutrition & Food Sciences
Valencia, September 23-25, 2014

HEALTH · NUTRITION · MATERIALS

Satellite Symposium

Nutritional Solutions for Healthy Life

• **Nutrient intake - a global view**	Manfred Eggersdorfer, University Groningen and DSM Switzerland
• **Vitamin E – emerging benefits**	Szabolcs Peter, DSM Switzerland
• **Impact of air pollution on human health**	Fernando Holguin, University of Pittsburgh, USA
• **Nutritional modulation of inflammation in airways disease**	Lisa Wood, University of Newcastle, Australia
• **Nutritional solutions to counteract impact of air pollution**	Daniel Raederstorff, Manfred Eggersdorfer DSM Switzerland
• **Variance in chemical mixture of air pollution – impact on nutritional interventions**	Jane Ellen Clougherty, University of Pittsburgh, USA
• **Panel discussion**	all

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Nutritional solutions for a healthy life

Nutrient intake – a global view

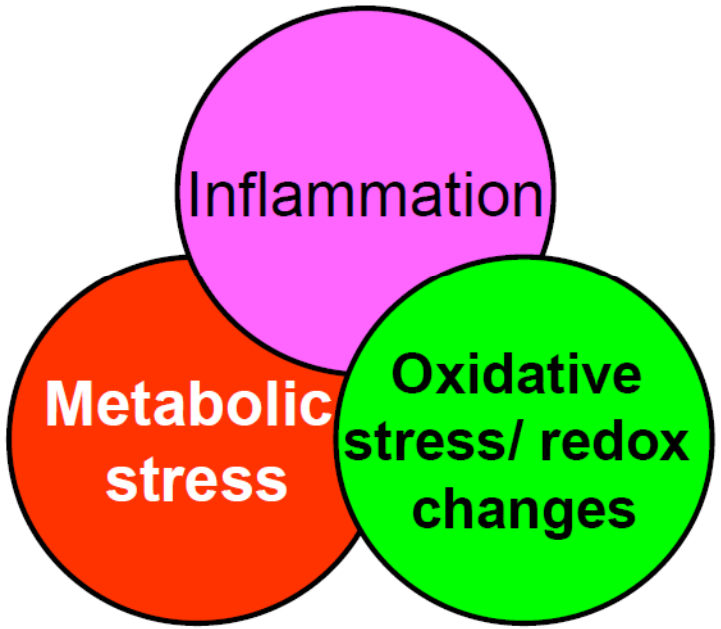
Manfred Eggersdorfer, PhD
Professor for Healthy Ageing University Groningen
Nutrition Science & Advocacy DSM Nutritional Products

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A healthy and long life depends on several factors

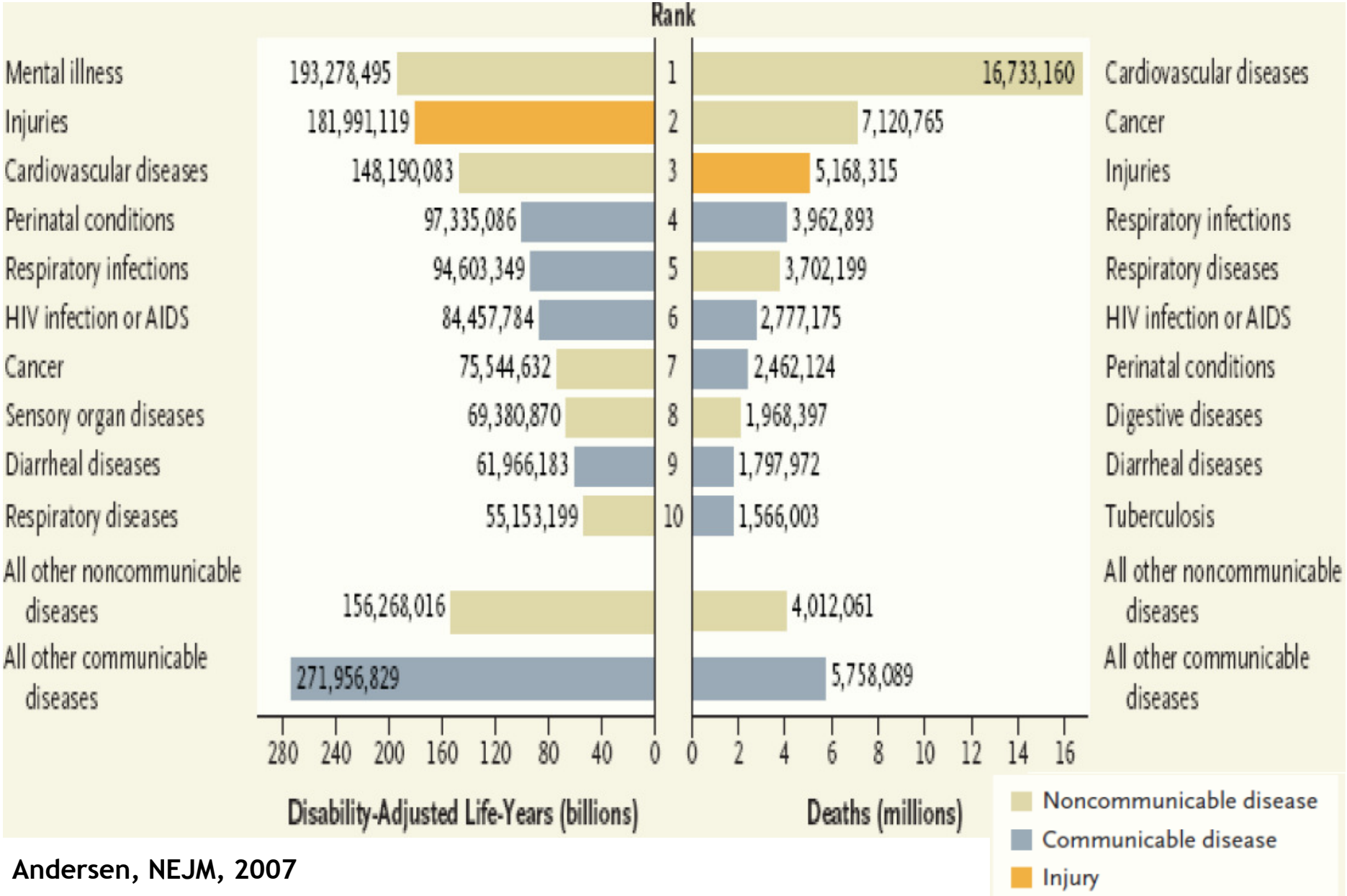
- 1000 days window
- Genetics
- Life-course events
- Education
- Employment
- Environment
- Lifestyle
- Nutrition



Ageing trajectory

➡ Environment/lifestyle/nutrition are modifiable risk factor

Major diseases are nutrition and lifestyle related



Andersen, NEJM, 2007

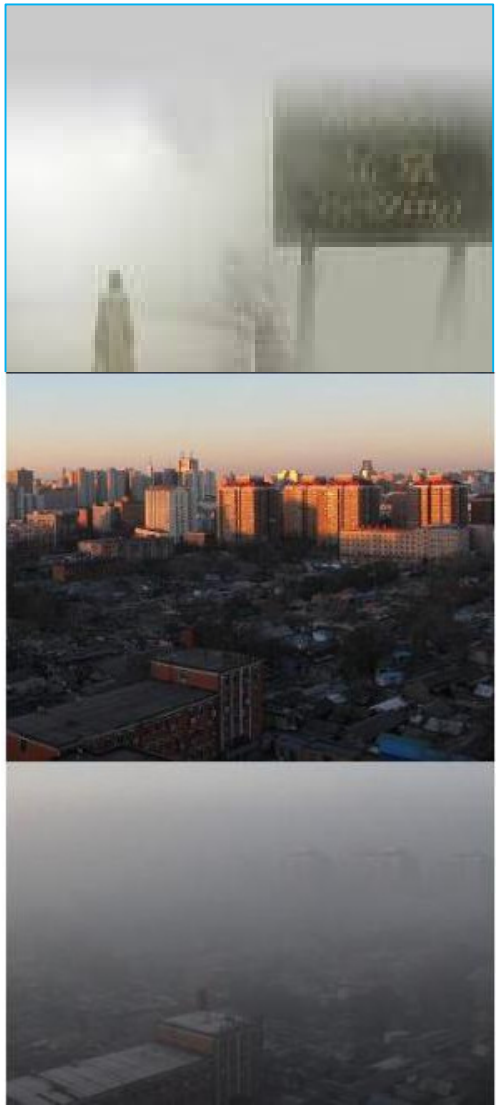
More people live in urban environment, number of mega cities increases (number in millions)

1970		1990		2011		2025	
1	Tokyo 23.3	1	Tokyo 32.5	1	Tokyo 37.2	1	Tokyo 38.7
2	New York 16.2	2	New York 16.1	2	Delhi 22.7	2	Delhi 32.9
		3	Mexico C 15.3	3	Mexico C 20.4	3	Shanghai 28.4
		4	Mumbai 12.4	4	New York 20.4	4	Mumbai 26.6
		5	Osaka 11.0	5	Shanghai 20.2	5	Mexico C 24.6
		6	Calcutta 10.9	6	Sao Paulo 19.9	6	New York 23.6
		7	Los Angel 10.9	7	Mumbai 19.7	7	Sao Paulo 23.2
		8	Seoul 10.5	8	Bejing 15.6	8	Dhaka 22.9
		9	Buenos Ai 10.5	9	Dhaka 15.4	9	Bejing 22.6
				10	Calcutta 14.4	10	Karachi 20.2
				11	Karachi 13.9	11	Lagos 18.9
				12	Buenos Air 13.5	12	Calcutta 18.7
				13	Los Angel 13.4	13	Manila 16.3
				14	Rio de Jan 12.0	14	Los Angel 15.7
				15	Manila 11.9	15	Shenzhen 15.5
				16	Moscow 11.6	16	Buenos Air 15.5
				17	Osaka 11.5	17	Guangzhou 15.5
				18	Istanbul 11.3	18	Istanbul 14.9
				19	Lagos 11.2	19	Cairo 14.7
				20	Cairo 11.2	20	Kinshasa 14.5
				21	Guangzhou 10.8	21	Rio de Jan 13.6
				22	Shenzhen 10.6	22	Bangalore 13.2
				23	Paris 10.6	23	Jakarta 12.8
						....	
						36	London 10.3

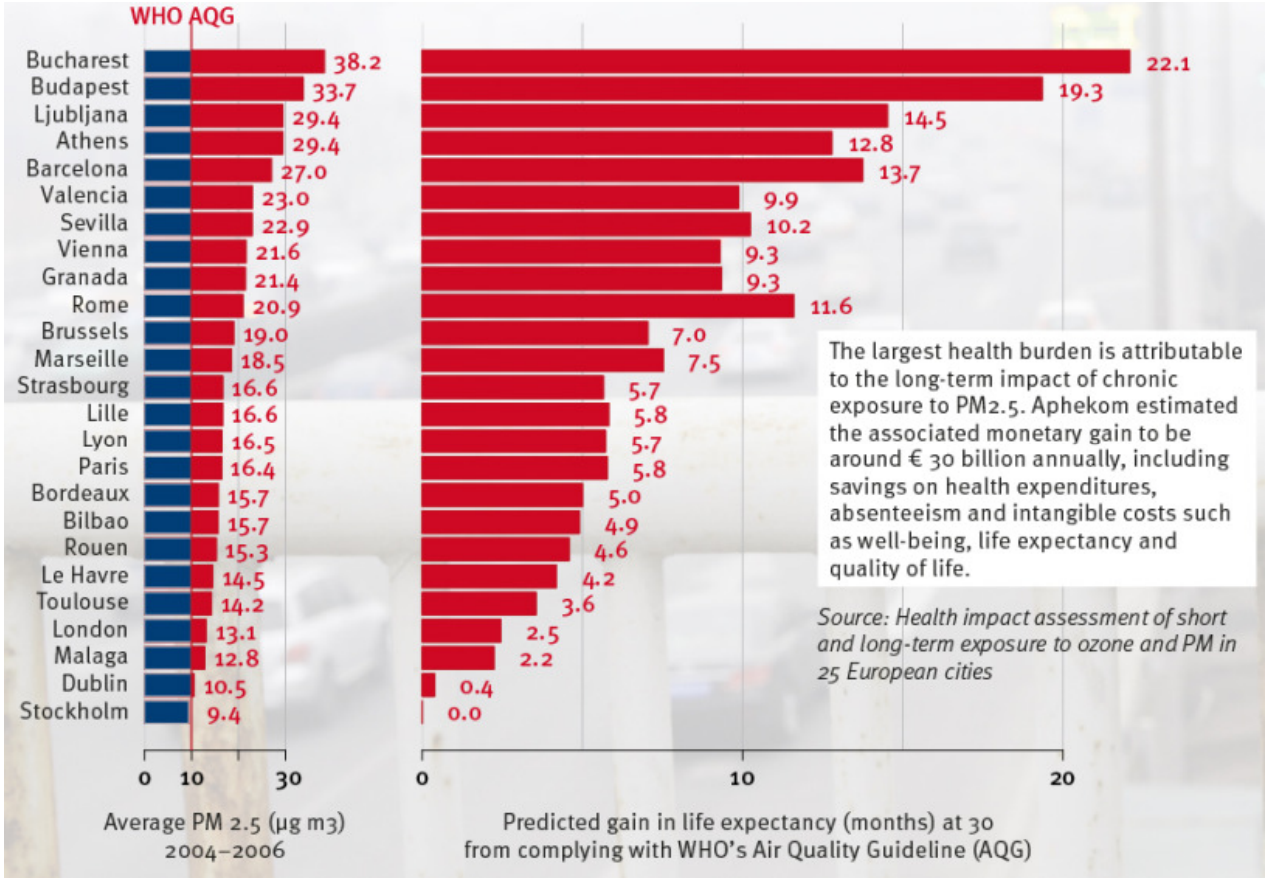
Source United Nations

Urbanization impacts lifestyle and health

- One in three urban dwellers lives in slums, 1 billion worldwide
- Increases use of motor vehicles
- Urban air pollution kills around 3.7 million people each year around the world, mainly due to cardiovascular and respiratory diseases
- Tuberculosis incidence is much higher in big cities
  - 4 x in New York City compared to US
  - 83 % of people with tuberculosis live in cities
- Urban environments tend to discourage physical activity and promote unhealthy food consumptions



Predicted average gain in life expectancy (months) for persons 30 years of age for a decrease in average annual level of PM2.5 to 10 µg/m^3



<u>Compliance with WHO AQG (10 µg/m^3) would result in:</u>

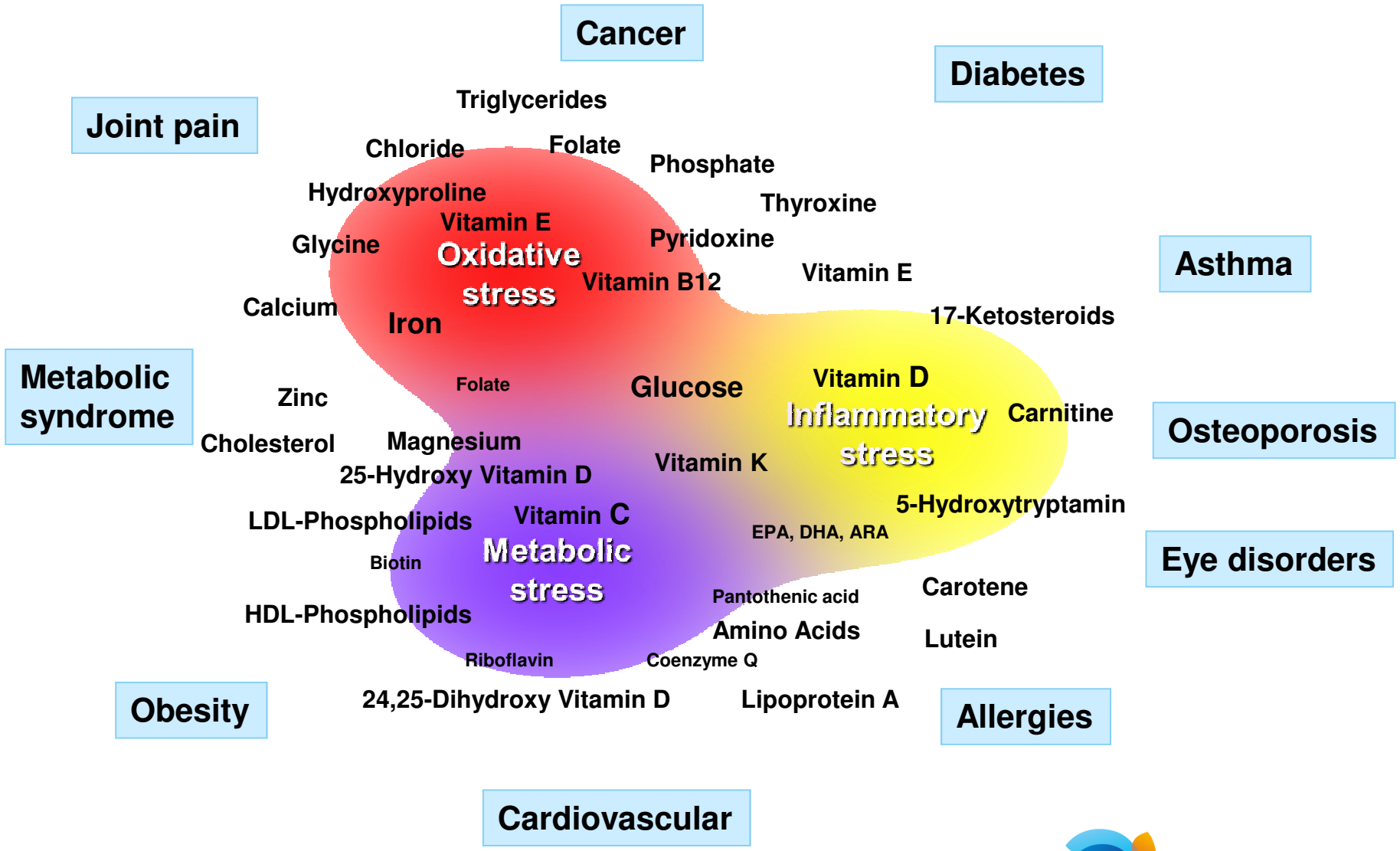
- **nearly 19,000 premature deaths avoided per annum (15,000 from cardiovascular causes)**
- **€31,5 billion saved annually**

www.aphekom.org

Air pollution was estimated to cause **3.7 million premature deaths** worldwide in 2012 (WHO)

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For a balance of all essential nutrients ….

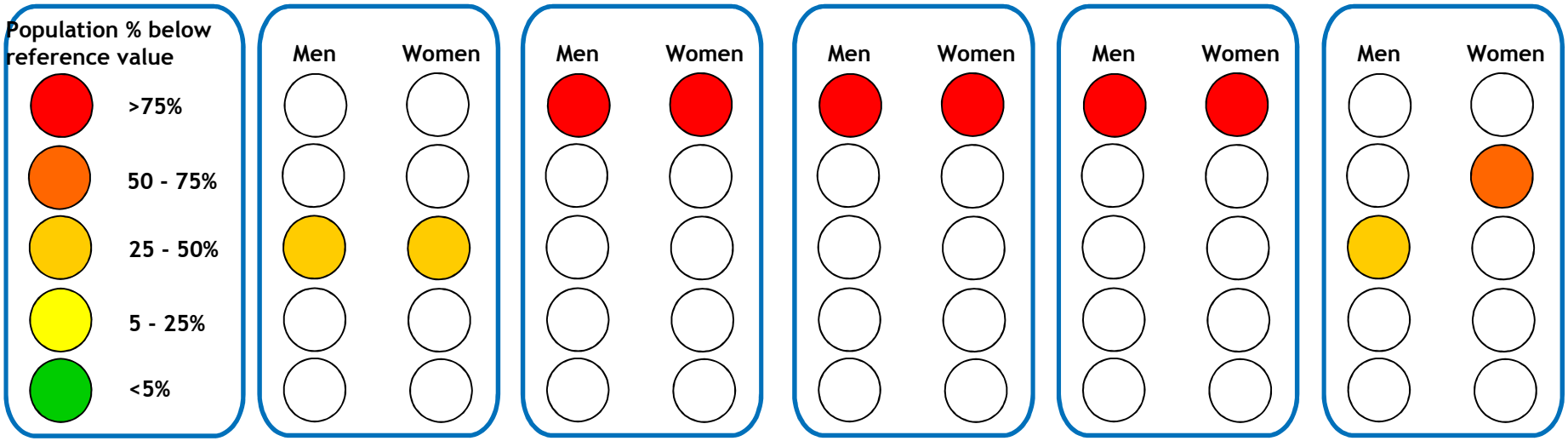


Adapted from Ben van Ommen

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However: Little compliance with food guidelines - people eat the 'wrong things'!





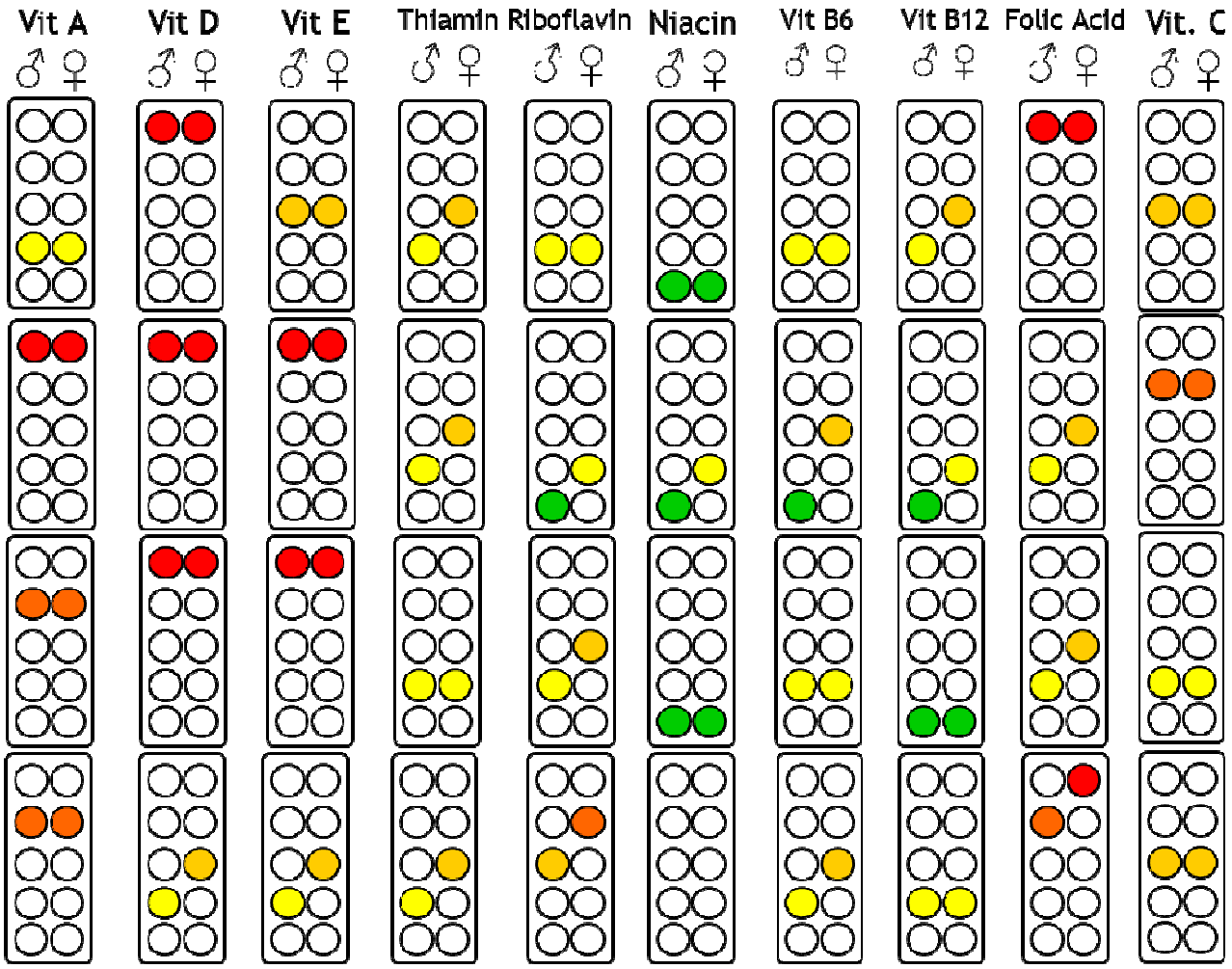
A large majority of the population does not meet the nutritional recommendations set by the food pyramid

Adapted from Krebs-Smith et al. 2010 JN

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Inadequate intake of nutrients

Micronutrient intake panel in US, NL, UK and Germany





Barbara Troesch, Birgit Hoeft, Michael McBurney, Manfred Eggersdorfer and Peter Weber Published in British Journal of Nutrition 2012, 108, pp 692-698

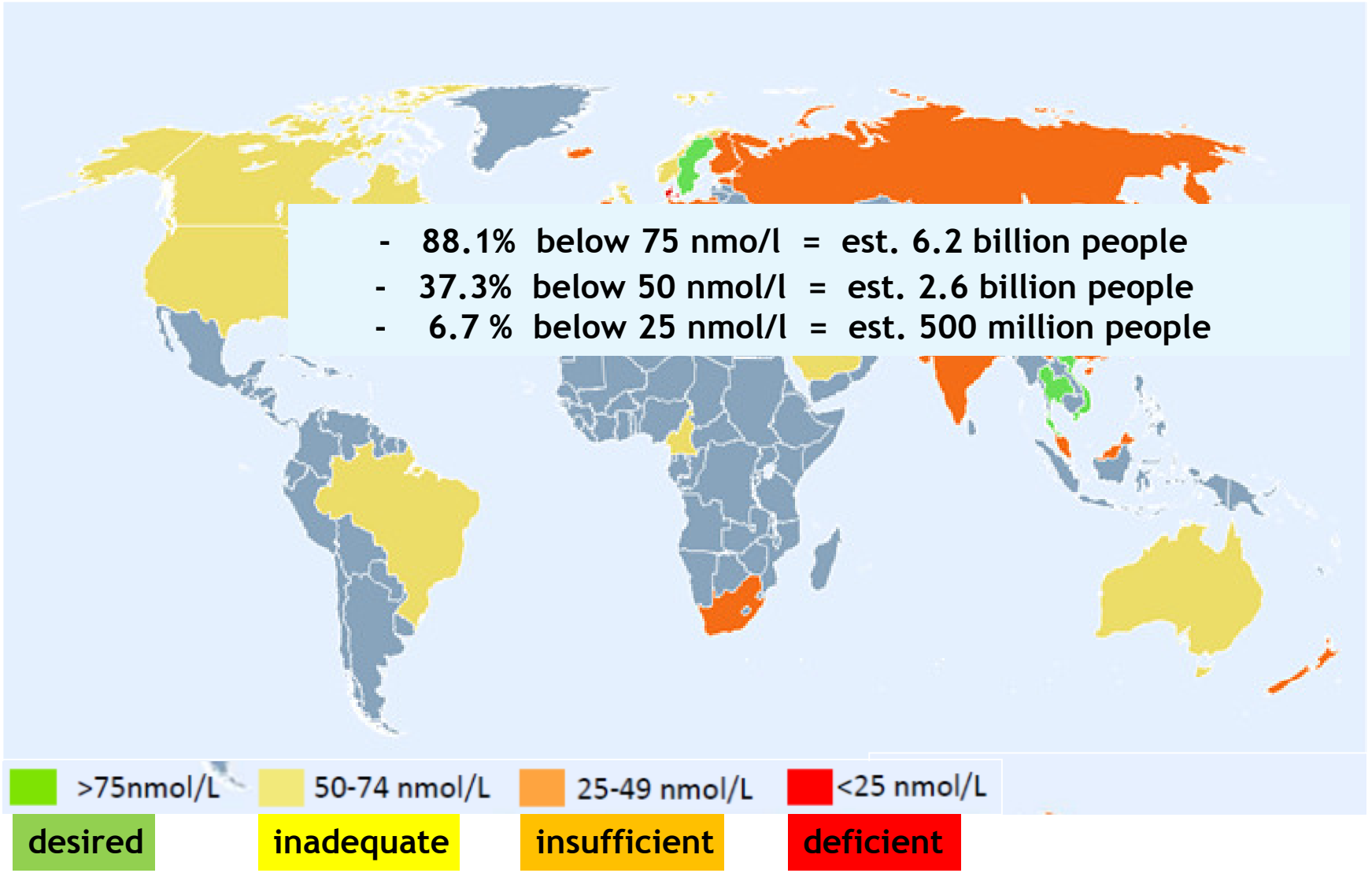
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More important than intake data is micronutrient status

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Example: Global Vitamin D status in adults

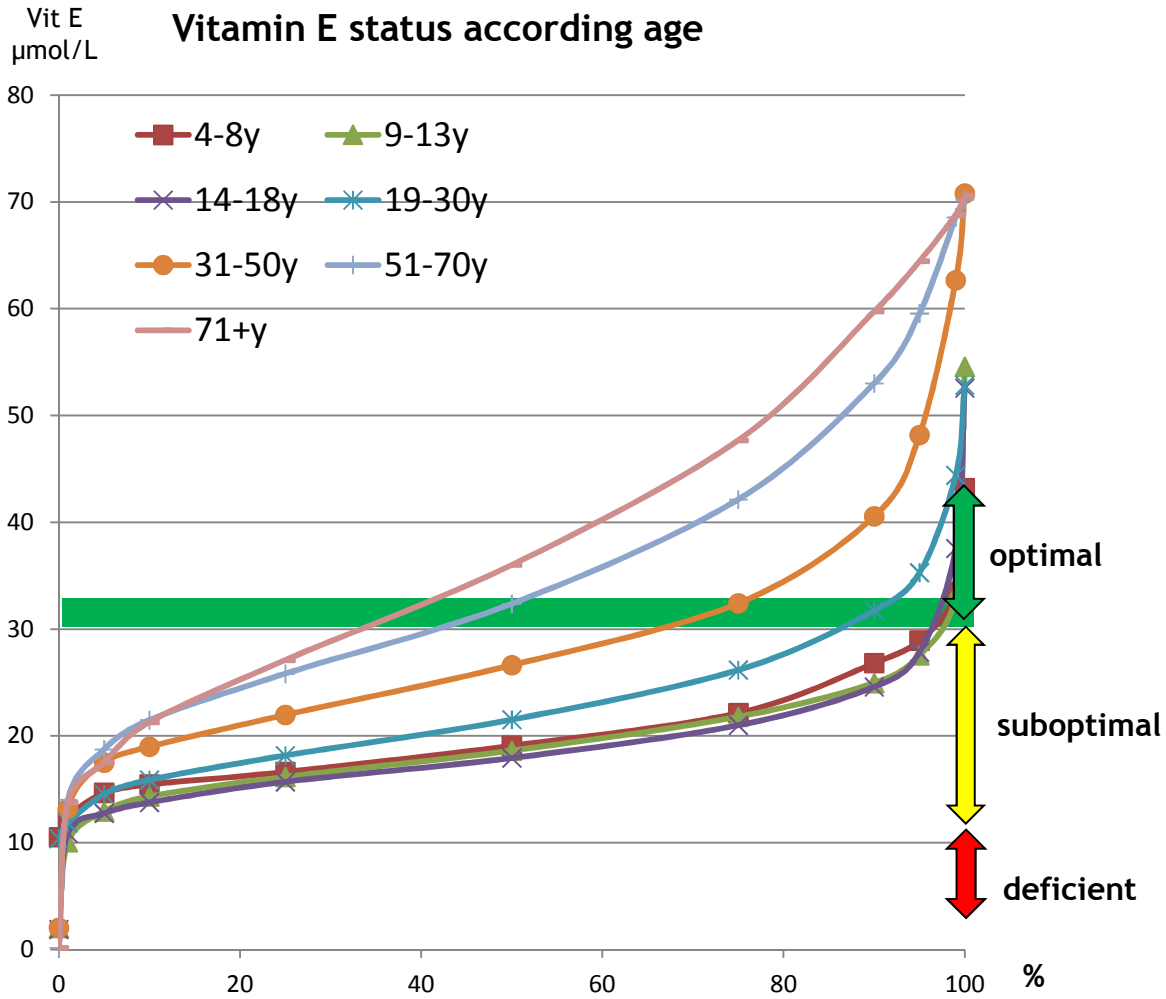
http://www.iofbonehealth.org/facts-and-statistics/vitamin-d-studies-map



Ref: Wahl DA et al, Archives of Osteoporosis 2012

Example Vitamin E: data indicate suboptimal status for major part of US population

- Assumption:
  Optimal vitamin status
  >30 µmol/L
- Deficiency < 12 µmol/L
  (IOM)
- Major part of
  population in
  suboptimal range
- Analysis in other
  countries
  demonstrates similiar
  situation



Source: NHANES

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Summary and conclusions

- Demographic, societal and lifestyle changes require the adjustment of food systems
- Micronutrient inadequacies are a global issue and cause health problems
- Global trend to urbanization with consequences on air pollution and other factors impacts lifestyle and health
- Food fortification and supplementation may complement diets in stress situations and are solutions to counteract negative impact of air pollution

In summary:
Ensuring micronutrient adequacy ensures health and well-being and is an important pillar to secure a healthy and long life

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What are potential consequences of low micronutrient status?

- More than 40% of nutrition related diseases take place before the age of 70.
- Approximately one third of cancers and up to 80% of heart disease, stroke and diabetes type 2 deaths are preventable.

Source WHO

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Consequences of inadequate vitamin D status

In women, the incidence of fractures is higher than the total incidence of cancer, heart infarction, stroke or diabetes

Osteoporotic fractures accounts for more days spent in hospital than many other diseases, including diabetes, myocardial infarction and breast cancer.

Source IOF

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A decent diet can provide all nutrients in quality and quantity



Vitamins

Vitamin A
Vitamin E
Vitamin C
Vitamin D
Vitamin B1
Vitamin B2
Vitamin B6
Vitamin B12
…

Enzymes

Phytase
…

Omegas

DHA
EPA
ARA

Fibers

Minerals

Calcium
Magnesium
Iron
Zinc
Iodine
Selenium
…

Carotenoids

B-carotene
Lutein
Zeaxanthin
…

Amino acids

Methionine
Lysine
…

… with consequences on nutrient intake

Deficiency and inadequacy of nutrients (WHO/FAO 2010)

Deficiency/ inadequacy	Affected persons	Symptoms
Iron	2000 million	Anemia
Zinc	1000 million	Skin lesions/diarrhoea/growth
Jodine	750 million	Goiter/cretinism
Vitamin A	200 million	Blindness, measles, death
Vitamin D	500 million	Rickets/osteoporsosis, ...
Folate	?	Neural tube defect
Pufas	?	?
....		

Deficiencies and inadequate intake of micronutrients are found in all countries, also in wealthy regions

Large-scale population-based dietary intake surveys

- **Nationale Verzehrsstudie II** (7'093 men & 8'278 women)

  Max Rubner-Institut. (2008) Nationale Verzehrsstudie II
- **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) Dutch National Food Consumption Survey 2007-2010- Diet of children and adults aged 7 to 69 years
- **NHANES 2003 - 2008** (3'944 men & 3'641 women)

  Centers for Disease Control and Prevention, National Center for Health Statistics. NHANES 2003 - 2008. Available from: Available from http://www.cdc.gov/nchs/nhanes/nhanes2003-2004/diet03_04.htm