

# Health economical analysis of the potential reduction of salt, saturated fat and sugar in foods to lower the risk of nutrition related diseases in Germany

Karolin Senftleben<sup>1,3</sup>, Katja Riedel<sup>2</sup>, Martin Langer<sup>2</sup>, Peter Deumelandt<sup>3</sup> and Toni Meier<sup>1,3</sup>

<sup>1</sup>Martin-Luther-Universität Halle-Wittenberg, <sup>2</sup>BRAIN AG, <sup>3</sup>Privates Institut für Nachhaltige Landwirtschaft GmbH (INL)

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## Objective

The international scientific community agree that a healthful nutrition lowers the risk to develop nutrition related diseases. Direct medical treatment costs of all diseases captured by the official Federal Health Monitoring in Germany rose nominally from 158 to 300 billion EUR between the years 1992 and 2012 (Destatis, 2014, Statistisches Bundesamt, <https://www-genesis.destatis.de>). Thus, lowering diet related diseases might also lead to a decrease of economic burden for the society. Subject of this study was the quantification of the economic burden of diet related diseases based on an unbalanced nutrition in Germany.

## Procedure & Methods

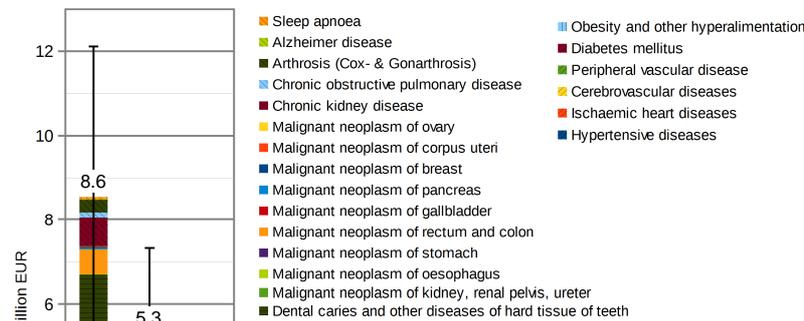
- Systematic review and meta-analysis of studies correlating non-communicable diseases (NCD) to excessive consumption of
  - Sugar (MDS, monosaccharides and disaccharides)
  - Saturated fatty acids (SFA)
  - Salt
- Classification of the published papers into evidence classes according to DGE (2011).
- Calculation of population attributable risk (PAR, according to Spiegelmann et al., 2007) for correlation of health care costs to diet induced risk factors of NCD.

$$PAR = 1 - \frac{1}{p(RR - 1) + 1}$$

P prevalence  
RR relative risk according to Grant (2014)

- Calculation of health care costs for treatment of NCD referring to healthcare expenditures in Germany and to international classification of diseases (ICD) (Destatis, 2014). Most recent data with a differentiation between different diseases from 2008 were used as reference.
- Analysis of stepwise reduction scenarios on medical treatment costs of NCD. A linear dependence between excessive intake of MDS, SFA or salt and reduction of corresponding treatment cost was assumed. 100 % reduction corresponds to a diet according to official recommendations of DGE (2012).
- Statistical effect sizes were validated by analyzing the 95% confidence interval (CI).

## Results I



**Fig. 1 Healthcare costs associated with an overconsumption of MDS, salt and SFA.** The overconsumption of sugar imposes the highest burden with 8.6 billion EUR (CI95%: 3.0-12.1) – mainly due to treatment costs of caries and other diseases of the hard tissue of teeth, hypertensive and cardiovascular diseases, diabetes mellitus, rectum and colon cancer as well as chronic kidney disease. At all the overconsumption of salt leads to healthcare costs of 5.3 billion EUR (CI95%: 3.2-7.3). The unbalanced intake of saturated fatty acids was associated with 2.9 billion EUR (CI95%: 32 million – 4.7 billion) – mainly due to treatment costs of diabetes mellitus, obesity, ischemic heart disease, chronic obstructive pulmonary disease and arthrosis (mainly mediated by overweight/obesity).

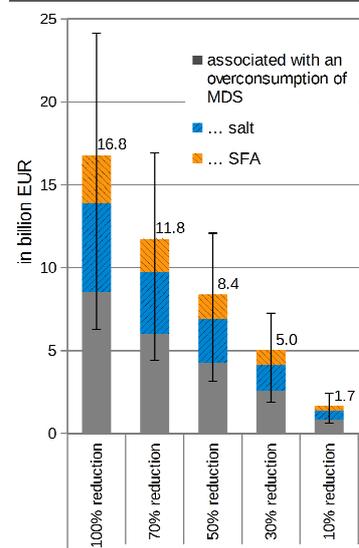
## Conclusions

- Expectable **direct healthcare savings** concerning disease burden and medical treatment costs by means of a balanced intake of sugar, salt and saturated fat **are substantial**.
- Association of dietary factors** (in particular an excessive intake of MDS, salt, SFA) and clinical endpoints **with related treatment costs is evident** (see Tab. 1 and Fig. 1).
- German healthcare **costs** correlated to an overconsumption of MDS, salt and SFA for **solely direct medical treatment**, were calculated to **16.8 billion EUR** (see Fig. 2).
- An **adequate intake** of MDS, salt and SFA would **lower yearly healthcare cost by 16.8 billion EUR**, which is calculated to be 7% (CI95% 2%-10%) of the total medical treatment costs in the year 2008 (254 billion EUR) and could be used as an **effective leverage** to diminish the pressure on healthcare, health insurance and national tax levy systems.
- Actual societal and **economic gains**, may **exceed the 16.8 billion EUR**, as in this study **solely direct medical treatment costs** regarding an adequate intake **were considered**.
- Optimizing existing and/or development of new formulations** or possibly by introducing new components with an enhanced nutritive performance will allow consumers access to healthier food and should be supported.
- Within the BMBF funded Strategic Alliance NatLifE 2020, **BRAIN AG develops** a new generation of **natural, biologically active ingredients** for food industries to **enable** the reduction of dietary risk factors and the formulation of tasty and **healthy food**.

## Results I

**Tab. 1. Total and avoidable healthcare costs by means of a balanced intake of MDS, salt, SFA regarding considered diseases.**

	ICD10 code	Total treatment costs 2008	Avoidable treatment costs by mean of a balanced intake of			References and evidence levels according to DGE (2011)	
			MDS	salt	SFA		
in million EUR							
Hypertensive diseases	I10-I15	9,059	1,070	2,525		Dhingra et al. 2007 I, II, III	
Ischaemic heart diseases	I20-25	6,202	1,164	887	233	Dhingra et al. 2007 Ib	
						IHME 2014 I, II, III	
Cerebrovascular diseases	I60-I63, I65-I67, I69	7,788	1,425			IHME 2014 I, II, III	
Peripheral vascular diseases	I70,I73	2,349	247			IHME 2014 I, II, III	
Diabetes mellitus	E10-E14	6,342	103			Basu et al. 2013 Ia	
... overweight/obesity mediated			537		972	Schmid et al. 2004 I, II, III	
Obesity and other hyperalimentionation	E65-E68	863	158		286	Dhingra et al. 2007 Ib	
						Schutz et al. 2002 Ib	
Dental caries & other diseases of hard tissue of teeth	K02, K03	8,525	3,666			Moynihan, Kelly 2013 Ia, Ila	
Malignant neoplasm of oesophagus	C15	281	15		27	Arnold et al. 2014 Ia, Ila, Ila	
... overweight/obesity mediated						IHME 2014 I, II, III	
Malignant neoplasm of stomach	C16	513	91				
Malignant neoplasm of rectum and colon	C18, C20	1,730	537			Bostick et al. 1994 Ib	
... overweight/obesity mediated			40		73	Arnold et al. 2014 Ia, Ila, Ila	
Malignant neoplasm of gallbladder	C23	45	1.3		2.4	Arnold et al. 2014 Ia, Ila, Ila	
... overweight/obesity mediated						Gallus et al. 2011 Ia, Ila	
Malignant neoplasm of pancreas	C25	462	22		12	Arnold et al. 2014 Ia, Ila, Ila	
... overweight/obesity mediated			6.9		315	Boyd et al. 2003 Ia, Ila	
Malignant neoplasm of breast	C50	1,970	25		44	Arnold et al. 2014 Ia, Ila, Ila	
... overweight/obesity mediated						Arnold et al. 2014 Ia, Ila, Ila	
Malignant neoplasm of corpus uteri	C54	194	11		21	Arnold et al. 2014 Ia, Ila, Ila	
... overweight/obesity mediated						Arnold et al. 2014 Ia, Ila, Ila	
Malignant neoplasm of ovary	C56	325	1.4		2.6	Arnold et al. 2014 Ia, Ila, Ila	
... overweight/obesity mediated						Arnold et al. 2014 Ia, Ila, Ila	
Malignant neoplasm of kidney, renal pelvis, ureter	C64-C66	254	8.8		16	Arnold et al. 2014 Ia, Ila, Ila	
... overweight/obesity mediated						Saldana et al. 2007 Ib	
Chronic kidney disease	N02-05, N15, N20-N23	1,232	689		124	IHME 2014 I, II, III	
Chronic obstructive pulmonary disease	J40-J44, J47	4,646	127		230	Behrens et al. 2014 Ib	
... overweight/obesity mediated							
Coxarthrosis (arthrosis of hip)	M16	2,969			67	121	Schmid et al. 2004 I, II, III
... overweight/obesity mediated							
Gonarthrosis (arthrosis of knee)	M17	3,762			236	427	Schmid et al. 2004 I, II, III
... overweight/obesity mediated							
Alzheimer's disease							
... overweight/obesity mediated							
... hypertension mediated	G30	993	7.5		14	Norton et al. 2014 I, II, III	
... diabetes mediated			8.0		19		
Sleep apnoea	G47.3	694	0.5				
... overweight/obesity mediated			53		96	Schmid et al. 2004 I, II, III	
<b>Sum</b>		<b>61,200</b>	<b>8,553</b>	<b>5,318</b>	<b>2,892</b>		
<b>Total avoidable treatment costs</b>			<b>16,800 million EUR</b>				



**Fig. 2 Reduction scenarios in healthcare costs associated with an overconsumption of MDS, salt and SFA.** The expected healthcare cost savings vary between 1.7 billion EUR in case of a 10 % reduction (CI95 %: 0.6-2.4) and 16.8 billion EUR in case of a 100 % reduction (CI95 %: 6.3-24.1). The 100 % reduction scenario corresponds to a diet according to official recommendations (DGE). In a further analysis it was assumed that solely 50% of hypertension mediated diseases stem from an excessive salt intake (BfR, 2008). In that case cost savings range from 1.4 to 14.2 billion EUR (data not shown).