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Variation in modelled healthy diets and the impact on carbon footprint

based on three different food patterns identified from the Danish diet

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Introduction A healthy diet complies with the national food-based dietary guidelines (FBDG) and Nordic nutrition recommendations (NNR2012). Although mostly plant-based it might not be the most climate friendly diets.

Objectives 1) Develop new healthy diet compositions by a simple diet modelling technique that ensures a nutrient content in accordance with the recommended values and depending on food preferences and habits, and 2) Further optimize the diet composition with regard to carbon footprint (CF).

Conclusion Different dietary patterns can fulfill Danish dietary recommendations. Specific constraints are needed to lower the Carbon Footprint of the both original and healthy diets.

Methods

- A simple modelling of the 'Traditional', 'Health conscious' and 'Fast food' patterns identified from national dietary data (Knudsen et al. 2014) into iso-caloric (10MJ) healthy diets that fulfil and the Danish FBDGs and NNR2012 with respect to both micro- and macronutrients and in accordance to core preferences.
- Updated list of estimated carbon footprint (CF) of food items included in the diets, based on literature
- Extension of modelling was used to optimize the healthy diets with regard to their estimated carbon footprint (CF).

Table 1. Food composition of Original Danish dietary patterns, Healthy modelled dietary patterns and CF-optimized healthy dietary patterns. The number of foods (N) within selected food groups included.

Food groups g/10MJ	Original Danish dietary patterns				Healthy modelled dietary patterns				CF-optimized dietary patterns			
	Traditional	Green	Fast food	Foods	Trad.1	Green1	Fast food1	Foods	Trad. 2	Green2	Fast food2	Foods
Coffee and the	813	861	464	4	812	861	461	4	813	860	461	2
Water	640	1384	863	3	638	1384	859	3	640	1384	863	1
Milk and Milkproducts	282	359	344	21	280	360	345	21	282	359	345	11
Cheese	34	35	34		25	25	25		25	25	25	
Cheese, fat	28	25	29		16	15	14		7	5	6	
Cheese, low fat	6	11	4		8	11	11		17	20	19	
Morning cereals	25	42	29	12	25	42	29	12	25	42	29	7
Bread	182	181	176	16	201	180	186	16	201	180	206	6
Ryebread	82	76	47		100	80	90		100	80	50	
Wheat bread, coarse	22	52	27		45	52	40		45	52	100	
Wheat bread, white	77	52	102		56	48	56		56	48	56	
Meat, incl poultry	129	95	118	26	128	94	114	26	131	89	116	15
Meat, red and proc	111	75	97		71	66	66		71	61	63	
Poultry	17	20	22		57	28	48		59	28	53	
Fish	23	31	15		50	50	51		52	52	55	
Egg	12	14	9		12	14	9		12	21	9	
Vegetables	125	238	150		310	310	319		312	327	322	
Vegetables, fine	65	122	95		157	158	166		158	160	169	
Vegetables, coarse	60	116	55	29	152	152	152	29	154	167	153	10
Fruit	150	343	172		240	340	205		240	340	205	
Juice	58	92	95		60	92	95		60	92	95	
Nuts	1	4	1		15	15	10		15	20	10	
Potatoes	118	85	79		120	85	116		150	110	102	
Rice and pasta	37	41	51		38	41	74		50	51	68	
Sauces, dressings	31	22	27		36	22	32		36	28	27	
Fats on bread	20	9	12		10	9	12		10	9	14	
Other fats	18	15	17		18	14	18		18	17	18	
Sugar, honey, marmelade	16	12	9		16	12	10		16	12	10	
Alcohol cont. drinks	281	174	173		190	155	111		253	173	141	
Soft drinks	252	201	468		170	179	300		227	171	382	
Ice, cakes, candy, chocolate	81	87	85		55	77	55		73	103	71	
Fast food meals etc.	52	45	131		35	40	84		47	53	107	
Total	Traditional	Green	Fast food	412	Trad.1	Green1	Fast food1	412	Trad. 2	Green2	Fast food2	125

Results

- Around 415 food items are included in the three original food patterns and used in the modelled healthy food patterns.
- Based on literature CF of these foods is updated, including the contribution from waste, transportation and cooking at home.
- Around 125 foods with the lowest CF from each food group were included in the CF optimized dietary patterns
- Despite variation in the amounts of contribution of foods in each food group and in the composition of foods within each food group, the estimated CFs of the modelled healthy dietary patterns are similar to original Danish patterns.
- CFs of the CF-optimized dietary patterns are similar to each other, and CF of CF-optimized dietary patterns are 17-25% lower than the original patterns. Only a small contribution to CF from transportation and cooking at home.

Table 2. Carbon Footprint (CF) estimated of the Original Danish dietary pattern, Healthy modelled dietary pattern, and CF-optimized healthy dietary pattern. (Estimated CF from production and processing, from waste within the food chain, from transportation and cooking at home.)

CF, g CO2:	Original Danish dietary patterns			Healthy modelled dietary patterns			CF-optimized dietary patterns		
	Traditional	Green	Fast food	Trad.1	Green1	Fast food1	Tradi. 2	Green2	Fast food2
Ps	3903	3966	3935	3730	3830	3688	2949	2774	2670
PsK	4651	4759	4693	4530	4626	4468	3551	3330	3240
PsKTbl	5203	5482	5208	5157	5362	5026	3303	3182	2962
PsKtdk	5094	5336	5086	5014	5210	4888	4138	4004	3752
Cooking	199	201	172	212	196	192	229	219	191
CF total	5293	5537	5258	5226	5406	5080	4368	4223	3943
CF total % of original pattern				1,3	2,4	3,4	17	24	25

Ps Production and processing
PsK Production and processing, and waste within the food chain
Tbl Transportation (estimated import and Danish products)
Tdk Transportation (estimated import as low as possible)