Supplementary Material 2

Supplemental Table S1. Dietary sources of protein among 2332 men from the Kuopio Ischaemic Heart Disease Risk Factor Study

ANIMAL PROTEIN SOURCES								PLANT PROTEIN SOURCES
MEAT				DAIRY		OTHER ANIMAL SOURCES		
Unprocessed red meat	**Processed red meat**	**White meat**[†]	**Offal**	**Non-fermented dairy**	**Fermented dairy**	**Fish**	**Eggs**	
Beef and veal	Sausage	Chicken	Liver	Milk	Cheese	Fish	Whole eggs	Grain products
Pork	Bacon	Turkey	Kidney	Cream	Cottage cheese	Shellfish		Legumes
Mutton and lamb	Store-marinated meats		Heart	Ice cream	Sour milk		Eggs in foods and baked goods	Nuts and seeds
Game (elk, reindeer)	Cold cuts		Sweetbread	Milk pudding	Yoghurt			Potatoes
	Canned processed meats		Blood	Powdered milk	Curdled milk			Vegetables
	Meat aspic				Quark Sour cream Crème fraiche Fromage frais			Mushrooms Fruits and berries

[†]All white meat was unprocessed.

Supplemental Table S2. Average intakes and correlation coefficients[†] between proteins from different dietary sources among 2332 men from the Kuopio Ischaemic Heart Disease Risk Factor Study

	TOTAL PROTEIN	**Animal protein**	Total meat[‡]	Red meat	Unprocessed red meat	Processed red meat	Fish	Dairy	Non-fermented dairy	Milk	Fermented dairy	Cheese	Egg	**Plant protein**	Grains	Non-grain plant sources
Average intake, g/d (SD)	92·9 (14·4)	64·8 (15·4)	24·4 (11·4)	22·0 (10·9)	13·1 (9·0)	9·0 (7·1)	8·1 (9·8)	28·8 (11·1)	17·6 (9·9)	16·9 (9·9)	11·2 (9·5)	5·6 (6·7)	3·6 (2·8)	25·8 (6·0)	20·5 (5·7)	5·3 (2·3)
TOTAL PROTEIN	1	0·91	0·40	0·33	0·32	0·09	0·34	0·44	0·10	0·11	0·37	0·26	0·06	0·03[§]	-0·02[§]	0·12
Animal protein		1	0·47	0·41	0·33	0·19	0·34	0·47	0·17	0·17	0·33	0·22	0·08	-0·34	-0·36	0·001[§]
Total meat[‡]			1	0·91	0·64	0·51	-0·16	-0·20	-0·22	-0·22	-0·002[§]	0·06	-0·02[§]	-0·24	-0·27	0·07
Red meat				1	0·72	0·55	-0·18	-0·18	-0·20	-0·20	-0·01[§]	0·04[§]	-0·01[§]	-0·24	-0·27	0·05
Unprocessed red meat					1	-0·10	-0·14	-0·09	-0·13	-0·13	0·03	0·05	0·03[§]	-0·08	-0·15	0·16
Processed red meat						1	-0·10	-0·14	-0·13	-0·13	-0·03[§]	0·004[§]	-0·05	-0·25	-0·22	-0·10
Fish							1	-0·08	-0·09	-0·08	0·0001[§]	-0·02[§]	-0·05	-0·06	-0·08	0·03[§]
Dairy								1	0·57	0·57	0·47	0·27	-0·07	-0·13	-0·10	-0·08
Non-fermented dairy									1	0·99	-0·37	-0·21	-0·02[§]	-0·16	-0·12	-0·15
Milk										1	-0·37	-0·21	-0·03[§]	-0·15	-0·10	-0·15
Fermented dairy											1	0·60	-0·02[§]	0·04	0·02[§]	0·06
Cheese												1	0·05	0·05	0·04	0·04
Egg													1	-0·06	-0·06	0·01
Plant protein														1	0·91	0·30
Grains															1	-0·08
Non-grain plant sources																1

[†]Correlation assessed by Spearman correlation coefficient.
[‡]Total meat includes red meat, white meat, and offal.
[§]Non-significant. For all other correlations $P<0.05$.

Supplemental Table S3. Baseline dietary intakes according to total, animal and plant protein intake among 2332 men from the Kuopio Ischaemic Heart Disease Risk Factor Study [Mean values with standard deviations (SD)]

	Total protein intake				Animal protein intake				Plant protein intake			
	Quartile 1 (<83·7 g/d)		Quartile 4 (>101·1 g/d)		Quartile 1 (<55·0 g/d)		Quartile 4 (>74·0 g/d)		Quartile 1 (<22·1 g/d)		Quartile 4 (>29·2 g/d)	
Characteristic	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Subjects, n	583		583		583		583		583		583	
Protein, g/d	76·2	7·4	111·4*	9·9	78·0	8·9	110·1*	11.1	92·9	16·4	93·2	14·5
Protein, E%	12·8	1·1	18·6*	1·9	13·1	1·3	18·4*	2·1	15·6	2·6	15·6	2·3
Animal protein, g/d	48·8	8·9	83·2*	12·0	46·8	7·5	84·6*	10·5	71·9	16·4	57·5*	14·9
Animal protein, E%	8·2	1·4	13·9*	2·2	7·9	1·1	14·2*	1·9	12·1	2·7	9·6*	2·4
Plant protein, g/d	25·2	6·3	26·1	6·4	28·8	6·9	23·4*	5·4	18·9	3·0	33·5*	4·6
Plant protein, E%	4·2	1·0	4·3	1·0	4·8	1·1	3·9*	0·9	3·2	0·4	5·6*	0·7
Fat, E%	39·9	6·3	37·3*	5·8	37·9	6·1	38·8*	5·9	41·9	6·0	35·2*	5·1
SFAs, E%	19·5	4·4	16·9*	3·7	18·2	4·3	17·9	3·9	20·2	4·2	16·2*	3·6
PUFAs, E%	4·2	1·4	4·7*	1·3	4·2	1·4	4·7*	1·4	4·4	1·5	4·4	1·3
MUFAs, E%	11·6	2·3	11·6	2·2	11·1	2·2	12·0*	2·2	12·6	2·3	10·6*	1·9
trans Fatty acids, E%	1·1	0·4	1·0*	0·4	1·1	0·4	1·0*	0·4	1·1	0·3	1·0	0·4
Cholesterol, mg/d	396	153	449*	167	370	152	469*	168	473	159	369*	143
Carbohydrates, E%	43·9	6·9	41·5*	6·3	46·4	6·4	39·8*	5·8	37·7	5·6	48·0*	5·1
High-quality carbohydrates[†], E%	13·1	5·1	14·3*	5·0	15·3	5·8	12·6*	4·4	9·7	2·9	18·2*	5·0
Glycaemic index	65	6	64*	5	66	6	63*	5	62	6	66*	5
Fibre, g/d	25·3	8·9	26·8*	10·0	28·5	9·8	24·0*	8·5	19·4	6·2	33·2*	9·5
Fruits, berries, and vegetables[‡], g/d	228	150	277*	157	252	155	256	153	202	134	297*	158
Potatoes, g/d	164	96	166	90	165	99	162	90	154	88	172*	96
Whole grain products, g/d	160	77	173*	84	185	91	150*	68	116	51	223*	88
Unprocessed red meat, g/d	58	40	98*	60	57	38	99*	60	82	57	69*	48
Processed red meat, g/d	70	62	77*	68	59	55	85*	71	95	72	52*	45
Fish, g/d	27	34	76*	75	27	35	76*	75	50	56	41*	52
Non fermented dairy, g/d	490	309	569*	367	458	288	598*	380	613	378	487*	304
Fermented dairy g/d	117	146	274*	275	122	147	262*	273	200	246	184	207
Coffee, mL/d	579	305	559	310	585	301	565	309	595	301	555*	301
Magnesium, mg/d	381	62	453*	70	406	73	434*	67	379	61	461*	69

E%, percentage of energy intake; MUFAs, monounsaturated fatty acids; PUFAs, polyunsaturated fatty acids; SFAs, saturated fatty acids.

[*] *P* for trend across quartiles <0.05; *P* for trend was assessed with linear regression.
[†] High-quality carbohydrates were defined as a sum of carbohydrates from whole grain products, legumes, nuts, seeds, mushrooms, fruits, berries, and vegetables (excluding potatoes).
[‡] Excluding potatoes.

Supplemental Table S4. Body mass index and markers of glucose homeostasis and inflammation at baseline according to protein intake at the study baseline among men[†] from the Kuopio Ischaemic Heart Disease Risk Factor Study. [Means and 95% confidence intervals (CI) obtained by using analysis of covariance]

	Body mass index, kg/m^2	95% CI	Fasting plasma glucose[‡], mmol/L	95% CI	Fasting serum insulin[‡], mU/L	95% CI	Serum high-sensitivity C-reactive protein[‡], mg/L	95% CI
TOTAL PROTEIN								
Quartile 1	26·3	26·0, 26·6	4·54	4·50, 4·57	10·89	10·38, 11·40	2·38	2·00, 2·77
Quartile 4	27·1	26·8, 27·4	4·53	4·49, 4·57	11·11	10·59, 11·64	2·26	1·87, 2·65
P for trend	0·001		0·65		0·73		0·82	
Animal protein (g/d)								
Quartile 1	26·2	25·9, 26·5	4·54	4·51, 4·58	10·45	9·93, 10·96	2·26	1·88, 2·65
Quartile 4	27·4	27·1, 27·7	4·53	4·49, 4·57	11·03	10·51, 11·55	2·38	1·99, 2·77
P for trend	<0·001		0·55		0·31		0·94	
Protein from total meat[§] (g/d)								
Quartile 1	26·7	26·5, 27·0	4·52	4·49, 4·56	10·63	10·15, 11·10	2·22	1·87, 2·57
Quartile 4	26·4	26·1, 26·7	4·52	4·48, 4·55	11·32	10·83, 11·80	2·49	2·13, 2·85
P for trend	0·38		0·73		0·06		0·29	
Protein from red meat (g/d)								
Quartile 1	26·8	26·5, 27·1	4·52	4·49, 4·56	10·58	10·10, 11·05	2·54	2·19, 2·89
Quartile 4	26·5	26·2, 26·8	4·51	4·47, 4·54	11·34	10·86, 11·82	2·33	1·98, 2·69
P for trend	0·25		0·44		0·04		0·49	
Protein from processed red meat (g/d)								
Quartile 1	26·5	26·3, 26·8	4·51	4·47, 4·54	10·46	10·00, 10·92	2·44	2·09, 2·78
Quartile 4	27·0	26·7, 27·2	4·52	4·49, 4·56	10·81	10·32, 11·29	2·37	2·01, 2·73
P for trend	0·09		0·67		0·28		0·94	
Protein from unprocessed red meat (g/d)								
Quartile 1	26·8	26·5, 27·0	4·53	4·50, 4·56	10·66	10·23, 11·09	2·36	2·04, 2·69
Quartile 4	26·5	26·2, 26·8	4·52	4·49, 4·55	11·16	10·72, 11·60	2·29	1·96, 2·61
P for trend	0·15		0·95		0·12		0·84	
Protein from fish (g/d)								
Quartile 1	26·1	25·8, 26·3	4·51	4·48, 4·54	10·82	10·37, 11·26	2·29	1·95, 2·62
Quartile 4	27·1	26·8, 27·3	4·54	4·50, 4·57	10·16	9·72, 10·61	2·17	1·84, 2·51
P for trend	<0·001		0·22		0·004		0·51	

Protein from egg (g/d)								
Quartile 1	26·6	26·3, 27·0	4·56	4·52, 4·60	11·13	10·62, 11·63	2·45	2·07, 2·83
Quartile 4	26·6	26·2, 26·9	4·50	4·46, 4·54	10·88	10·32, 11·45	2·10	1·68, 2·52
P for trend	0·75		0·10		0·82		0·19	
Protein from dairy (g/d)								
Quartile 1	26·7	26·4, 27·0	4·55	4·51, 4·58	10·79	10·28, 11·29	2·41	2·04, 2·79
Quartile 4	26·6	26·3, 27·0	4·51	4·47, 4·55	10·88	10·37, 11·39	2·49	2·10, 2·87
P for trend	0·92		0·21		0·97		0·97	
Protein from non-fermented dairy (g/d)								
Quartile 1	26·6	26·3, 26·9	4·54	4·51, 4·57	10·52	10·06, 10·98	2·17	1·83, 2·52
Quartile 4	26·5	26·2, 26·8	4·52	4·48, 4·55	11·26	10·80, 11·73	2·34	1·99, 2·69
P for trend	0·78		0·28		0·02		0·68	
Protein from milk (g/d)								
Quartile 1	26·6	26·3, 26·8	4·54	4·51, 4·57	10·58	10·12, 11·04	2·17	1·83, 2·52
Quartile 4	26·5	26·2, 26·8	4·52	4·48, 4·55	11·20	10·73, 11·66	2·43	2·09, 2·78
P for trend	0·96		0·39		0·04		0·53	
Protein from fermented dairy (g/d)								
Quartile 1	26·7	26·4, 27·0	4·52	4·49, 4·56	11·09	10·65, 11·54	2·32	1·99, 2·65
Quartile 4	26·7	26·4, 26·9	4·53	4·50, 4·56	10·47	10·03, 10·92	2·24	1·91, 2·58
P for trend	0·98		0·89		0·09		0·98	
Protein from cheese (g/d)								
Quartile 1	26·6	26·3, 26·9	4·56	4·53, 4·59	11·10	10·61, 11·50	2·32	1·99, 2·66
Quartile 4	26·5	26·2, 26·8	4·51	4·48, 4·54	10·40	9·95, 10·84	2·41	2·09, 2·74
P for trend	0·17		0·26		0·03		0·53	
Protein from other fermented dairy‖ (g/d)								
Quartile 1	26·8	26·5, 27·0	4·52	4·49, 4·56	10·87	10·41, 11·33	2·23	1·88, 2·57
Quartile 4	26·7	26·4, 27·0	4·51	4·47, 4·54	10·74	10·28, 11·20	2·29	1·94, 2·64
P for trend	0·66		0·52		0·82		0·97	
Plant protein (g/d)								
Quartile 1	26·4	26·1, 26·8	4·58	4·54, 4·62	10·95	10·40, 11·50	2·46	2·04, 2·87
Quartile 4	26·5	26·1, 26·8	4·49	4·45, 4·53	10·56	10·00, 11·12	2·23	1·81, 2·65
P for trend	0·92		0·01		0·21		0·52	
Protein from grain products (g/d)								
Quartile 1	26·4	26·1, 26·7	4·57	4·53, 4·61	11·22	10·69, 11·74	2·16	1·77, 2·56
Quartile 4	26·7	26·4, 27·1	4·46	4·42, 4·50	10·42	9·88, 10·95	2·29	1·89, 2·69
P for trend	0·19		0·001		0·04		0·90	
Protein from non-grain plant sources (g/d)								

Quartile 1	26·9	26·6, 27·1	4·49	4·46, 4·53	10·71	10·27, 11·16	2·17	1·83, 2·50
Quartile 4	26·5	26·3, 26·8	4·52	4·49, 4·55	10·82	10·37, 11·26	2·42	2·09, 2·75
P for trend	0·20		0·29		0·54		0·30	

Models adjusted for age, examination year, energy intake, marital status, income, use of hypertension medication, family history of diabetes, pack-years of smoking, education, leisure-time physical activity, serum ferritin, alcohol intake, glycaemic index, and intakes of fibre, magnesium, coffee, cholesterol, and saturated, monounsaturated, polyunsaturated and trans fatty acids.

[†]Data on body mass index was available for 2324 men, and on plasma glucose, serum insulin, and serum high-sensitivity C-reactive protein concentrations were available for 2312 men at baseline.

[‡]Additionally adjusted for BMI.

[§]Total meat includes red meat, white meat, and offal.

[‖]Other fermented dairy includes sour milk, yoghurt, curdled milk, quark, sour cream and crème fraiche.

Supplemental Table S5. Body mass index adjusted change in risk of type 2 diabetes (T2D) with isocaloric replacement of 1 percent of energy from different animal proteins with energy from plant protein [Hazard ratios (HR) and 95% confidence intervals (CI) derived from Cox proportional hazards regression models]

Replaced protein	HR	95 % CI
Animal protein	0·81	0·67, 0·98
Total meat protein[†]	0·83	0·68, 1·01
Red meat	0·82	0·67, 1·00
Processed red meat protein	0·80	0·64, 0·99
Unprocessed red meat protein	0·83	0·68, 1·01
Fish protein	0·85	0·69, 1·04
Dairy protein	0·79	0·65, 0·97
Non-fermented dairy protein	0·79	0·64, 0·97
Fermented dairy protein	0·79	0·65, 0·97
Egg protein	1·11	0·68, 1·82

Adjusted for age, examination year, energy intake, marital status, income, use of hypertension medication, family history of diabetes, pack-years of smoking, education, leisure-time physical activity, serum ferritin, alcohol intake, glycaemic index, and intakes of fibre, magnesium, coffee, cholesterol, and saturated, monounsaturated, polyunsaturated and trans fatty acids and body mass index.

[†]Total meat includes red meat, white meat, and offal.

Supplemental Table S6. Type 2 diabetes incidence according to the major protein sources among 2332 men from the Kuopio Ischaemic Heart Disease Risk Factor Study [Hazard ratios (HR) and 95% confidence intervals (CI) derived from Cox proportional hazards regression models]

	Intake quartile								Per 100 g increase	
	1 (n=583)	2 (n=583)		3 (n=583)		4 (n=583)				
	HR	HR	95% CI	HR	95% CI	HR	95% CI	*P*-trend	HR	95% CI
Total meat[†]										
Median intake (g/d)	76	124		170		249				
Number of events, incidence rate/1000 PY	94, 8·52	109, 9·63		100, 8·87		129, 11·43				
Model 1	1	1·18	0·89, 1·56	1·08	0·81, 1·44	1·47	1·10, 1·96	0·01	1·14	1·00, 1·29
Model 2	1	1·20	0·90, 1·58	1·09	0·81, 1·45	1·47	1·10, 1·96	0·02	1·12	0·99, 1·28
Model 3	1	1·20	0·91, 1·60	1·08	0·81, 1·44	1·45	1·09, 1·94	0·02	1·12	0·99, 1·27
Model 4	1	1·21	0·91, 1·61	1·10	0·81, 1·50	1·50	1·03, 2·18	0·05	1·12	0·92, 1·35
Model 5	1	1·16	0·87, 1·55	1·11	0·81, 1·52	1·44	0·98, 2·10	0·08	1·10	0·91, 1·32
Red meat										
Median intake (g/d)	65	112		154		229				
Number of events, incidence rate/1000 PY	99, 8·99	110, 9·77		101, 8·96		122, 10·72				
Model 1	1	1·11	0·85, 1·46	1·04	0·78, 1·38	1·27	0·96, 1·70	0·13	1·10	0·96, 1·26
Model 2	1	1·13	0·86, 1·48	1·03	0·78, 1·38	1·26	0·94, 1·69	0·16	1·09	0·95, 1·24
Model 3	1	1·12	0·85, 1·47	1·02	0·77, 1·36	1·23	0·92, 1·65	0·21	1·07	0·94, 1·23
Model 4	1	1·08	0·82, 1·43	1·00	0·74, 1·35	1·13	0·78, 1·63	0·62	1·00	0·82, 1·21
Model 5	1	1·14	0·86, 1·52	1·04	0·77, 1·42	1·13	0·78, 1·64	0·66	0·99	0·82, 1·20
Processed red meat										
Median intake (g/d)	8	39		75		138				
Number of events, incidence rate/1000 PY	95, 8·81	102, 8·78		111, 9·83		124, 11·04				
Model 1	1	0·99	0·75, 1·31	1·16	0·88, 1·53	1·35	1·02, 1·79	0·02	1·19	1·02, 1·39
Model 2	1	0·98	0·74, 1·29	1·15	0·87, 1·53	1·28	0·96, 1·70	0·04	1·16	0·99, 1·35
Model 3	1	0·97	0·73, 1·29	1·14	0·86, 1·51	1·25	0·94, 1·66	0·06	1·14	0·97, 1·33
Model 4	1	0·95	0·71, 1·26	1·10	0·83, 1·48	1·21	0·86, 1·71	0·18	1·13	0·90, 1·41
Model 5	1	0·96	0·72, 1·27	1·08	0·80, 1·44	1·14	0·80, 1·62	0·34	1·11	0·89, 1·39
Unprocessed red meat										
Median intake (g/d)	21	53		80		131				
Number of events, incidence rate/1000 PY	109, 9·94	113, 9·95		105, 9·42		105, 9·18				
Model 1	1	0·99	0·76, 1·29	0·94	0·71, 1·23	0·91	0·69, 1·20	0·44	0·94	0·77, 1·14
Model 2	1	0·92	0·71, 1·20	0·97	0·74, 1·27	0·92	0·70, 1·22	0·64	0·96	0·79, 1·17
Model 3	1	0·93	0·71, 1·21	0·97	0·74, 1·28	0·93	0·70, 1·22	0·66	0·96	0·79, 1·17
Model 4	1	0·92	0·70, 1·20	0·95	0·72, 1·25	0·89	0·67, 1·18	0·48	0·91	0·74, 1·11

Model 5	1	1·00	0·77, 1·31	0·97	0·74, 1·28	0·95	0·72, 1·27	0·70	0·91	0·75, 1·11
Dairy products										
Median intake (g/d)	296	583		803		1121				
Number of events, incidence rate/1000 PY	106, 9·36	104, 9·21		98, 8·69		124, 11·24				
Model 1	1	1·02	0·78, 1·35	1·01	0·76, 1·34	1·44	1·07, 1·94	0·02	1·05	1·02, 1·08
Model 2	1	0·93	0·70, 1·22	0·92	0·69, 1·22	1·33	0·98, 1·80	0·08	1·04	1·01, 1·08
Model 3	1	0·92	0·70, 1·21	0·91	0·68, 1·22	1·31	0·96, 1·77	0·10	1·04	1·01, 1·08
Model 4	1	0·90	0·67, 1·20	0·92	0·66, 1·28	1·23	0·81, 1·87	0·37	1·05	1·00, 1·11
Model 5	1	1·00	0·74, 1·34	0·98	0·70, 1·36	1·28	0·84, 1·94	0·31	1·06	1·00, 1·11
Non-fermented dairy products										
Median intake (g/d)	163	377		587		914				
Number of events, incidence rate/1000 PY	116, 10·23	93, 8·22		103, 8·98		120, 11·11				
Model 1	1	0·84	0·64, 1·10	0·93	0·71, 1·22	1·27	0·95, 1·69	0·06	1·03	1·00, 1·06
Model 2	1	0·79	0·60, 1·04	0·86	0·65, 1·13	1·18	0·89, 1·58	0·15	1·02	0·99, 1·05
Model 3	1	0·79	0·60, 1·04	0·85	0·65, 1·12	1·15	0·86, 1·54	0·21	1·02	0·98, 1·05
Model 4	1	0·78	0·59, 1·03	0·86	0·64, 1·14	1·05	0·75, 1·45	0·57	1·00	0·96, 1·04
Model 5	1	0·85	0·64, 1·13	0·92	0·69, 1·22	1·15	0·83, 1·60	0·31	1·01	0·97, 1·05
Milk										
Median intake (g/d)	147	355		567		880				
Number of events, incidence rate/1000 PY	116, 10·20	95, 8·39		104, 9·12		117, 10·82				
Model 1	1	0·85	0·65, 1·12	0·95	0·72, 1·24	1·22	0·92, 1·61	0·11	1·03	0·99, 1·06
Model 2	1	0·79	0·60, 1·04	0·88	0·67, 1·15	1·13	0·85, 1·51	0·24	1·02	0·99, 1·05
Model 3	1	0·78	0·59, 1·03	0·86	0·66, 1·13	1·10	0·83, 1·47	0·33	1·02	0·98, 1·05
Model 4	1	0·77	0·58, 1·02	0·85	0·64, 1·14	0·99	0·71, 1·36	0·82	1·00	0·96, 1·04
Model 5	1	0·81	0·61, 1·08	0·92	0·69, 1·23	1·04	0·75, 1·45	0·57	1·01	0·97, 1·05
Fermented dairy products										
Median intake (g/d)	4	55		182		438				
Number of events, incidence rate/1000 PY	96, 8·89	108, 9·39		110, 9·56		118, 10·61				
Model 1	1	1·02	0·77, 1·34	1·04	0·79, 1·36	1·19	0·91, 1·56	0·16	1·04	1·00, 1·09
Model 2	1	1·10	0·83, 1·46	1·15	0·87, 1·52	1·26	0·95, 1·65	0·12	1·04	1·00, 1·09
Model 3	1	1·11	0·84, 1·47	1·16	0·88, 1·53	1·28	0·97, 1·68	0·09	1·04	1·00, 1·09
Model 4	1	1·08	0·81, 1·43	1·10	0·84, 1·46	1·28	0·96, 1·71	0·10	1·05	1·00, 1·10
Model 5	1	1·15	0·87, 1·53	1·14	0·86, 1·51	1·28	0·95, 1·71	0·15	1·04	0·99, 1·09
Cheese										
Median intake (g/d)	0	8		22		48				
Number of events, incidence rate/1000 PY	120, 10·20	99, 9·58		111, 9·73		102, 8·94				
Model 1	1	0·90	0·69, 1·17	0·90	0·69, 1·16	0·82	0·62, 1·07	0·17	0·71	0·47, 1·07

Model 2	1	0·91	0·69, 1·19	0·96	0·74, 1·26	0·89	0·67, 1·18	0·56	0·83	0·55, 1·27
Model 3	1	0·92	0·70, 1·21	0·98	0·75, 1·28	0·92	0·69, 1·22	0·68	0·86	0·57, 1·31
Model 4	1	0·94	0·71, 1·23	0·99	0·76, 1·30	0·89	0·67, 1·19	0·52	0·78	0·51, 1·18
Model 5	1	1·03	0·78, 1·35	1·07	0·82, 1·40	1·02	0·76, 1·36	0·91	0·88	0·59, 1·32
Other fermented dairy‡										
Median intake (g/d)	0	50		185		449				
Number of events, incidence rate/1000 PY§	132/8·98	96/9·39		97/9·61		107/10.81				
Model 1	1	1·01	0·77, 1·31	1·04	0·80, 1·36	1·22	0·94, 1·58	0·11	1·02	1·00, 1·05
Model 2	1	1·08	0·83, 1·41	1·14	0·87, 1·49	1·24	0·96, 1·60	0·11	1·02	1·00, 1·04
Model 3	1	1·09	0·83, 1·42	1·15	0·88, 1·50	1·26	0.97, 1·63	0·09	1·02	1·00, 1·04
Model 4	1	1·03	0·79, 1·35	1·13	0·86, 1·47	1·27	0·96, 1·68	0·07	1·03	1·00, 1·05
Model 5	1	1·08	0·82, 1·41	1·08	0·82, 1·41	1·25	0·94, 1·66	0·14	1·02	1·00, 1·04
Major plant protein sources‖										
Median intake (g/d)	164	221		276		368				
Number of events, incidence rate/1000 PY	121, 11·28	117, 10·58		96, 8·30		98, 8·48				
Model 1	1	0·90	0·69, 1·17	0·66	0·49, 0·87	0·64	0·46, 0·88	0·002	0·82	0·71, 0·94
Model 2	1	0·91	0·70, 1·18	0·68	0·51, 0·91	0·66	0·47, 0·92	0·01	0·83	0·71, 0·95
Model 3	1	0·92	0·71, 1·20	0·69	0·51, 0·92	0·67	0·48, 0·94	0·01	0·83	0·72, 0·96
Model 4	1	1·01	0·77, 1·34	0·81	0·58, 1·12	0·90	0·58, 1·40	0·48	0·98	0·78, 1·24
Model 5	1	1·04	0·79, 1·37	0·84	0·60, 1·17	0·98	0·62, 1·55	0·71	1·00	0·79, 1·27

PY, person-years.

†Total meat includes red meat, white meat and, offal.

‡Other fermented dairy includes sour milk, yoghurt, curdled milk, quark, sour cream and crème fraiche.

§Number of subjects in the quartiles one to four: 780 (zero intake), 517, 516, and 519, respectively.

‖Major plant protein sources include grain products, legumes, nuts, and seeds.

Model 1 adjusted for age, examination year, and energy intake.

Model 2 adjusted for Model 1 and marital status, income, use of hypertension medication, family history of diabetes, pack-years of smoking, education, leisure-time physical activity, and alcohol intake.

Model 3 adjusted for Model 2 and intakes of coffee, and fruits, berries, and vegetables.

Model 4 adjusted for Model 3 and serum ferritin, glycaemic index, and intakes of fibre, magnesium, cholesterol, and saturated, monounsaturated, polyunsaturated, and trans fatty acids.

Model 5 adjusted for Model 4 and body mass index and fasting plasma glucose, and fasting serum insulin.

Supplemental Table S7. Body mass index adjusted change in risk of type 2 diabetes (T2D) with isocaloric replacement of a 50-gram daily portion of foods providing animal protein with foods providing plant protein. [Hazard ratios (HR) and 95% confidence intervals (CI) derived from Cox proportional hazards regression models]

Replaced protein source	HR	95 % CI
Total meat[†]	0·92	0·85, 1·01
Total red meat	0·93	0·86, 1·02
Processed red meat	0·92	0·83, 1·01
Unprocessed red meat	0·96	0·86, 1·08
Fish	0·96	0·86, 1·08
Dairy	0·94	0·87, 1·01
Non-fermented dairy	0·94	0·87, 1·01
Fermented dairy	0·93	0·86, 1·01
Eggs	1·27	1·01, 1·60

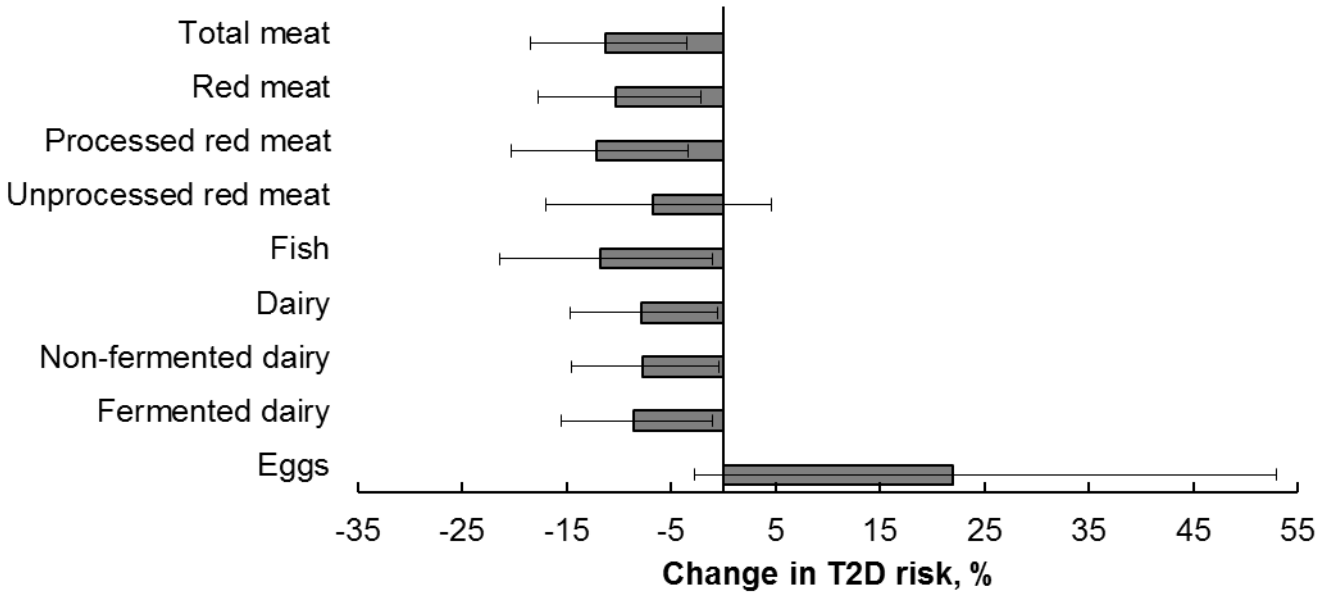
Adjusted for age, examination year, energy intake, marital status, income, use of hypertension medication, family history of diabetes, pack-years of smoking, education, leisure-time physical activity, intakes of alcohol, coffee, and fruits, berries and vegetables and body mass index. Foods providing plant protein include grain products, legumes, nuts, and seeds.

[†]Total meat includes red meat, white meat, and offal.

Supplemental Table S8. Body mass index adjusted change in risk of type 2 diabetes (T2D) with isocaloric replacement of a 50-gram daily portion of animal protein sources with egg. [Hazard ratios (HR) and 95% confidence intervals (CI) derived from Cox proportional hazards regression models]

Replaced protein source	HR	95 % CI
Total meat[†]	0·73	0·58, 0·91
Total red meat	0·73	0·58, 0·92
Processed red meat	0·72	0·58, 0·91
Unprocessed red meat	0·76	0·59, 0·96
Fish	0·76	0·60, 0·96
Dairy	0·73	0·59, 0·92
Non-fermented dairy	0·74	0·59, 0·92
Fermented dairy	0·73	0·59, 0·91

Adjusted for age, examination year, energy intake, marital status, income, use of hypertension medication, family history of diabetes, pack-years of smoking, education, leisure-time physical activity, intakes of alcohol, coffee, and fruits, berries and vegetables, and body mass index.
[†]Total meat includes red meat, white meat, and offal.



Supplemental Fig. S2. Change in risk of type 2 diabetes (T2D) with isocaloric replacement of a 50-gram daily portion of foods providing animal protein with foods providing plant protein. Values are hazard ratios and 95% confidence intervals derived from Cox proportional hazards regression models. Adjusted for age, examination year, energy intake, marital status, income, use of hypertension medication, family history of diabetes, pack-years of smoking, education, leisure-time physical activity, alcohol intake, coffee intake and intake of fruits, berries and vegetables. Foods providing plant protein include grain products, legumes, nuts, and seeds. Total meat includes red meat, white meat, and offal.