Betydning af kostens indhold af protein for vægtregulering

DSKE Efteruddannelsesdag
Tirsdag 11. oktober 2011, Axelborg

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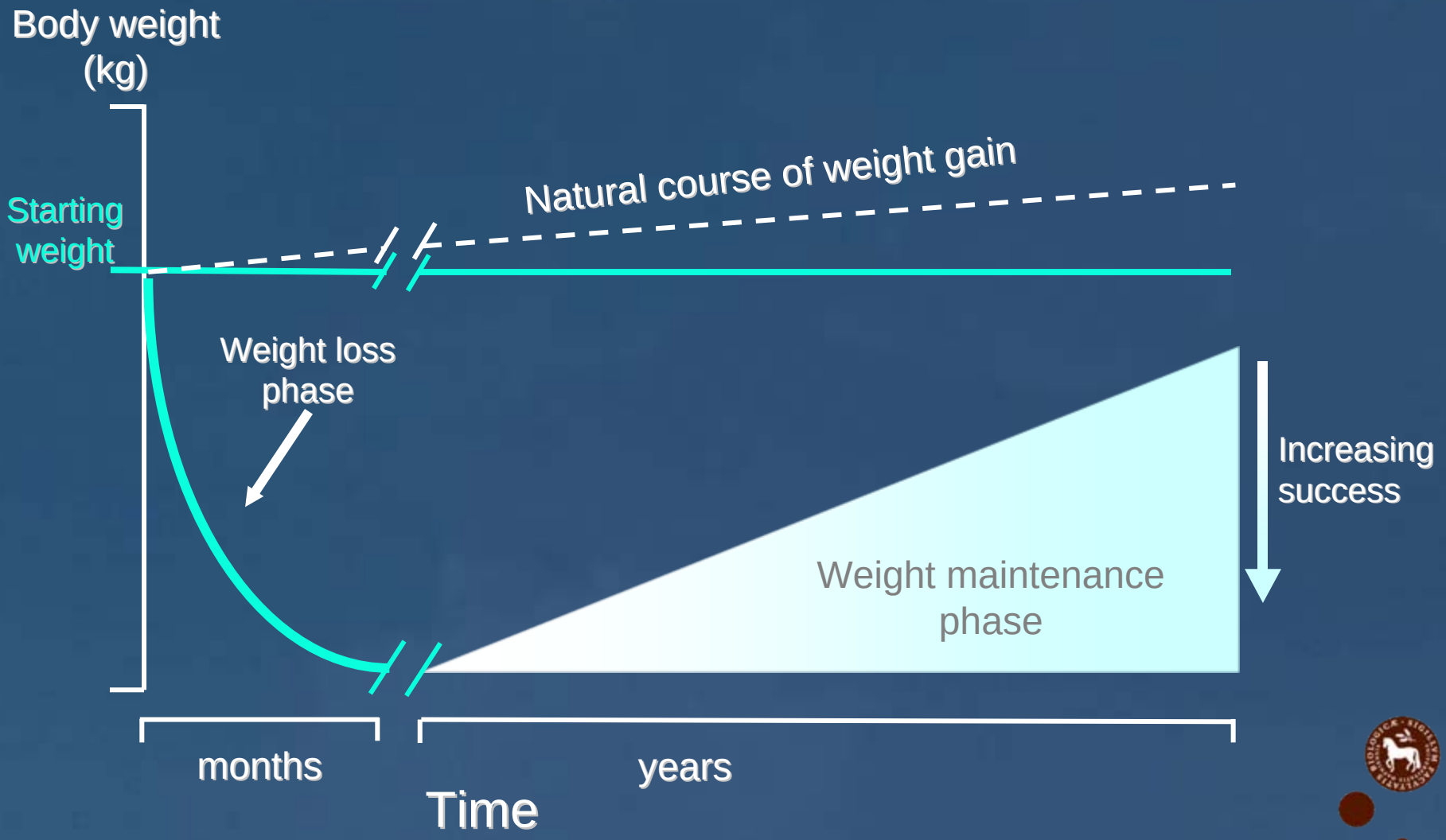
Vi har formodentlig spist masser af protein tidligere !

	MODERN	PALEO
Fat, E%	37 E% (97g)	21 E%
Protein (E%)	15 E% (83g)	34 E%
Carbohydrate (E%)	57 E% (256g)	45 E%

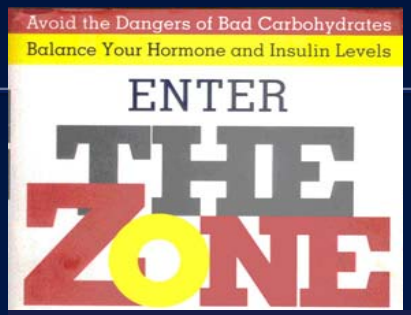
45-65% of dietary intake of animal origin, now 30-35%

Eaton NEJM 1985 og Cordain AJCN 2000

MEN KAN "MERE PROTEIN" BRUGES SOM ET REDSKAB TIL AT REGULERE KROPSVÆGTEN?



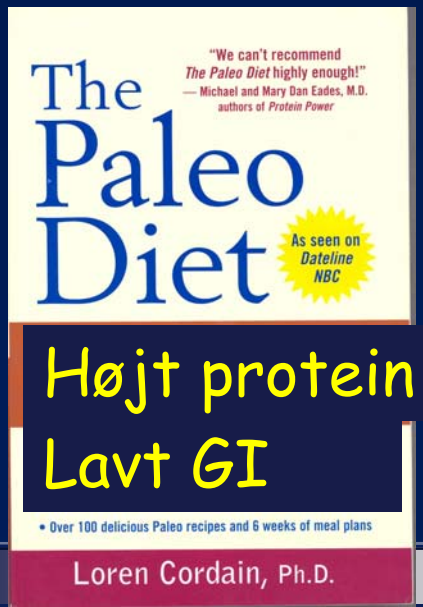
Flere af de meget kendte (og anvendte) slankebøger (diets) anvender højt protein som et centralt element



Højt protein
Lavt GI

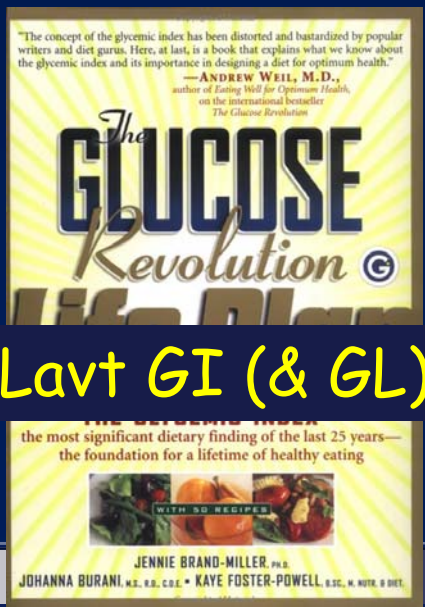
Højt protein
Højt fedt
Lav kulhydrat

Højt protein
Lavt GI



Højt protein
Lavt GI

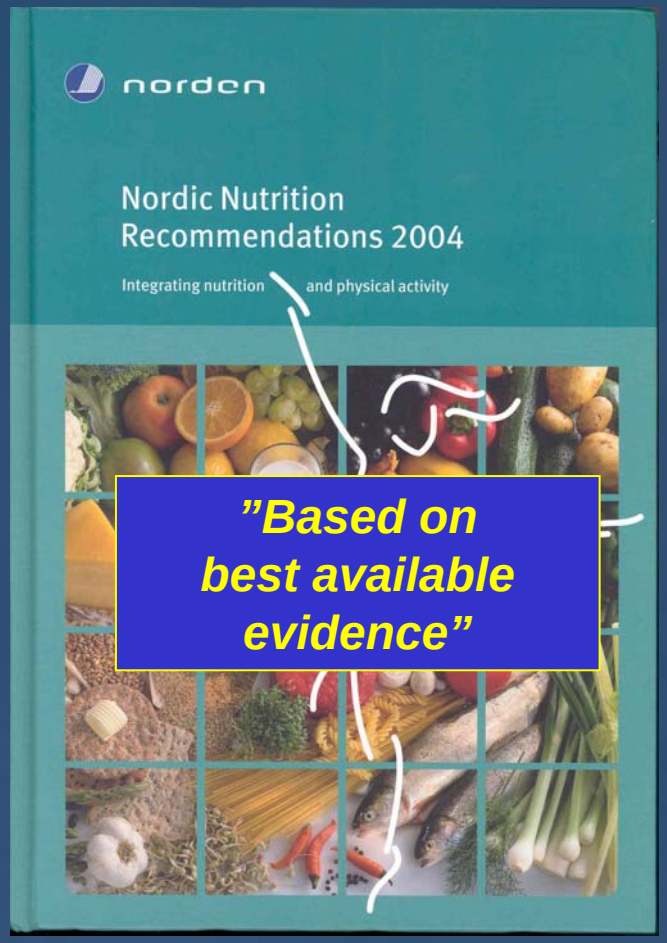
Højt Protein



Lavt GI (& GL)

HVAD SIGER GÆLDENDE ANBEFALINGER?

Total Fat (E%)	25-35
Total Carbohydrate (E%)	55-60
Total Protein (E%)	10-20
Total Saturated Fat (E%)	<10
Total Monounsaturated Fat (E%)	5-15
Total Polyunsaturated Fat (E%)	5-10
Added Sugar (E%)	<10



NNA gælder primært for grupper af raske mennesker. Ved sygdom og for grupper med specielle behov må kostens sammensætning tilpasses efter de krav, der foreligger.

NNA forudsættes at blive anvendt som

- retningslinier ved planlægning af kost til grupper
- grundlag for undervisning og oplysning om kost og ernæring
- grundlag for fødevare- og ernæringspolitik
- reference ved vurdering af kostundersøgelser

Protein. *Protein skal udgøre 10-20% af energiindtaget (E%). Målsætningen på befolkningsniveau er 15 E% fra protein. Denne værdi skal anvendes ved kostplanlægning.*

Energiandelen for protein kan være lavere end 10 E%, men af hensyn til kostvanerne i Norden og kravet om variation i kosten anbefales 15 E% ved kostplanlægning. Et proteinindtag af denne størrelse vil rigeligt kunne dække behovet for essentielle aminosyrer.
Ved meget lave energiindtag hos voksne (<6,5 MJ/dag) kan det være nødvendigt at planlægge efter et proteinindhold, der er højere end 15 E%.

http://www.dfvf.dk/Files/Filer/Ern%C3%A6ring/Nringsstoffer/NNA_2004.pdf

Officielle 8 kostråd

Spis frugt og grønt  6 om dagen

Spis fisk og fiskepålæg  flere gange om ugen

Spis kartofler, ris eller pasta og groft brød  hver dag

Spar på sukker  især fra sodavand, slik og kager

Spar på fedtet  især fra mejeriprodukter og kød

Spis varieret og bevar normalvægten 

Sluk tørsten i vand 

Vær fysisk aktiv  mindst 30 minutter om dagen

HVAD ER HØJT PROTEIN EGENTLIG?

	Average Danish diet	Low fat (Ornish)	Walter Willett	Atkins maintenance	Nordic NR 2004
Fat E%	~30-35	<25	40	52	25-35
Carbohydrate E%	~50-55	60	45	19	55-60
Protein E%	**~15**	**15**	**15**	**25**	**10-20**
SFA E%	~15	<10	<10	20	< 10
MUFA E%	~11	~10	>20	19	10-15
PUFA E%	~5	~5	>5	9	5-10
Added sugar E%	~10	<10	<10	NA	< 10

HVORDAN VIRKER HØJT PROTEIN PÅ VÆGTEN ?

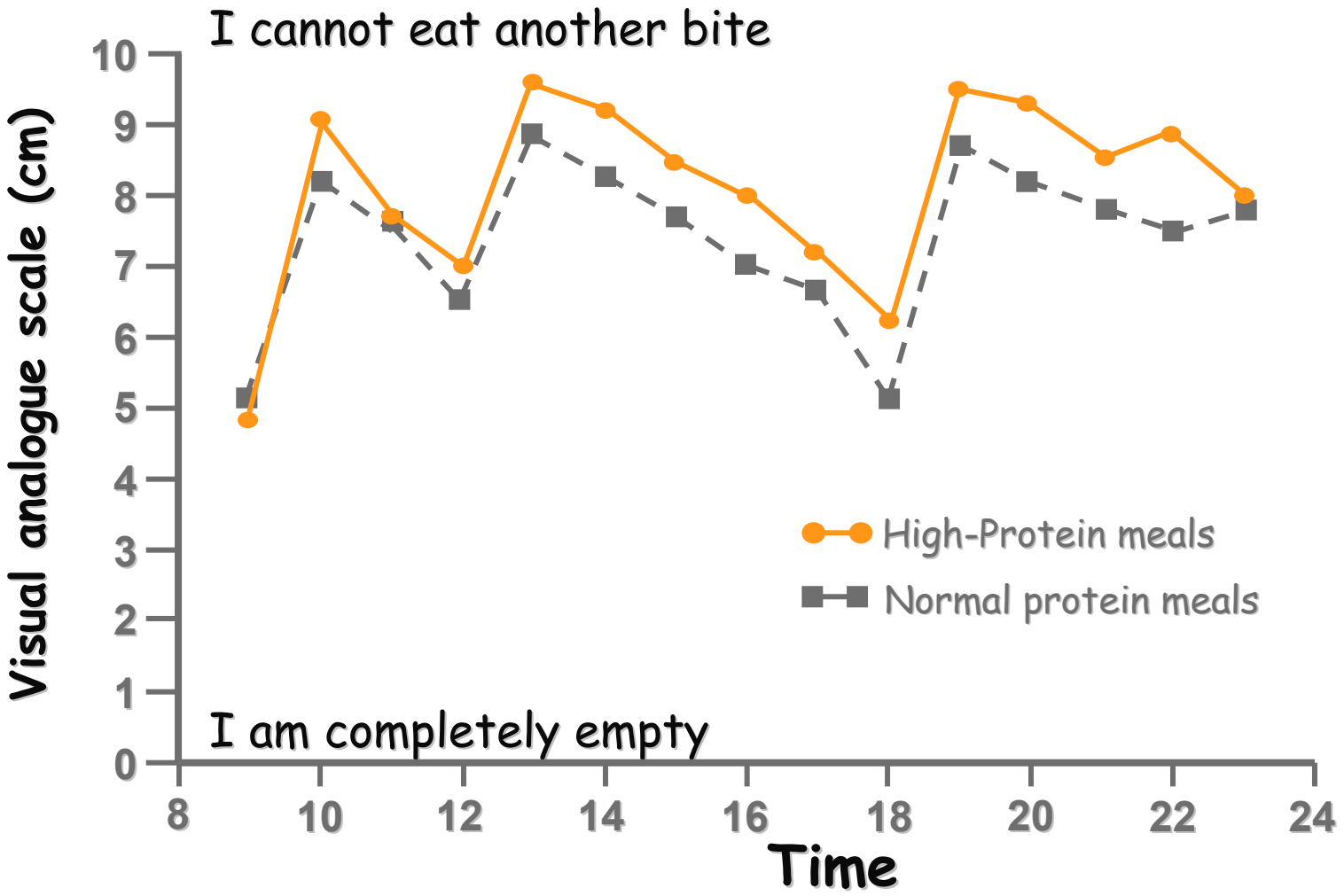
Øget mæthed (og mindre sult) ?

Øget forbrænding ?

Nedsat energi-absorption ?

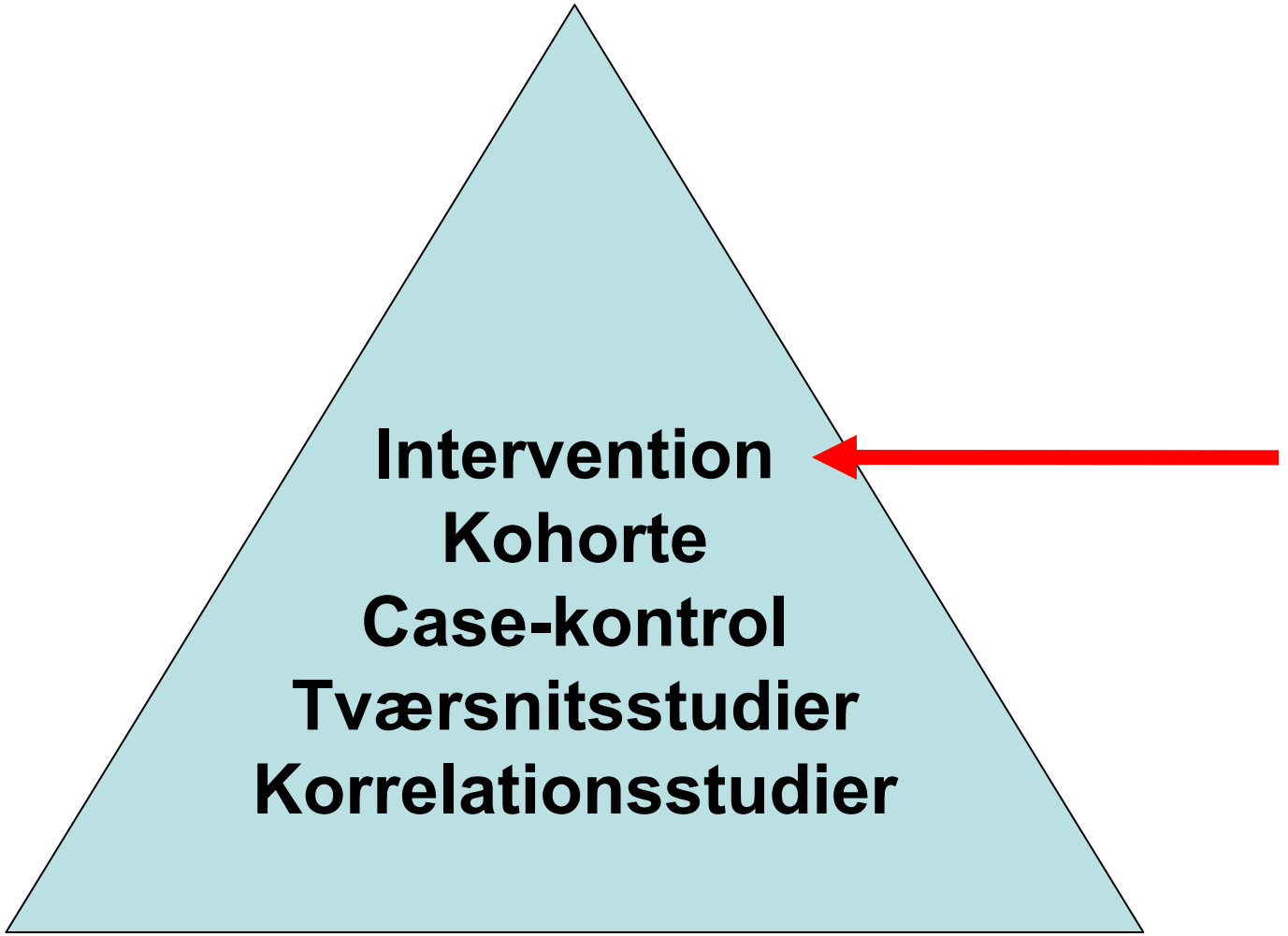
Andet ?

Effect on satiety – how satisfied do you feel? (et typisk resultat)



Thermogenic effect of protein

Men virker det i praksis, og hvad viser ”lodtrækningsstudier” på mennesker?



Importance of protein

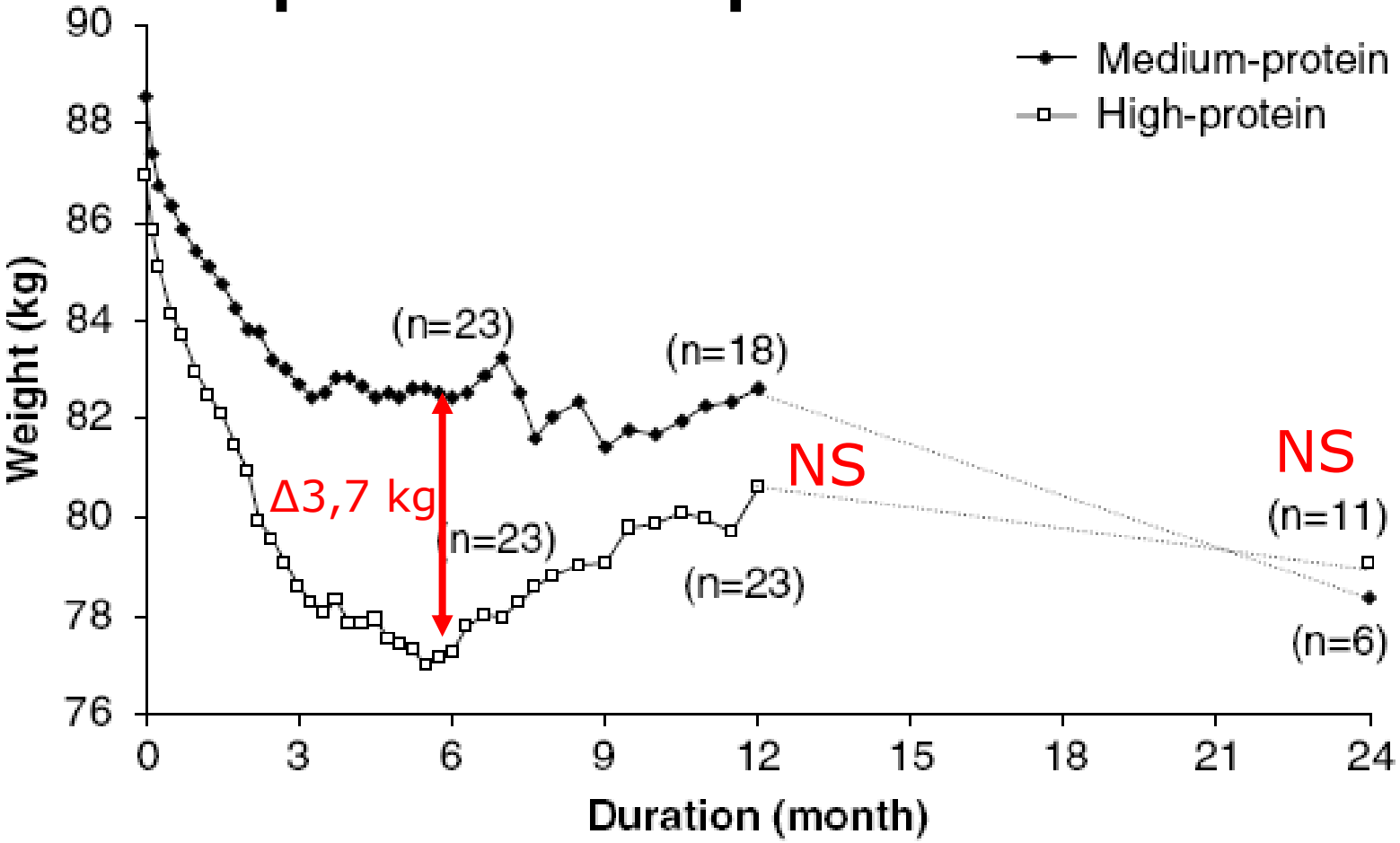


Figure 2 Changes in body weight during strictly controlled dietary intervention (months 0–6), dietary counselling (months 6–12) and at 24 months follow up. Values are means. *n* = number of subjects at given time (missing values are interpolated).

Due A et al. Int J Obes 2004;28:1283-90.

	Duration	Subjects(n)	Diets	BW change HP vs. others
Ad libitum				
Skov et al. (1999)[4]	6 months	65 OW+OB	HP vs. HC	Decrease
Lejeune et al. (2005)[49]	6 months	113 OW	HP vs. control	Decrease
Weigle et al. (2005)[75]	16 weeks	19 NW+OW	WM 2 weeks + isocaloric 2 weeks + *ad libitum* 12 weeks	Decrease
Energy restricted				
Dansinger et al. (2005)[8]	12 month	160 OW+OB	Atkins vs. Zone vs. Weight Watchers vs. Ornish	NS
McAuley et al. (2005)[21]	24 weeks	96 OW	Zone vs. Atkins vs. HC	Decrease comp. to HC
Farnsworth et al. (2003)[71]	68 weeks	57 OW	HP vs. LP	NS
Truby et al. (2006)[76]	6 months	293 OW+OB	Atkins vs. Slim-fast vs. Weight Watchers vs. Rosemary Conley	NS
Luscombe et al. (2003)[15]	16 weeks	36 OB	HP vs. LP	NS
Layman et al. (2003)[16]	10 weeks	24 OW+OB	HP vs. HC	NS FM decrease
Baba et al. (1999)[17]	4 weeks	13 OB	HP vs. HC	Decrease
Labayen et al. (2003)[18]	10 weeks	11 OB	HP vs. HC	Decrease
Luscombe-Marsh et al. (2005)[72]	16 weeks	57 OW+OB	HP vs. HF	NS
Noakes et al. (2005)[74]	12 weeks	100 OW+OB	HP vs. HC	NS

BW: body-weight, **FM**: fat mass, **HC**: high-carbohydrate, **HF**: high-fat, **HP**: high-protein, **LP**: low-protein, **NS**: non-significant **NW**: normal-weight, **OB**: obese, **OW**: overweight, **VM**: weight maintenance

Ét af de største RCTs som har undersøgt spørgsmålet

Comparison of Weight-Loss Diets with Different Compositions of Fat, Protein, and Carbohydrates

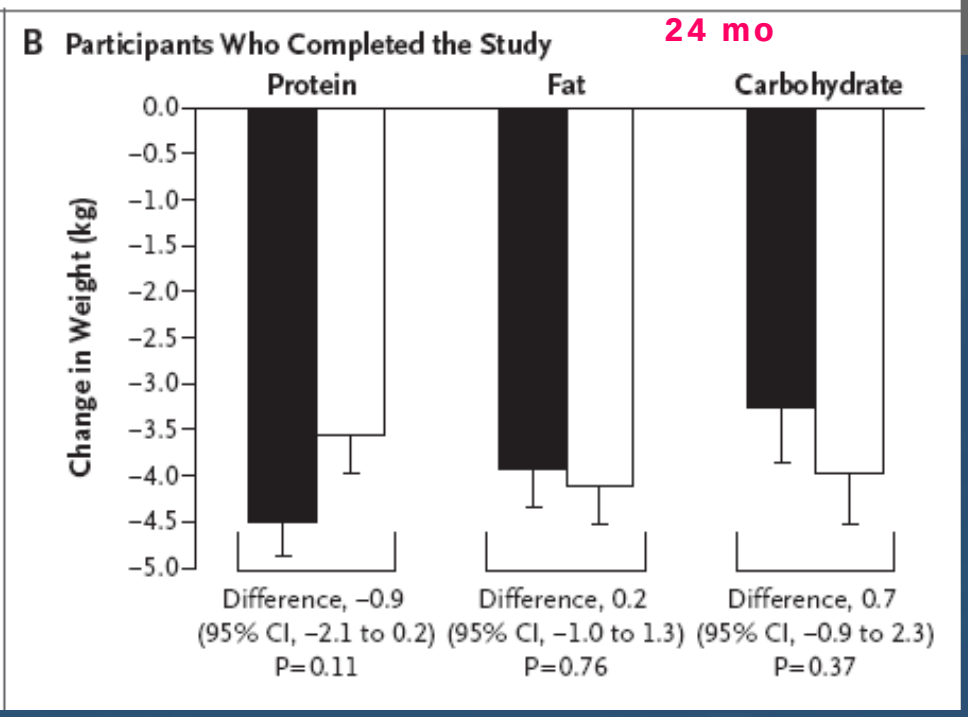
Frank M. Sacks, M.D., George A. Bray, M.D., Vincent J. Carey, Ph.D., Steven R. Smith, M.D., Donna H. Ryan, M.D., Stephen D. Anton, Ph.D., Katherine McManus, M.S., R.D., Catherine M. Champagne, Ph.D., Louise M. Bishop, M.S., R.D., Nancy Laranjo, B.A., Meryl S. Leboff, M.D., Jennifer C. Rood, Ph.D., Lilian de Jonge, Ph.D., Frank L. Greenway, M.D., Catherine M. Loria, Ph.D., Eva Obarzanek, Ph.D., and Donald A. Williamson, Ph.D.

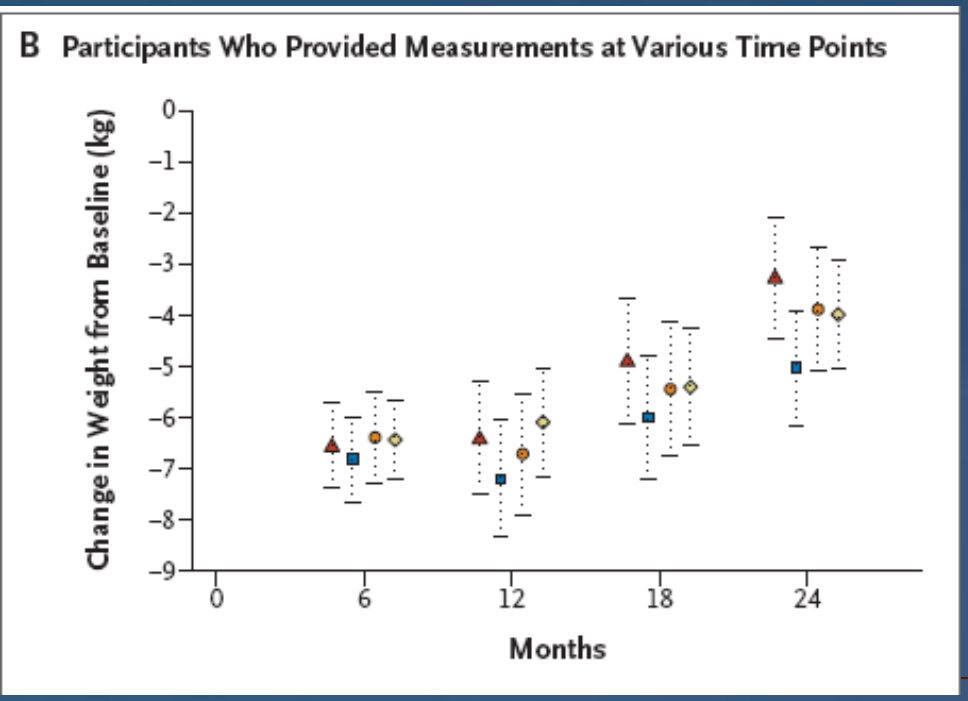
METHODS

We randomly assigned 811 overweight adults to one of four diets; the targeted percentages of energy derived from fat, protein, and carbohydrates in the four diets were 20, 15, and 65%; 20, 25, and 55%; 40, 15, and 45%; and 40, 25, and 35%. The diets consisted of similar foods and met guidelines for cardiovascular health. The participants were offered group and individual instructional sessions for 2 years. The primary outcome was the change in body weight after 2 years in two-by-two factorial comparisons of low fat versus high fat and average protein versus high protein and in the comparison of highest and lowest carbohydrate content.

Sacks et al. NEJM

24 mo





High protein, fat, or carbohydrate

Low or average protein, fat, or carbohydrate

Carbohydrate/Protein/Fat:

- 65/15/20%
- 55/25/20%
- 45/15/40%
- 35/25/40%

Sacks et al. NEJM

Problem:
Compliance (overholden) af høj protein kosten har ikke været særlig god!

No difference between groups in actual 24h U-Nitrogen excretion !

Table 2. Risk Factors, Nutrient Intake, and Biomarkers of Adherence, According to Diet, at 6 Months and 2 Years.*

Variable	Low Fat, Average Protein				Low Fat, High Protein			
	6-Mo Value	Change from Baseline	2-Yr Value	Change from Baseline	6-Mo Value	Change from Baseline	2-Yr Value	Change from Baseline
Nutrient intake per day								
Energy (kcal)	1636±484	−477	1531±480	−354	1572±568	−353	1560±461	−402
Carbohydrate (%)	57.5±11.1	12.8	53.2±11	9.3	53.4±8.5	7.4	51.3±9.2	6.8
Protein (%)	17.6±3.4	0.2	19.6±3.9	2.1	21.8±3.8	3.9	20.8±4	2.5
Fat (%)	26.2±8	−11.8	26.5±8	−12.0	25.9±6.8	−10.1	28.4±8.1	−8.4
Saturated fat (%)	7.5±3.2	−4.9	8±3.1	−4.3	7.9±2.7	−3.9	8.9±3.8	−3.1
Biomarkers of adherence								
Urinary nitrogen (g)‡	11.1±4.1	−11.5	11.8±4.6	−9.1	11.9±4.3	−2.5	11.8±3.9	−2.8
Respiratory quotient§	0.84±0.04	0.58	0.83±0.04	−0.48	0.84±0.04	0.16	0.84±0.04	−0.84

NORDEA FONDEN

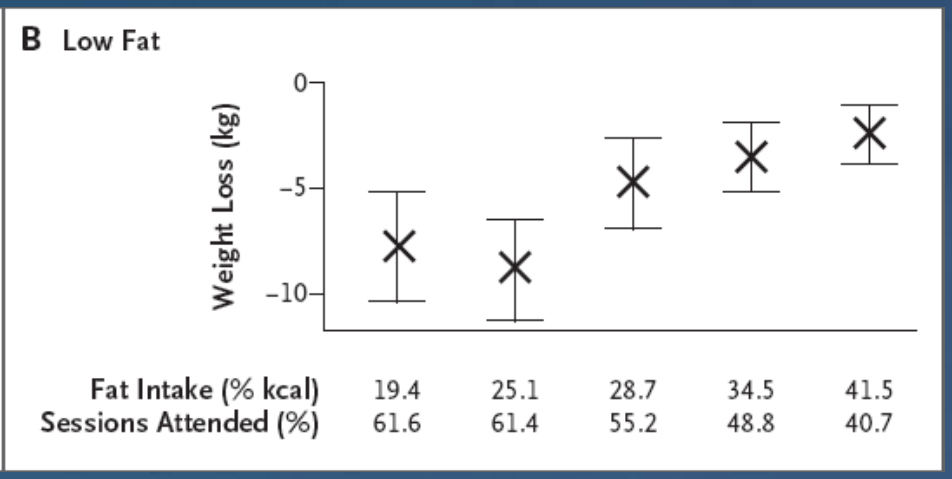
Sacks et al. NEJM

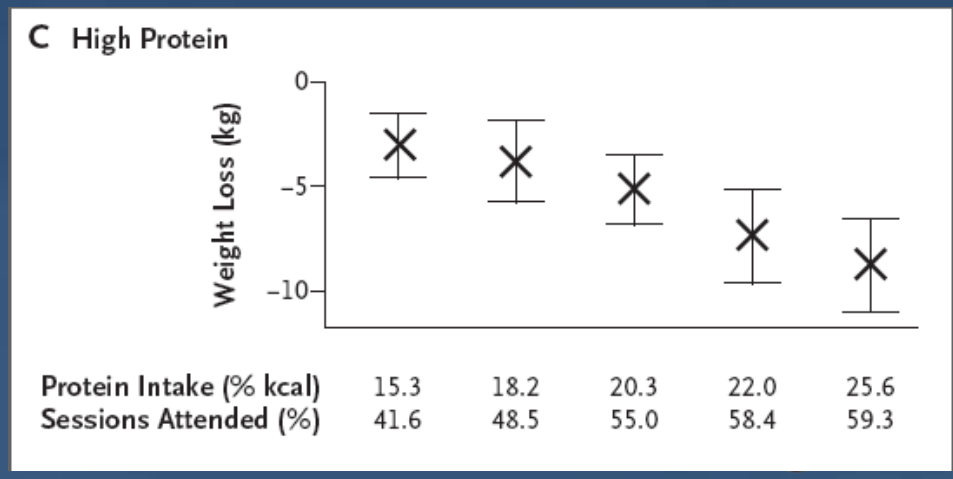
COMPLIANCE PROBLEMET:

Weight Change According to Attendance at Group Sessions and Dietary Adherence

Attendance at group sessions strongly predicted weight loss at 2 years (0.2 kg for every session attended) and was similar among the diet groups.

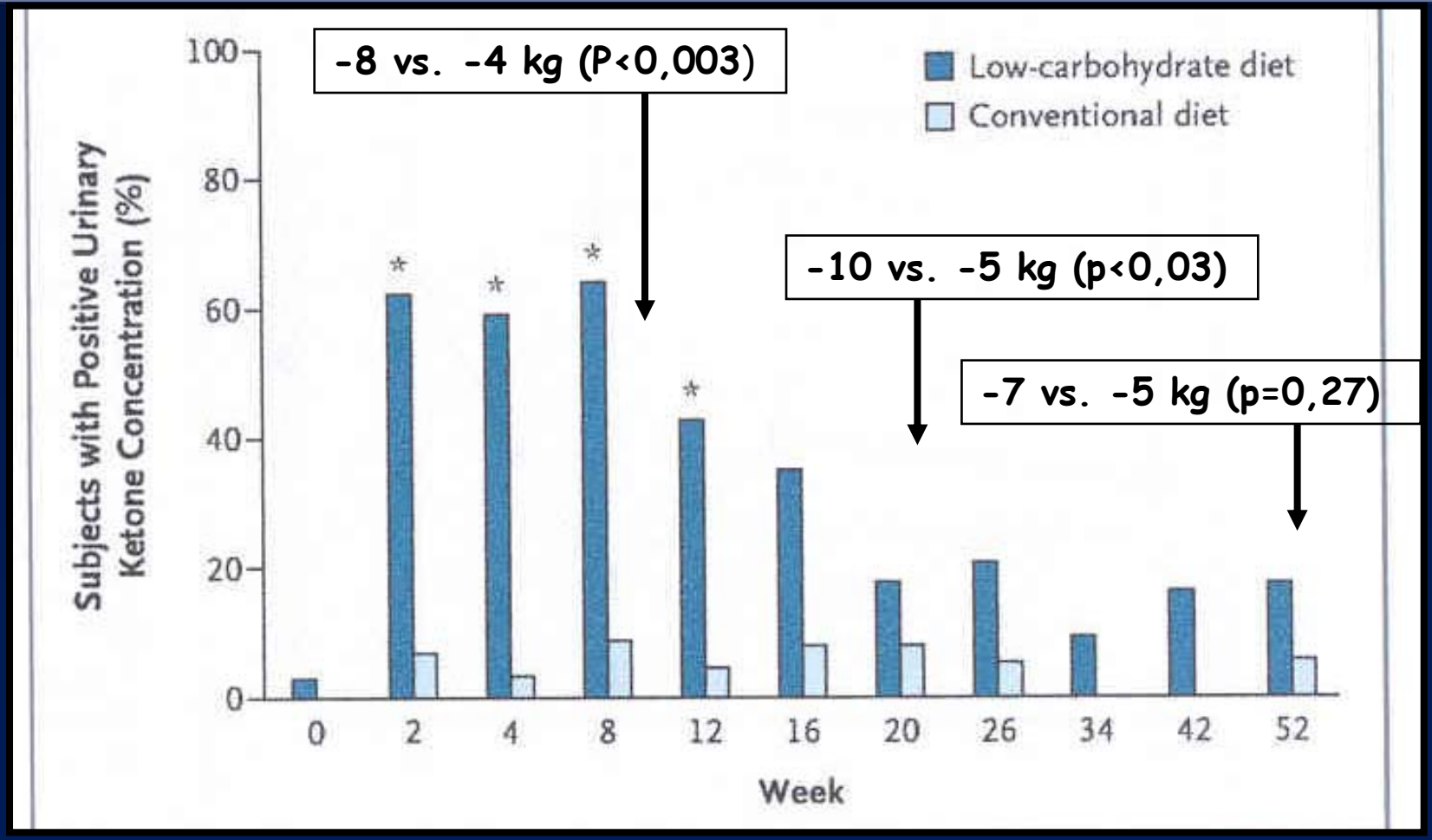
Adherence to the goal for protein intake was associated with more weight loss only in the high-protein groups, and adherence to the goal for fat intake was associated with more weight loss only in the low-fat groups (P<0.001)





Sacks et al. NEJM

Compliance til lav kulhydrat kost ?



Foster G et al. NEJM 2003

Annals of Internal Medicine | ARTICLE

Weight and Metabolic Outcomes After 2 Years on a Low-Carbohydrate Versus Low-Fat Diet

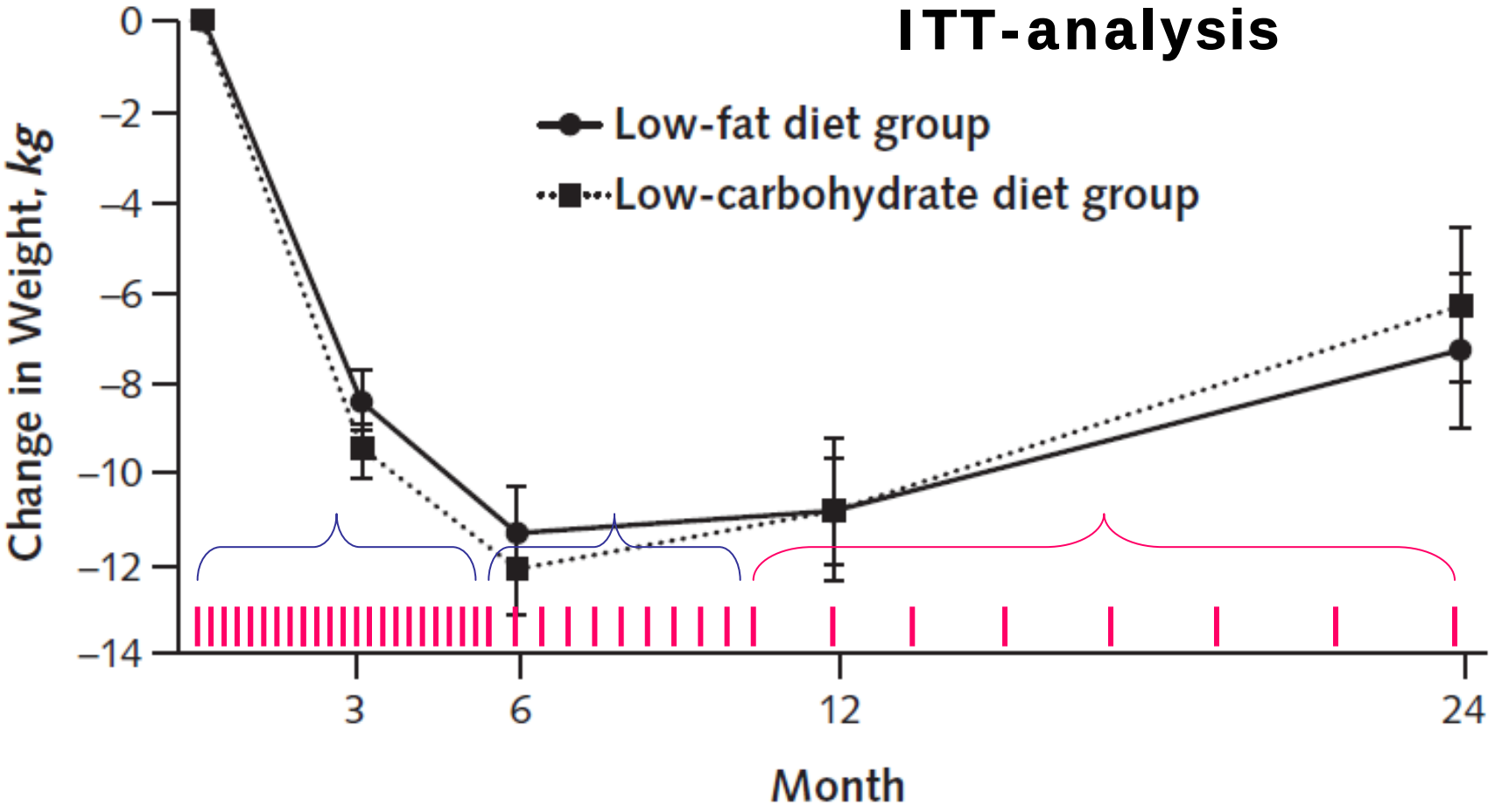
A Randomized Trial

Gary D. Foster, PhD; Holly R. Wyatt, MD; James O. Hill, PhD; Angela P. Makris, PhD, RD; Diane L. Rosenbaum, BA; Carrie Brill, BS; Richard I. Stein, PhD; B. Selma Mohammed, MD, PhD; Bernard Miller, MD; Daniel J. Rader, MD; Babette Zemel, PhD; Thomas A. Wadden, PhD; Thomas Tenhave, PhD; Craig W. Newcomb, MS; and Samuel Klein, MD

Ann Intern Med. 2010;153:147-157.

Setting

Recruitment and data collection were completed at the University of Colorado Denver, Denver, Colorado; Washington University, St. Louis, Missouri; and the University of Pennsylvania, Philadelphia, Pennsylvania.



Common Instructions

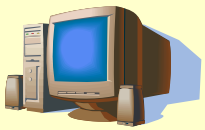
All participants received comprehensive, in-person group behavioral treatment (13, 14) weekly for 20 weeks, every other week for 20 weeks, and then every other month for the remainder of the 2-year study period. Each treatment session lasted 75 to 90 minutes. The **Appendix**

The DiOGenes research lines

RTD 1
Diet intervention

RTD 5
Food technology

RTD 6



Data Hub

RTD 4
Psychological predictors & behaviour

RTD 2
Genetics/Transcriptomics/ Proteomics/Metabolomics

RTD 3 Population studies

An Integrated Project of the EU 6th Framework Programme for Research and Technological Development (2005-2009)

Co-ordinator Wim Saris, University of Maastricht

www.diogenes-eu.org

Diogenes diet intervention

Multicentre trial in 8 European cities

Copenhagen (Astrup A, Larsen TM)
Maastricht (van Baak M, Saris W)

Berlin (Pfeiffer A)
Cambridge (Jebb S)
Prague (Kunesova M)
Pamplona (Martinez JA)
Sofia (Hanjieva S)
Heraklion (Kafatos A)

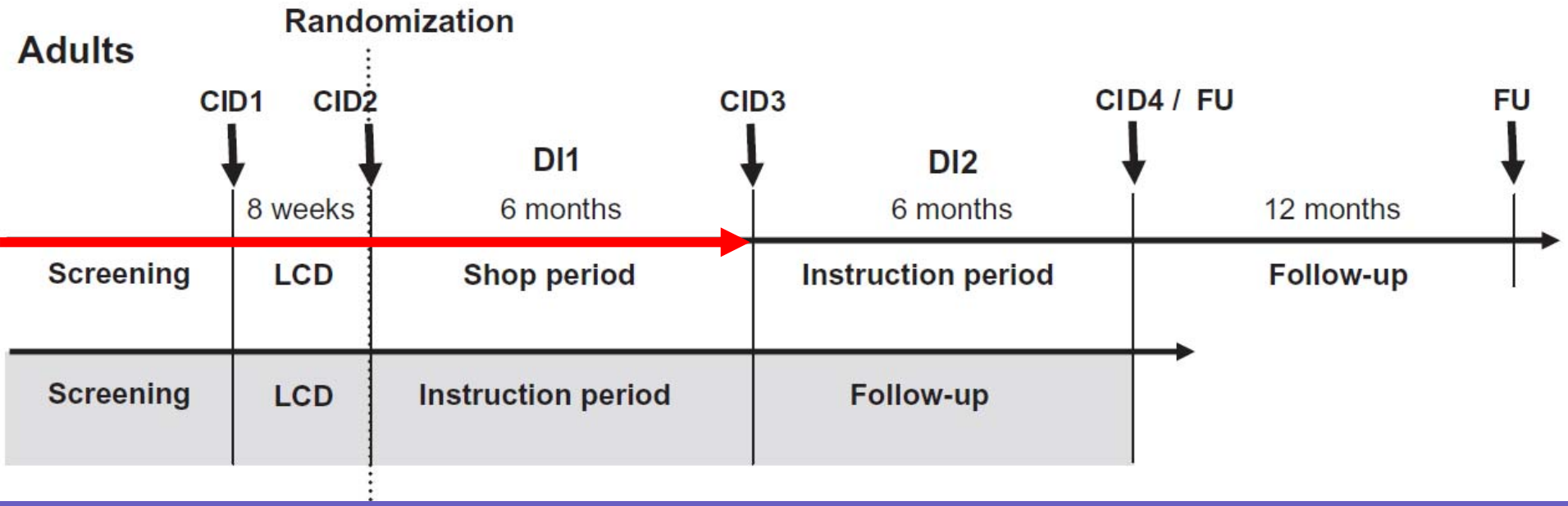
The study is registered with
www.ClinicalTrials.gov
number NCT00390637

Inclusion criteria

- Family (adult + child)
- One adult with BMI > 27 (preferably higher)
- Healthy
- 1-3 children (preferably iso-BMI > 25)
- Adults obtain > 8% weight loss during 8 w LCD

Contract no. FP6-2005-513946

Study design



Details on methodology published in:

Larsen TM, Dalskov S, van Baak M et al. Obes Rev 2010; 11(1):76-91.
Moore CS, Lindroos AK, Kreutzer M et al. Obes Rev 2010; 11(1):67-75.

Diogenes – Højt indhold af protein i kosten

Vejledning til deltagerne i forhold til højt proteinindhold (og lavt indhold af fedt) i kosten:

- **Vælg magre mejeriprodukter**
- **Vælg magert kød**
- **Spis fisk og skaldyr**
- **Spis æg**
- **Spis bælgfrugter**

Diogenes diet intervention

Shop model

- shopping 1-2 times weekly to aim at 100% food supply
- control the macronutrient composition at every session

Shop Computer Programme

Diet Composition, ad libitum (Targeted)

	LP/LGI	LP/HGI	HP/LGI	HP/HGI	Control
Protein E%	13 (8-18)	13 (8-18)	25 (20-30)	25 (20-30)	15 (10-20)
CHO + fibre E%	60 (55-65)	60 (55-65)	48 (43-53)	48 (43-53)	60 (55-65)
Fat E%	27 (22-32)	27 (22-32)	27 (22-32)	27 (22-32)	25 (20-30)
Glycemic index	low	high	low	high	medium

Δ of 15 GI units

Δ of 15 GI units

OBS: All were "healthy diets"

Diogenes diet intervention (all 8 centres*)

Main outcomes

- Changes in body weight and body composition
- Drop-out
- Percentage of subjects maintaining 5 and 10% of body weight loss
- Changes in risk factors for cardiovascular disease and type 2 diabetes

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

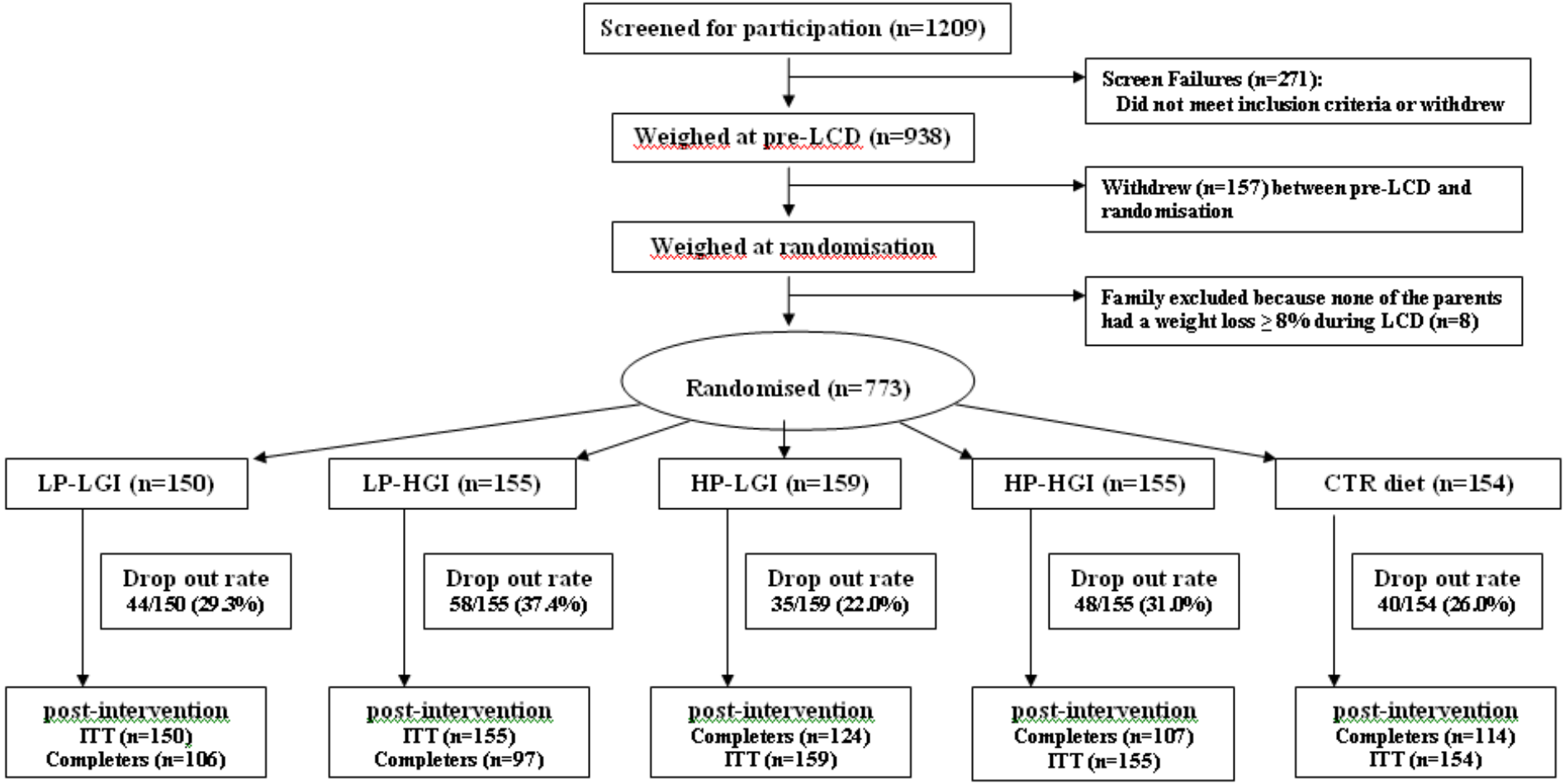
Diets with High or Low Protein Content and Glycemic Index for Weight-Loss Maintenance

Thomas Meinert Larsen, Ph.D., Stine-Mathilde Dalskov, M.Sc., Marleen van Baak, Ph.D., Susan A. Jebb, Ph.D., Angeliki Papadaki, Ph.D., Andreas F.H. Pfeiffer, M.D., J. Alfredo Martinez, Ph.D., Teodora Handjieva-Darlenska, M.D., Ph.D., Marie Kunešová, M.D., Ph.D., Mats Pihlsgård, Ph.D., Steen Stender, M.D., Ph.D., Claus Holst, Ph.D., Wim H.M. Saris, M.D., Ph.D., and Arne Astrup, M.D., Dr.Med.Sc., for the Diet, Obesity, and Genes (Diogenes) Project

ABSTRACT

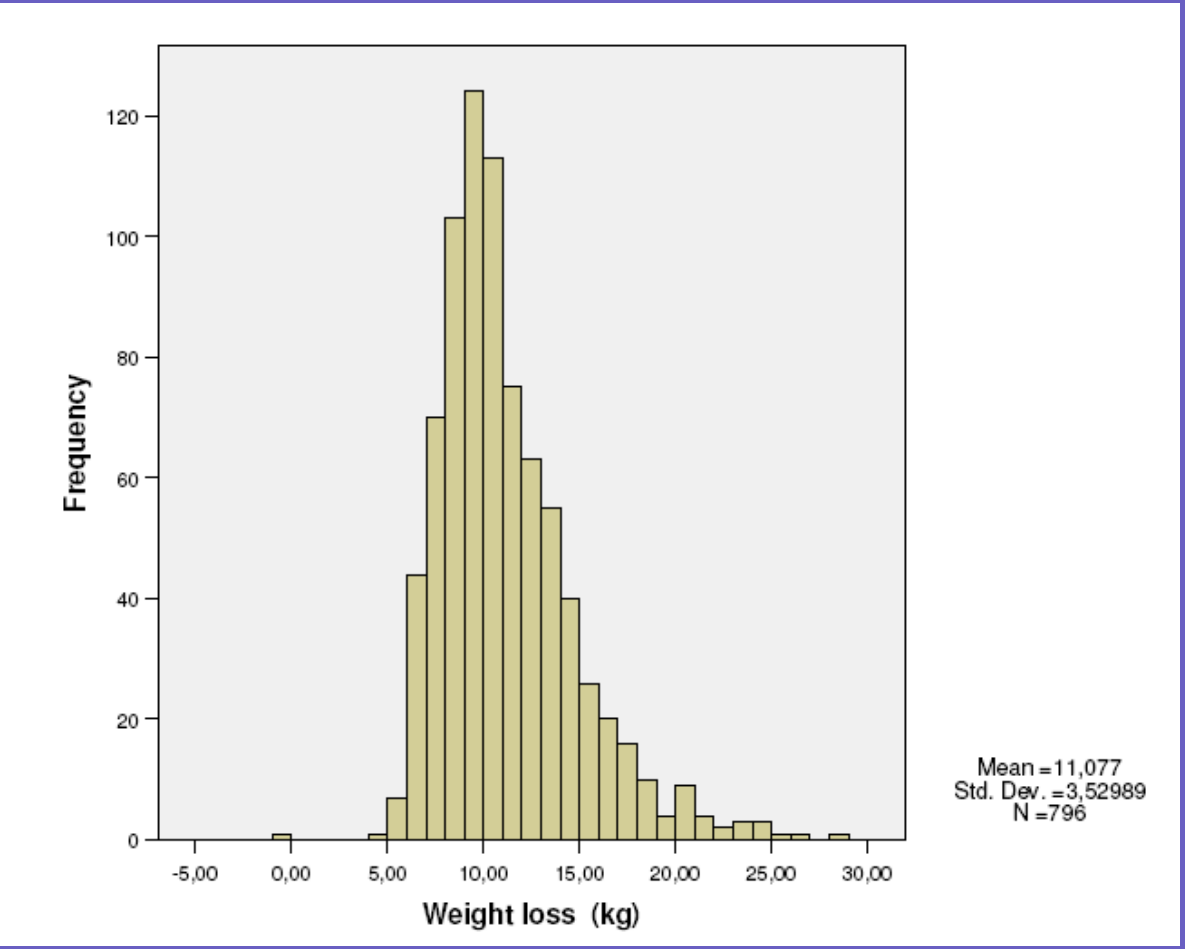
New England Journal of Medicine, published online Nov 25, 2010.

Patient flow



COMPLETERS: 548 Subjects

Weight loss on 8 week LCD



Major end-point: Drop-out rate

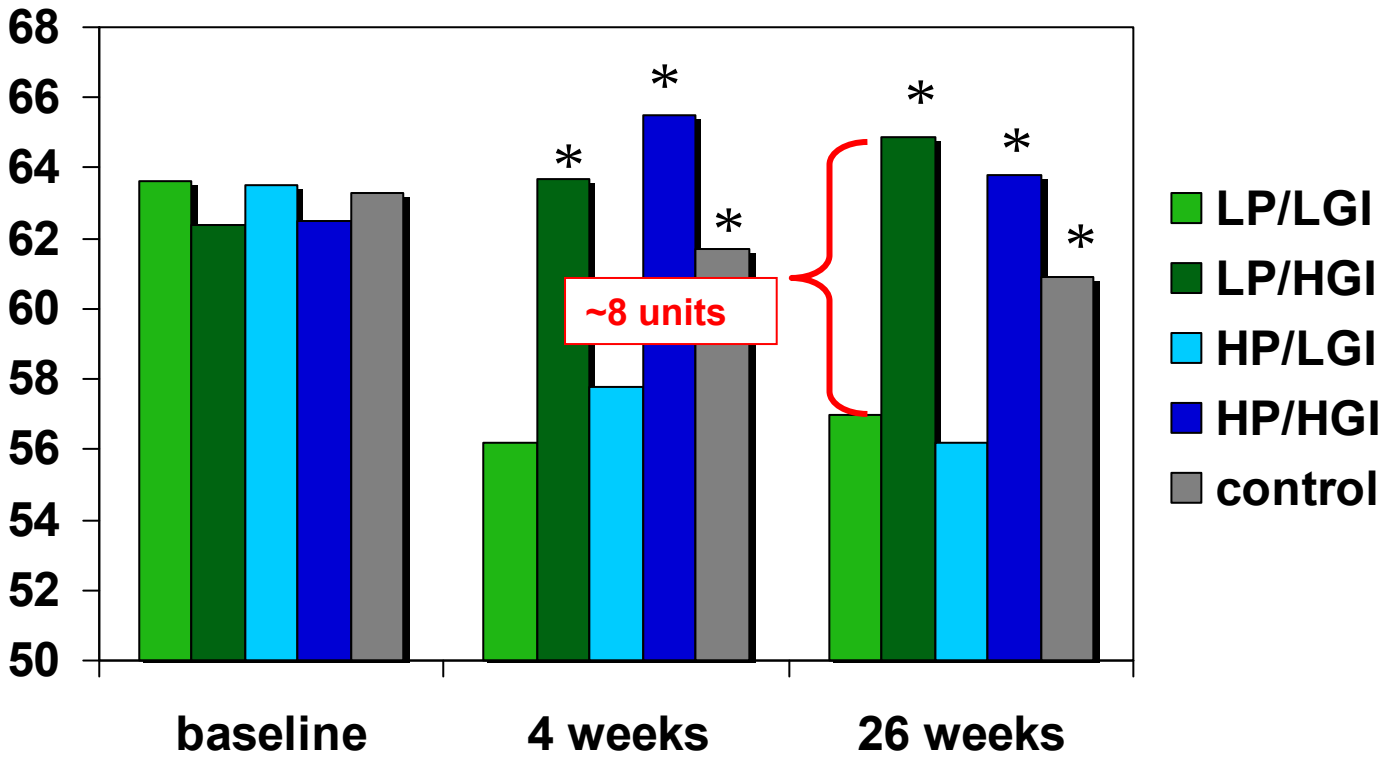
	Drop-out/Randomised (%)
LP/LGI	44/150 (29.3)[ab]
LP/HGI	58/155 (37.4) [b]
HP/LGI	35/159 (22.0) [a]
HP/HGI	48/155 (31.0) [ab]
CTR	40/154 (26.0) [ab]
Overall	225/773 (29.1)

Assignment to:
HP vs. LP diets associated with 20.0% lower drop out rate, p=0.05.

Assignment to:
LGI vs. HGI diets associated with 22.6% lower drop-out rate, p<0.02.

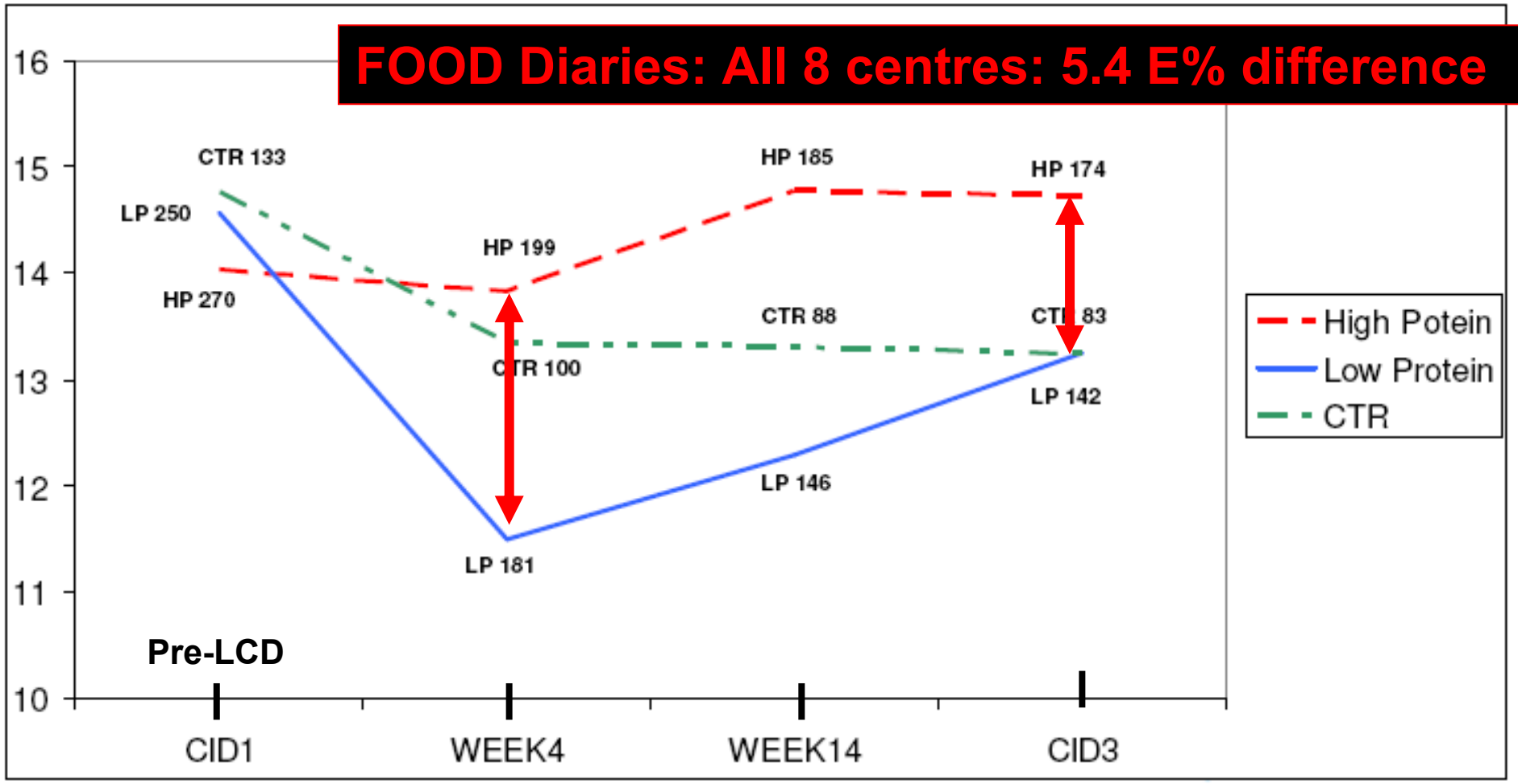
The superscripts a and b are indicating if two groups are significantly different (p<0.05) in a logistic regression model after adjustment for centre, centre type (shop/intervention), gender, BMI at post-LCD, BW loss during LCD, family type, and age at screening. This is the case if they do not share a common letter

Compliance to Glycemic Index (shop centres)



FOOD Diaries: All 8 centres: 5 GI units difference

Compliance to dietary protein intake as assessed by 24 hour urinary nitrogen excretion



Results: Body weight changes

- **Overall weight regain** was relatively low (0.56 kg), and that the overall weight loss in completers as therefore quite high (10.6 kg)

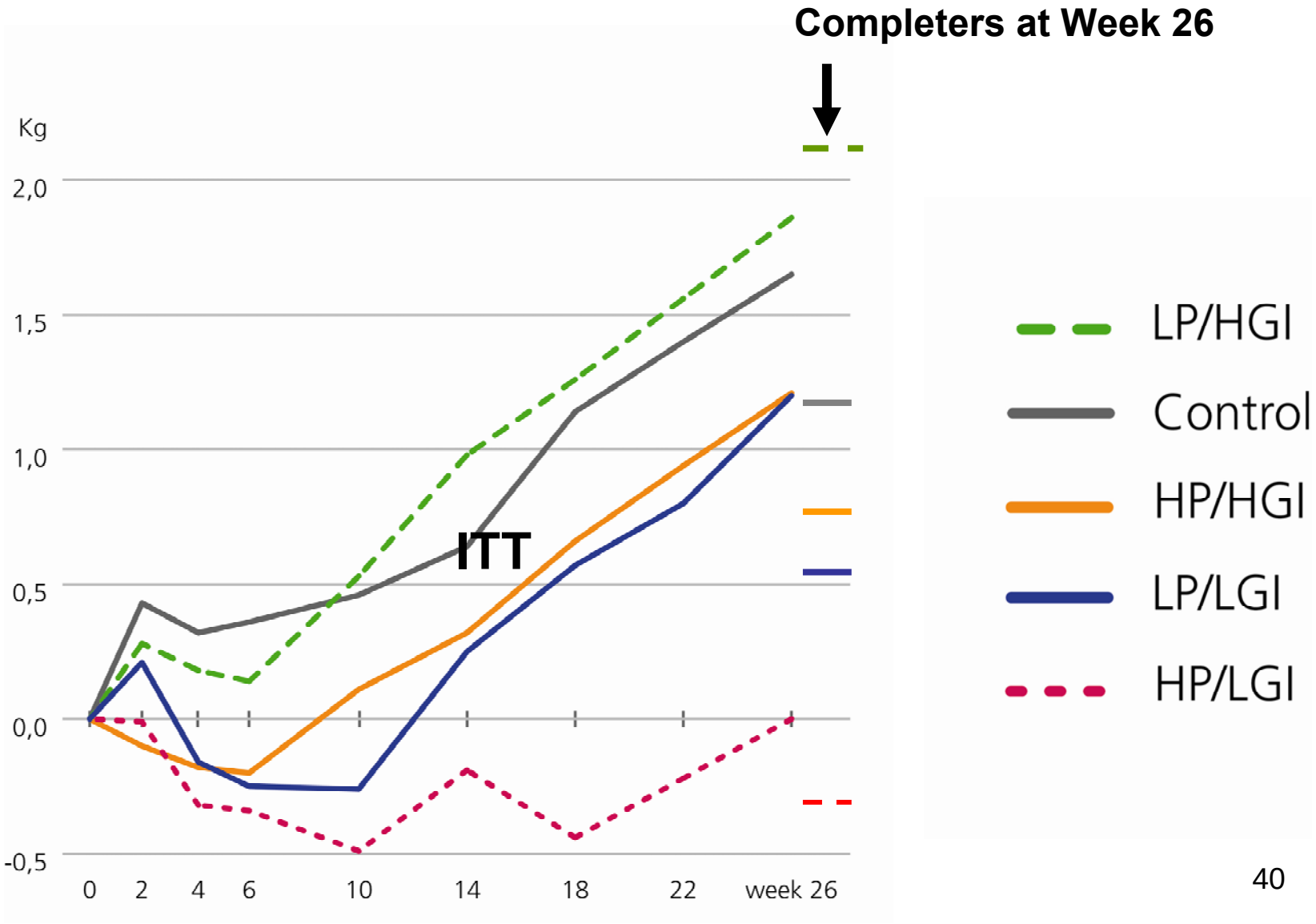
- **Completers analysis** (N=548) (kg, mean, 95% CI);

LP/LGI (N=106):	0.3 (-0.74, 1.40)
LP/HGI (N=97):	1.7 (0.48, 2.87)
HP/LGI (N=124):	-0.4 (-1.70, 0.93)
HP/HGI (N= 107):	0.6 (-0.65, 1.78)
CTR (N=114):	0.8 (-0.17, 1.86)

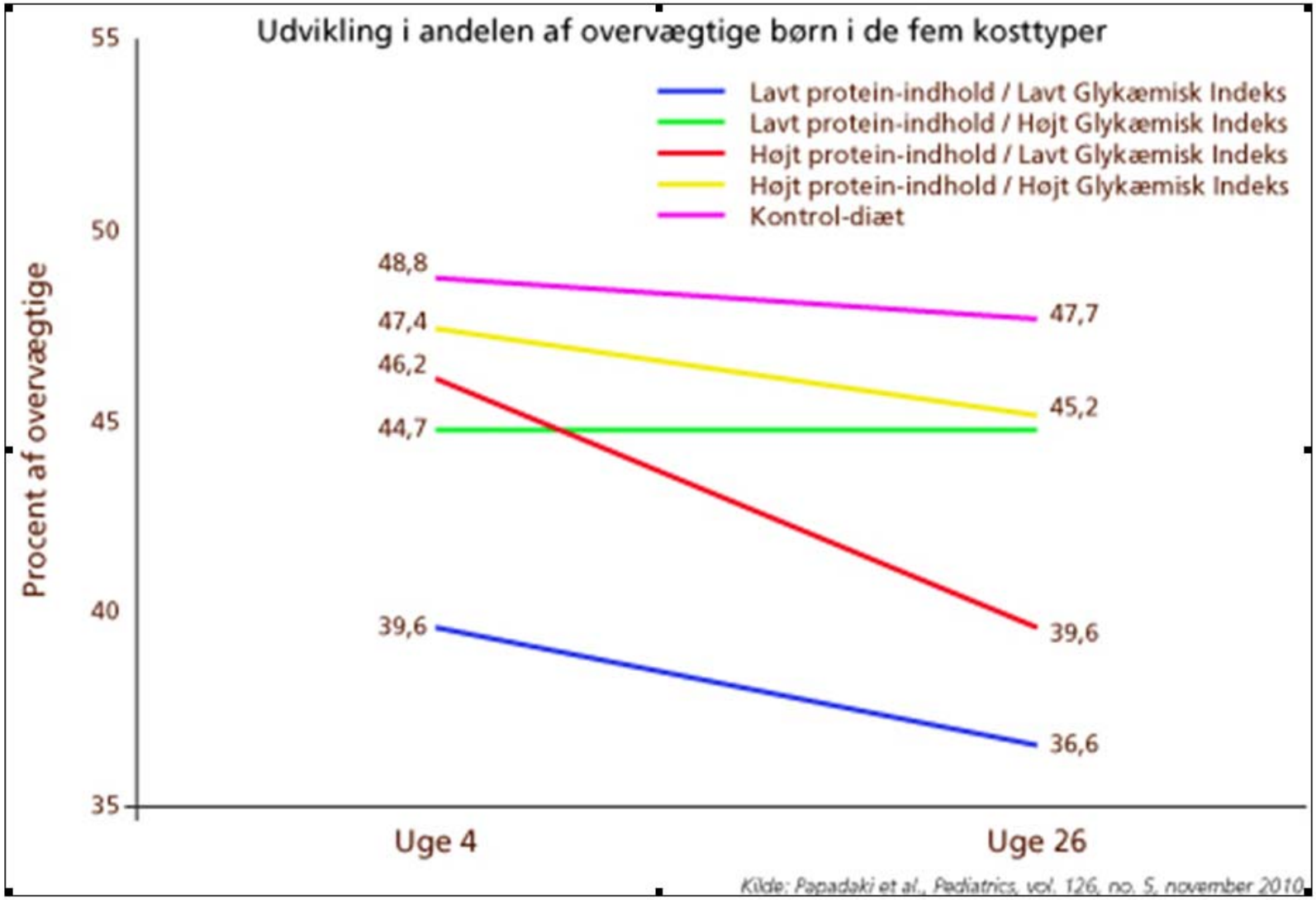
Overall group difference p-value: 0.01 (ANCOVA)

- The assignment to LP and HGI diets **completer analysis** (N=548), linear regression model) produced higher weight regain of
LP: 1.14 kg (0.23,2.06) (p=0.02)
HGI: 1.09 (0.18, 2.00) (p=0.02)

In an ITT-analysis (N=773, mixed linear model) the weight regain was 0.93 kg (95 % CI: 0.31; 1.55, p=0.003) lower by HP than LP, and 0.95 kg (0.33; 1.57, p=0.003) lower by LGI than HGI diets.



HP/LGI virkede også godt i børn



Conclusions from Diogenes

- A low GI diet high in calories from protein prevented weight regain after a 12 % weight loss.
- The high-protein/low GI diet was associated with lower drop out rate

Chapter 2
Balancing Calories to Manage Weight

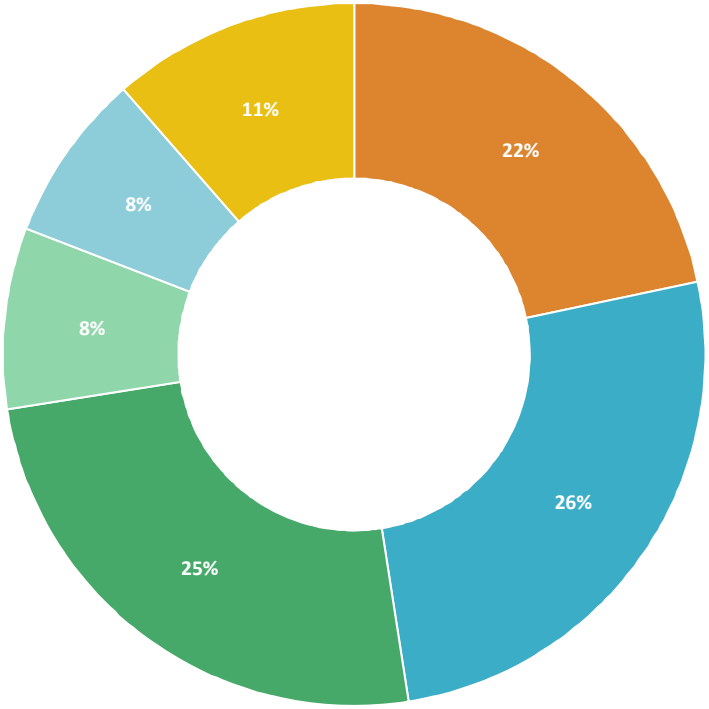
- Epidemic of overweight and obesity in all segments of our society ***new***
  - Environmental factors contribute to weight gain
- Calorie balance over time is key
- Important modifiable factors
  - Calories consumed in foods and beverages
  - Calories expended in physical activity
- Strong evidence for no optimal proportion of macronutrients for weight loss

Konflikt: Kan alle spise "høj-protein" i fremtiden?

2010	2050
	
❖ Befolkning: 6 mia.	❖ Befolkning: 9 mia.
	
❖ Udledning: 50 mia. ton	❖ Udledning: 20 mia. ton
❖ Verdensborger: 8,3 ton	❖ Verdensborger: 2,2 ton
❖ Borger i DK: 18,4 ton	❖ Borger i DK: ca. 3 ton?
❖ Borger i Afrika syd for Sahara: < 2 ton	❖ Borger i Afrika: ca. 2 ton?

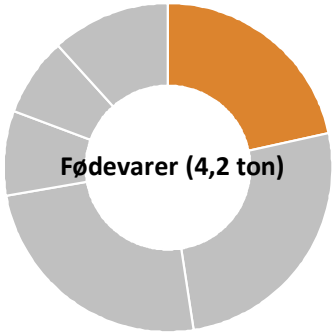
Konflikt: Øget animalsk protein øger vores udslip af drivhusgasser !

Region Hovedstaden - Borgeren (19,3 ton)



- Fødevarer (4,2 ton)
- Bolig (5 ton)
- Transport og rejser (4,8 ton)
- Shopping (1,6 ton)
- Serviceydelser (1,5 ton)
- Det offentlige (2,2 ton)

Forbrugeren i Region H. – 2010

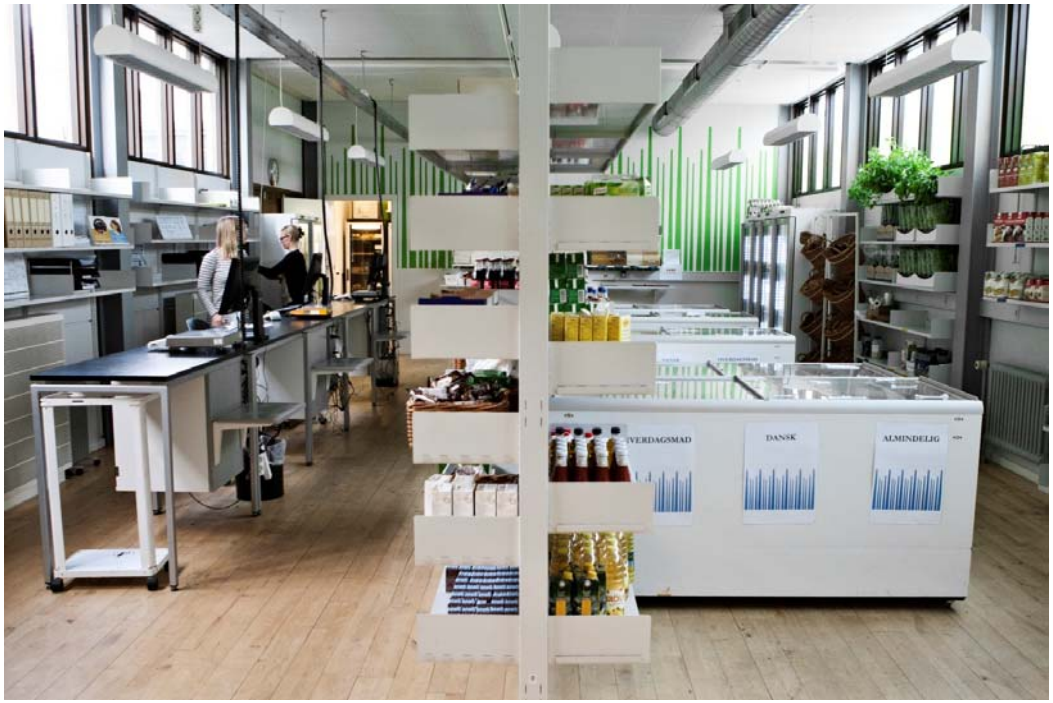


Fødevarer (ton CO_2e pr. borger)	4,2
Kød	1,9
Ikke animalske fødevarer	1,2
Mejeriprodukter	0,8
Drikkevarer og tobak	0,3

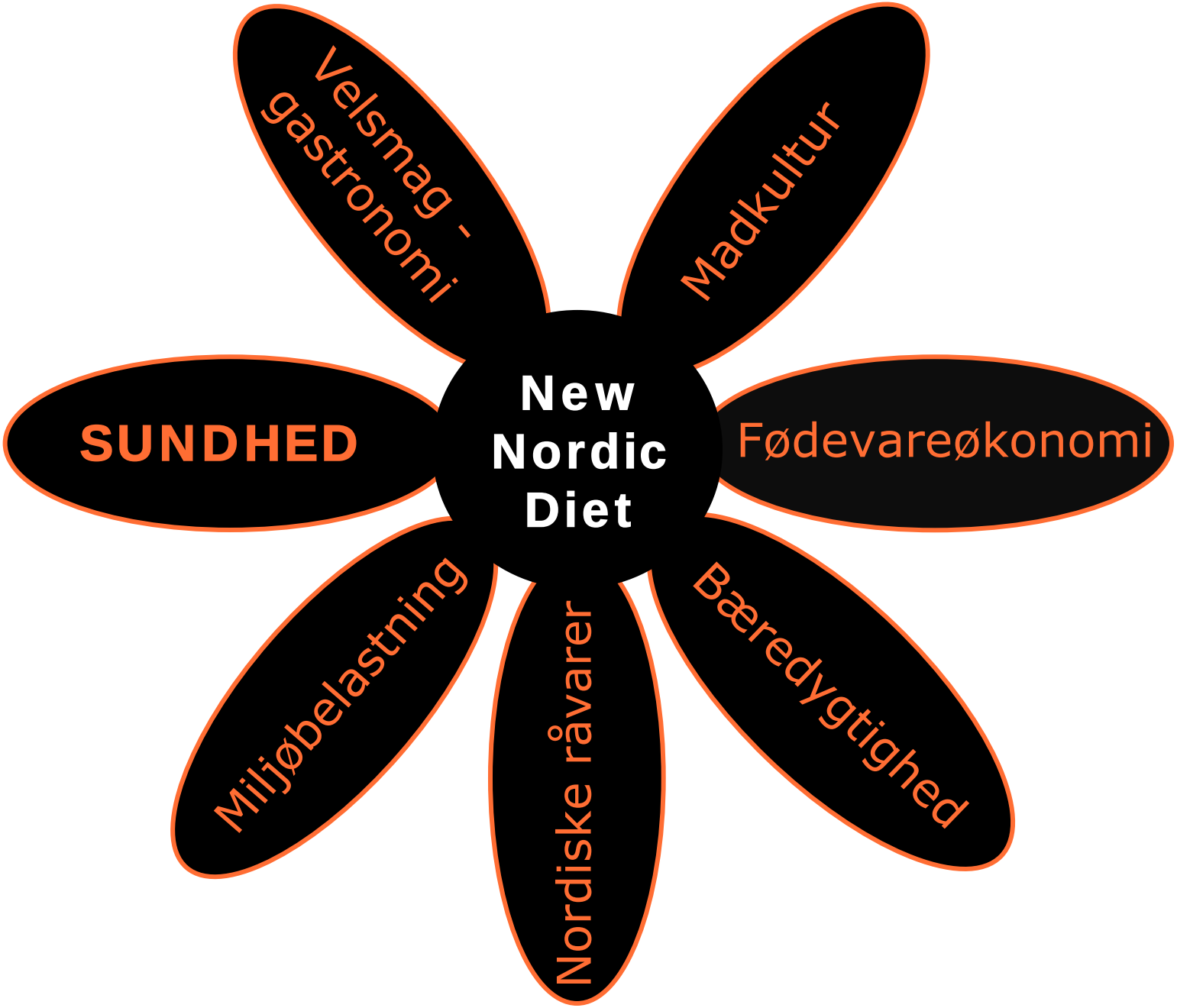
Niras, Januar 2011

http://www.niras.dk/Aktuelt/I-fokus/Klima/~/media/Files/NIRAS-DK/In-focus-Climate/pdf/Klimafodaftryk-hovedrapport-pdf.ashx

SHOPUS butiksprojekt



Thomas Meinert Larsen
Lektor, Institut for Human Ernæring, LIFE, KU


New Nordic Diet
Velsmag - gastronomi
Madkultur
SUNDHED
Fødevareøkonomi
Miljøbelastning
Nordiske råvarer
Bæredygtighed

Fra principper og strukturer til mad

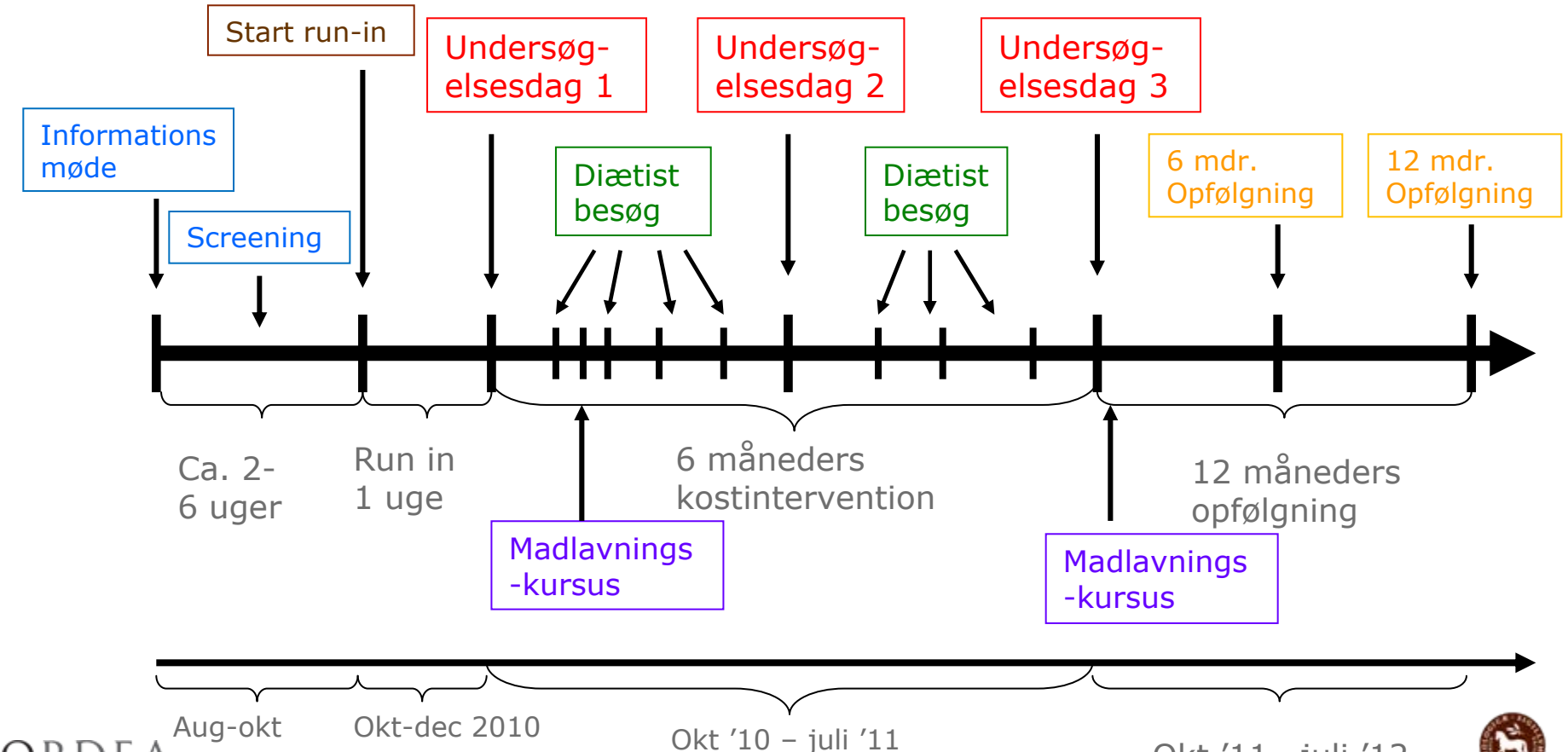
180 aftensmadsopskrifter i overensstemmelsen med principperne og strukturen (48 forretter, 84 hovedretter, 48 desserter)

Samlet i menuplaner for én uge ad gangen – kun aftensmad

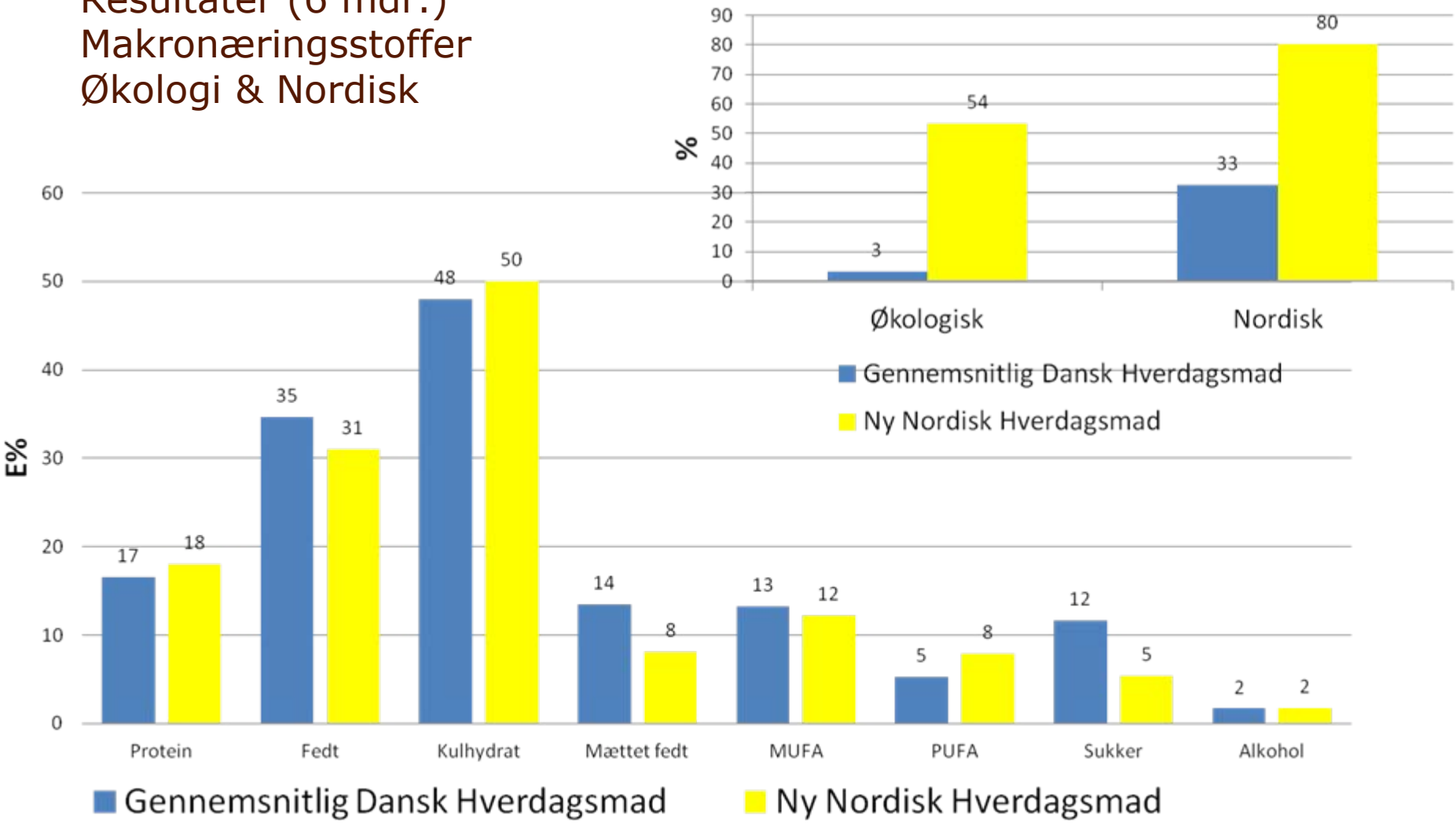
3 menuplaner pr sæson = 3 uger pr sæson

I alt 12 ugers måltidsplaner for hele året

Studie forløb



Resultater (6 mdr.)
Makronæringsstoffer
Økologi & Nordisk



KONKLUSIONER

- En høj protein kost kan fremme vægttab (når den følges)
  - Måske sænke risiko for T2D og CVD
  - Måske fremme muskel-funktion og andre fysiologiske funktioner
- En høj protein kost er måske sikker på lang sigt
  - Har formodentlig ingen negativ effekt på nyre-funktion (hos raske)
  - Har formodentlig ingen negativ effekt på knogler (hos raske)
  - Har måske en negativ påvirkning på visse cancer-former (colon)
- Fastholdelse af en kost med højt protein kan være en udfordring
  - Uklart om vægttab kan fastholdes på lang sigt
- En høj protein kost (animalsk) øger klima-belastning og miljø-problemer
  - Uklart om vegetabilske kilder kan virke lige så godt/bedre som animalske
  - Uklart om teknologisk udvikling kan sænke miljø-belastning

END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WEIGHT
LOSS
CLINIC


"Try this diet and if it works, I'll try it!"