

PREVIEW

PREvention of diabetes through lifestyle
Intervention and population studies
in Europe and around the World

Diabetes prevention with TDR and a low GI/low glycemic load diet

Professor Jennie Brand-Miller

Charles Perkins Centre, University of Sydney

On behalf of the PREVIEW Consortium

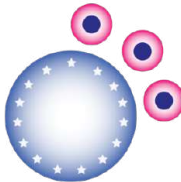
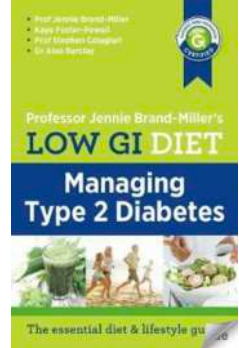
Project Coordinator: Professor Anne Raben, University of Copenhagen

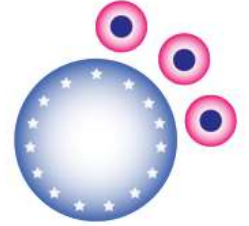




Duality of interest

- President of Glycemic Index Foundation, a non-profit food endorsement program in Australia www.gisymbol.com
- Director of Sydney University Glycemic Index Research Service www.glycemicindex.com
- Co-author of books *The New Glucose Revolution* and *The Low GI Diet, World's Best Diet....*





PREVIEW is a landmark multi-national study in diabetes prevention

- **Meal replacements** for initial **weight loss**
- Compared 2 diets & 2 exercise intensities
 - 3-year **weight loss maintenance**



PREVIEW sites




University of Copenhagen
Prof Thomas Laursen




University of Helsinki
Prof Mikael Fogelholm




Maastricht University
Prof Margriet Westerterp




University of Pamplona
Prof Alfredo Martinez



University of Nottingham
Prof Ian Macdonald



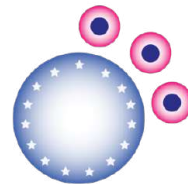
Medical University of Sofia
Prof Teodora Handjieva



University of Sydney
Prof Jennie Brand-Miller

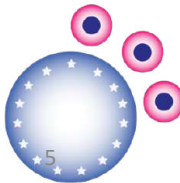
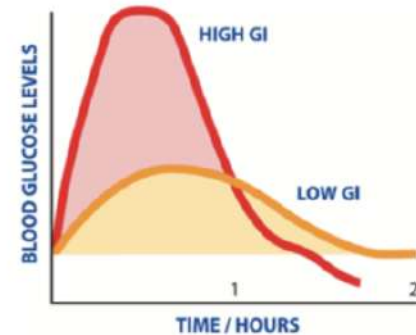


University of Auckland
Prof Sally Poppitt



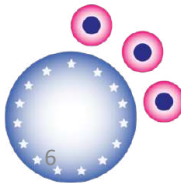
Aims

- To find a **more effective** way to reduce risk of diabetes
- To investigate a **higher-protein, lower-carbohydrate, lower-GI** diet
- To compare moderate versus intense **physical activity**
- To compare long term (3 y) weight loss maintenance
- To investigate **sleep** and **stress**
- **Behavioural** and sociological factors

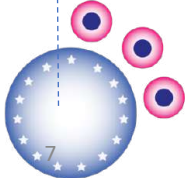
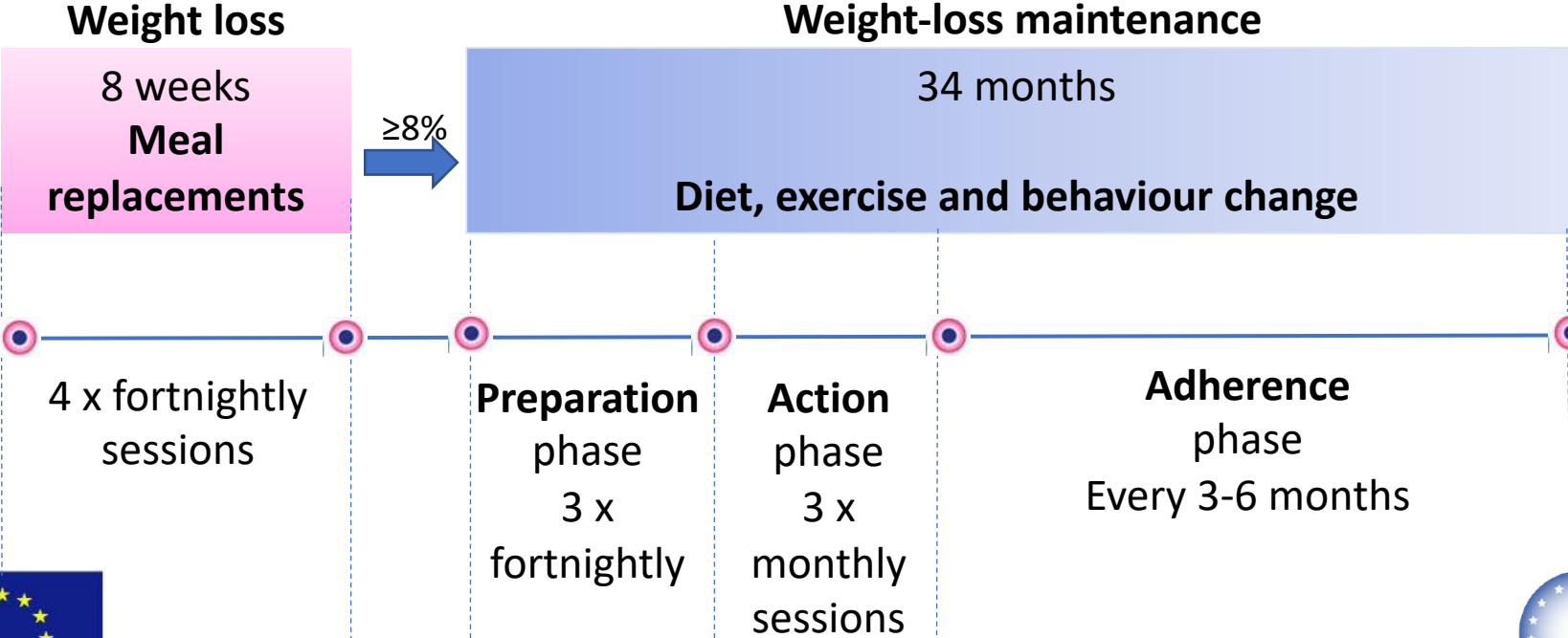


Inclusion criteria

- Adults aged **25 to 70** years
- Overweight and obesity (**BMI \geq 25**)
- **Pre-diabetes** by ADA criteria
 - Fasting glucose >5.6 - 6.9 mM, 120 min post-load >7.8 - 11.0 mM
- Willingness to undertake **7 clinical investigation days**
 - Baseline, 8 weeks, 26, 52, 78, 104 and 156 weeks
- To attend **17 group sessions**
- Willingness to **collect data** at regular intervals:
 - 4-day dietary records, 7-day accelerometry, 24 h urine samples

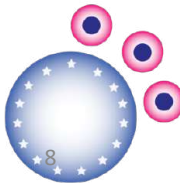


PREVIEW RCT: a group lifestyle modification with fading frequency of contact



Phase 1: 8 weeks of weight loss

- **Total meal replacements** for 8 weeks
 - 4 sachets/day (810 calories per day)
 - + 375 g salad vegetables
- **Fast** weight loss
- **No** exercise prescription
- Sets the scene for **weight loss maintenance**



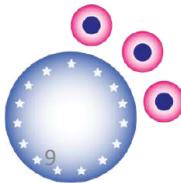
Phase 2: diet, exercise, behaviour change

Randomised to one of two **diets**

- Higher protein with lower GI carbohydrates
 - 25% E as protein, 45% E as CHO, GI <50
- Moderate protein with moderate GI
 - 15% E as protein, 55% E as CHO, GI >56

Randomised to one of 2 **exercise** regimes

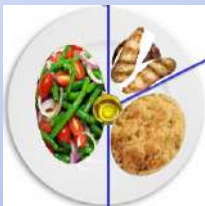
- High intensity
 - 76-90% max heart rate, 75 min/week
- Moderate intensity
 - 60-75% max heart rate, 150 min/week



Four intervention groups

2 diets x 2 exercise strategies

MP-MI: Moderate protein (moderate GI)
Moderate intensity exercise



HP-MI: Higher protein (lower GI)
Moderate intensity exercise



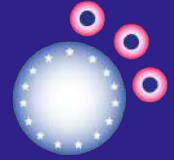
MP-HI: Moderate protein (moderate GI)
High intensity exercise



HP-HI: Higher protein (lower GI)
High intensity exercise



At the end of weight loss phase (8 weeks)



15,611 adults were pre-screened for Finnish risk score >12

5472 screened by 75 g OGTT

2326 eligible

- 67% **women**
- Age: **52 years**
- Body weight: **100 kg (BMI: 35)**

79% achieved $\geq 8\%$ weight loss

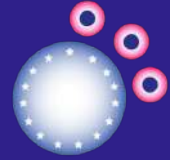
Weight loss **11%** of initial body weight



Baseline

8 weeks

Findings at 3 years



- Completion rate:
 - **74%** at 12 mths, **52%** at 36 mths
- Participants who developed diabetes = **62**
- Cumulative incidence of T2D = **3.1%**
 - Expected rate was ~**13.5%**
- **No significant differences** between diets or groups (most outcomes)
- T2D cases among drop-outs not known 😞
 - Similar T2D rate in all centres, irrespective of drop out rate



Cumulative incidence of T2 diabetes

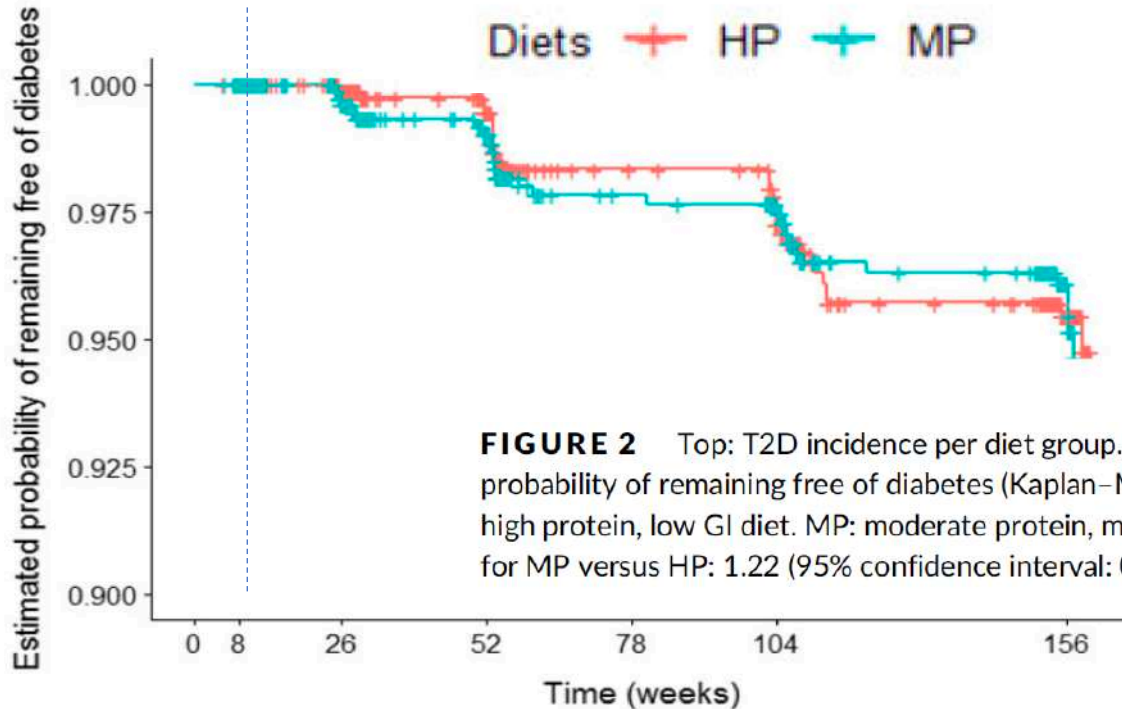
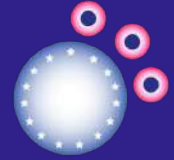
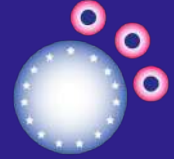


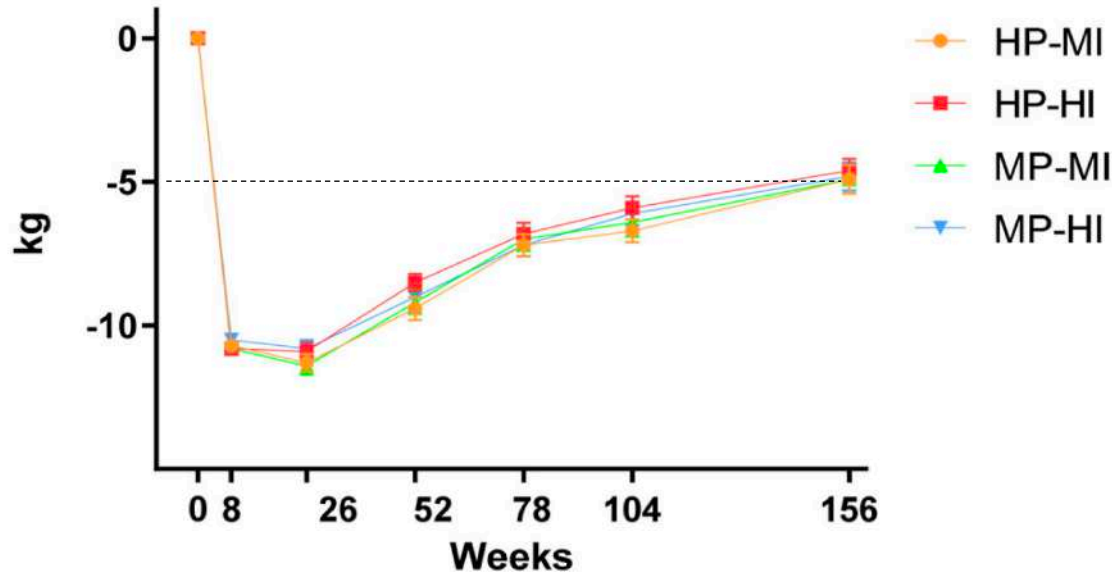
FIGURE 2 Top: T2D incidence per diet group. Estimated probability of remaining free of diabetes (Kaplan-Meier plot). HP: high protein, low GI diet. MP: moderate protein, moderate GI diet. HR for MP versus HP: 1.22 (95% confidence interval: 0.73-2.05, $P = .45$).

Weight loss maintenance

No significant differences among the 4 groups



Δ Body weight

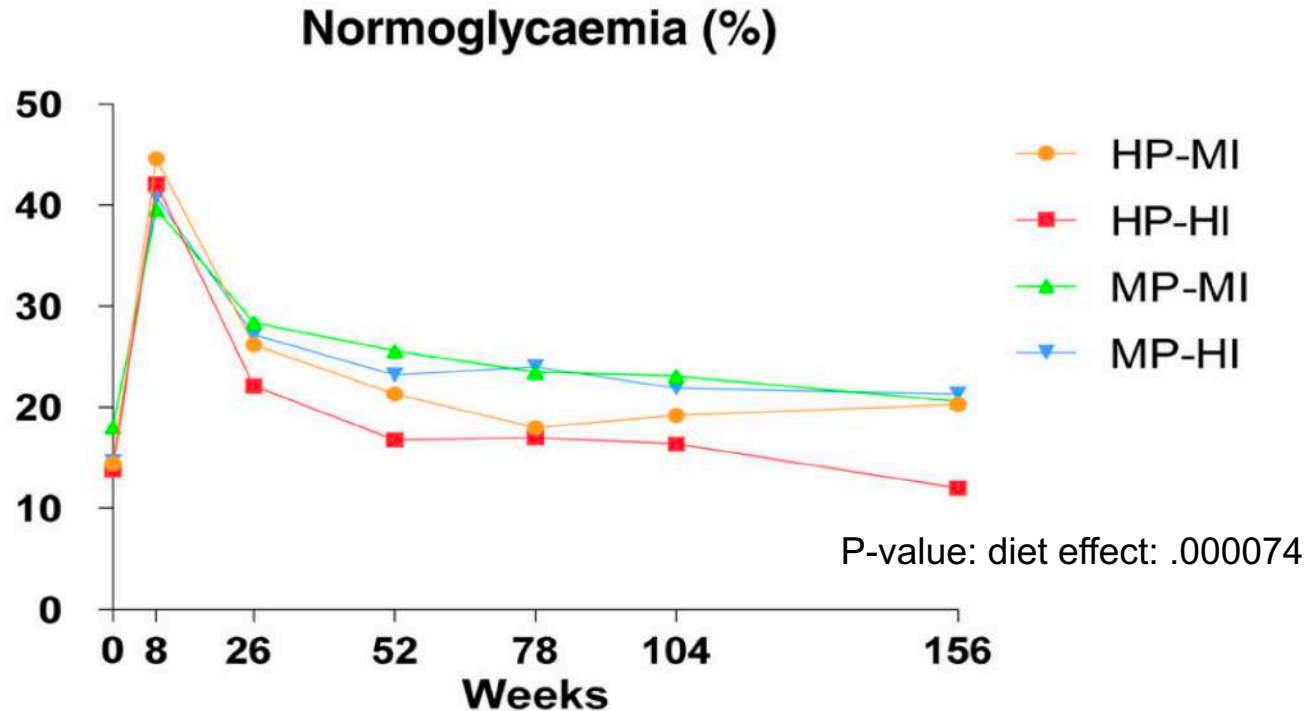
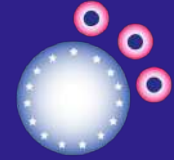


$P > 0.05$
Linear mixed model
(repeated measurements).
Data are presented as
means \pm SEM

1 in 2 participants maintained 5% weight loss, 1 in 4 maintained 10% weight loss, 1 in 5 gained weight

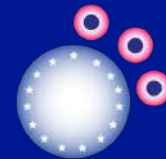
Differences in normoglycemia

Higher protein diet had fewer with normal glucose levels

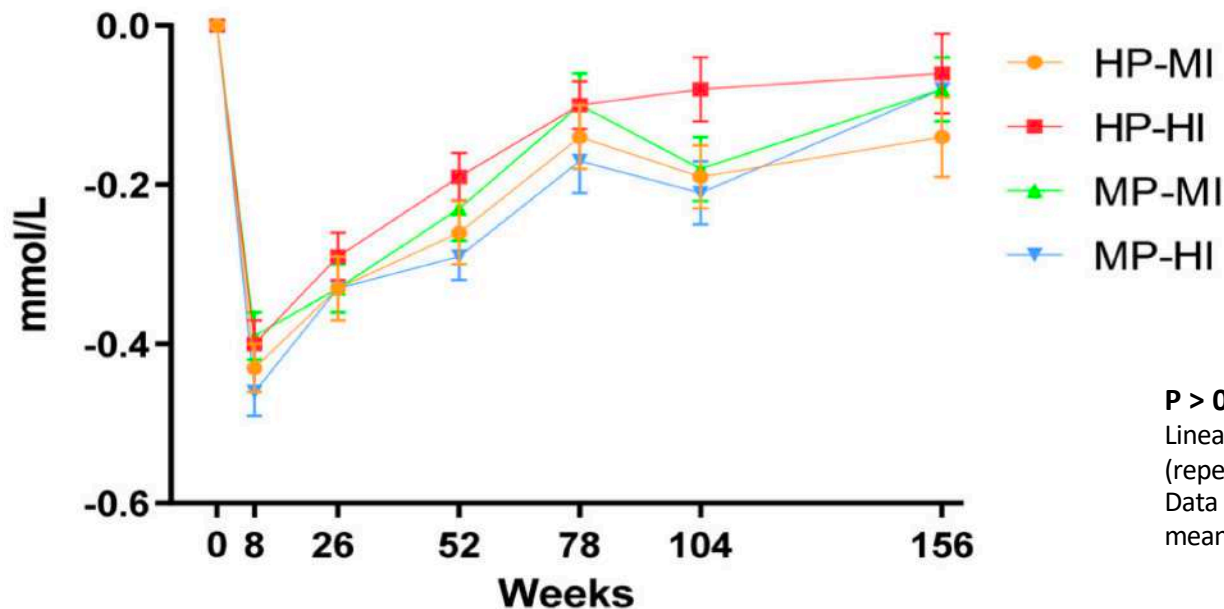


Fasting glucose rebounded

So did HbA_{1c} and blood lipids



Δ Fasting glucose



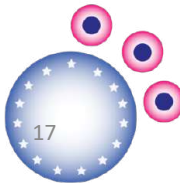
P > 0.05
Linear mixed model
(repeated measurements).
Data are presented as
means ± SEM

Composition of diets at 6 months

Significant differences ($p < 0.00001$)

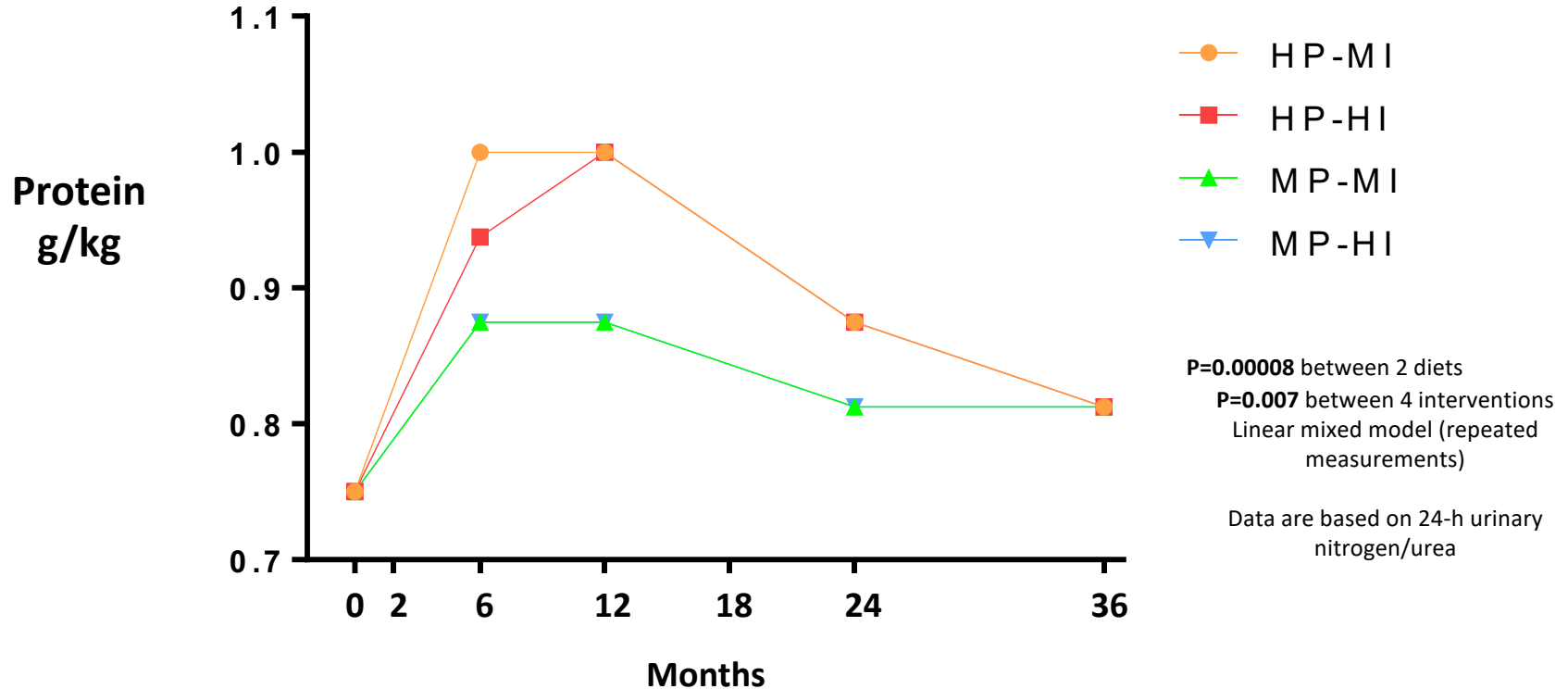
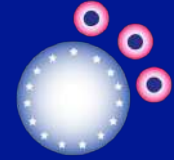
	High protein-low GI	Mod protein-mod GI
Protein %E	22.4	18.9
Carbohydrate %E	37.7	42.9
GI	51	56
GL	83	99

Differences were smaller at 12, 24 and 36 months but still significant at $P < 0.00001$



Protein intake was higher in all groups

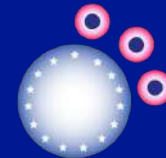
But highest in the two high protein groups



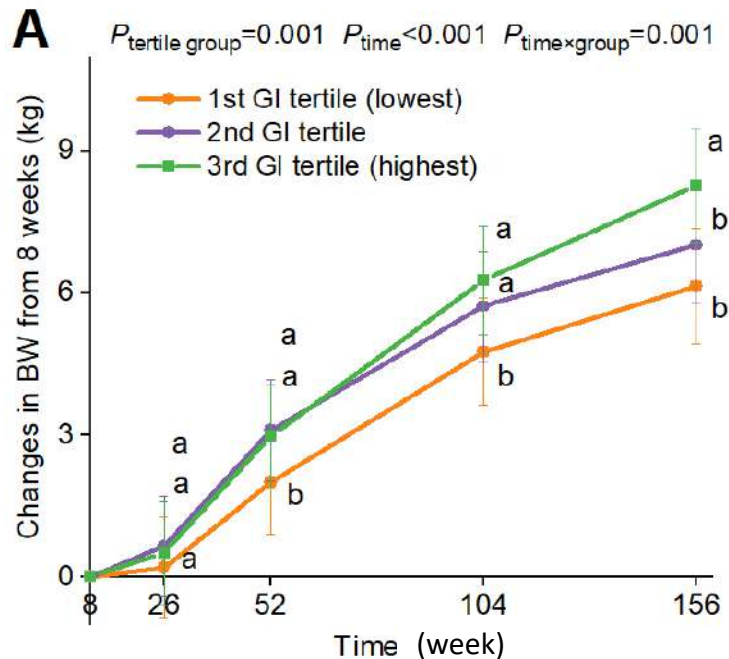
Longitudinal associations with GI and GL

- A secondary pooled observational analysis
- 3-year weight loss maintenance phase
- n = 1280 participants with 4-day dietary records
- At 6, 12, 18, 24 and 36 months
- Multi-adjusted linear mixed models with repeated measurements
- Divided participants into tertiles of GI and GL

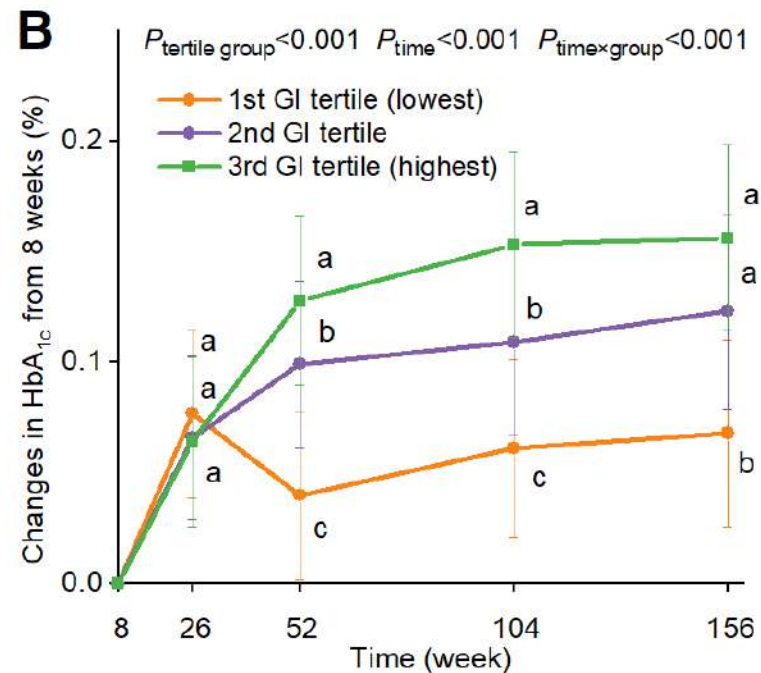
Dose-response relationships: Glycemic index, weight and HbA_{1c}



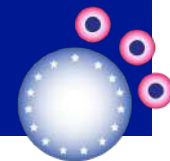
Body weight



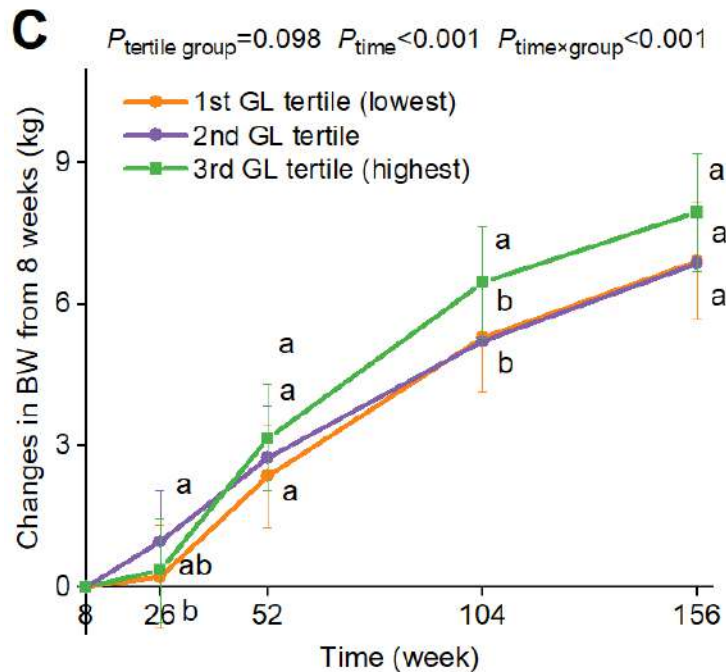
HbA_{1c}



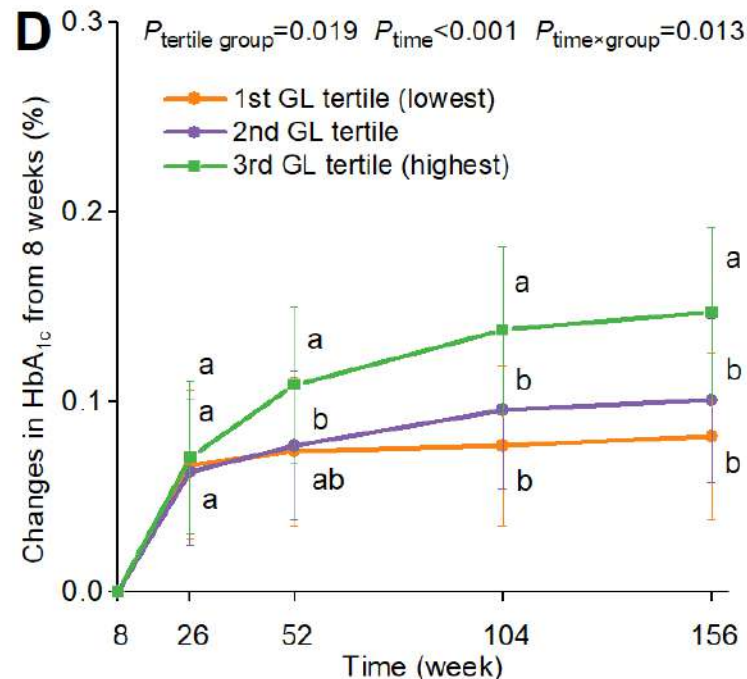
Dose-response relationships: Glycemic load, weight and HbA_{1c}



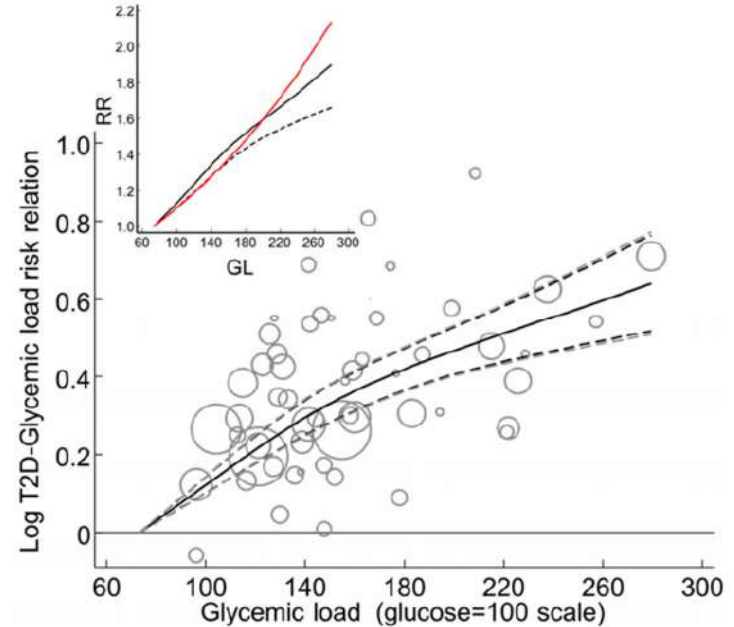
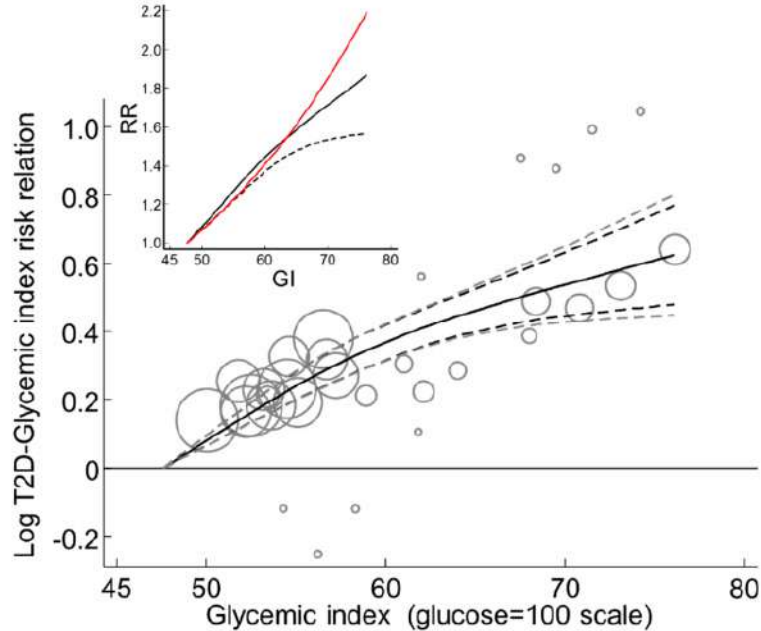
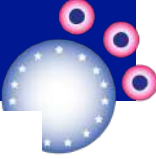
Body weight



HbA_{1c}



Meta-analysis of observational cohort studies on GI, GL and risk of T2D



In public health, GI and GL are substantial food markers predicting the development of T2D in persons of European and East Asian ancestry

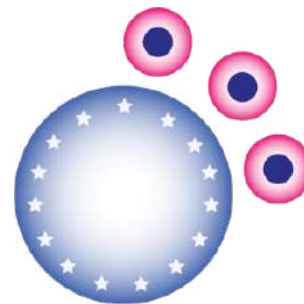
Conclusions

- PREVIEW achieved a remarkable reduction in T2D incidence (>75%)
- Reasons?
 - Large initial weight loss **using TMR** (average = 11% loss)
 - **Sustained** weight loss maintenance (1 in 2 maintained $\geq 5\%$ wt loss)
 - **Higher protein** intake in both groups (20%E at 3 y)
 - **Lower GI** and **GL diets** may facilitate larger reductions in **fat mass** and **HbA1c**



PREVIEW acknowledgements & funding

In particular, our cheerful, long-suffering participants



Danish Meat and Research Institute.
Food and Agricultural Organisation, DK



**GLYCEMIC
INDEX
FOUNDATION**
Making healthy choices easy



PREVIEW Project Information

- ✓ **Acronym:** PREVIEW
- ✓ **Project Name:**
PREVention of diabetes through lifestyle **I**ntervention and population studies in **E**urope and around the **W**orld
- ✓ **Grant Agreement no.:** 312057
- ✓ **Theme:** KBBE 2012.2.2-03; Impact of lifestyle on well-being and diet-related diseases.
- ✓ **Total budget:**14.1 mio € (9 mio from the EU)
- ✓ **Start date:** 1-Jan-2013
- ✓ **Final date:** 31-Dec-2017
- ✓ **Coordinator:** University of Copenhagen

