Online-Only Supplemental Material

SUPPLEMENTARY MATERIALS

Dietary Assessment

All data from food diaries were entered into national nutrient analysis software i.e., Dankost Pro (Denmark), AivoDiet (Finland), Mijn Eetmeter (the Netherlands), Nutritics (the U.K.), Dial (Spain), Nutrition Calculation (Bulgaria), and Foodworks (Australia and New Zealand) for further calculation.

Ascertainment of type 2 diabetes and cardiovascular disease incidence

Type 2 Diabetes was diagnosed based on the World Health Organization criteria (1): 1) an oral glucose tolerance test (75 g of glucose) with fasting plasma glucose>7.0 mmol/L and/or 2-h postprandial plasma glucose≥11.1 mmol/L, or 2) type 2 diabetes diagnosed by a medical doctor using random plasma glucose≥11.1 mmol/L in the presence of symptoms of diabetes, an oral glucose tolerance test or HbA_{1c}. Cardiovascular disease (CVD) was identified via self-reported serious adverse events and coded according to the World Health Organization International Classification of Diseases (ICD-10).

Statistical Analysis

Descriptive statistics were used to summarize characteristics for participants with available data, completers, and non-completers. The normality of the data was examined graphically using histograms and p-p plots. Continuous variables with approximately normal and non-normal distributions and categorical variables were presented as means ± standard deviation, median (25^{th}, 75^{th} percentiles), and counts and frequencies, respectively. Difference between completers and non-completers in characteristics was assessed by t-test for approximately normally-distributed variables, Wilcoxon non-parametric test for non-normally-distributed variables, and Chi-square test for categorical variables.

To best represent the long-term dietary and physical activity patterns of participants during WLM, a cumulative average method based on all available measurements of self-reported diet, protein intake from urinary nitrogen, and accelerometry-measured physical activity was used. In this calculation, the 26-week self-reported diet was related to yearly changes in anthropometric outcomes, body composition, and markers of glycemic status from 8 to 26 weeks (supplemental table 2); the average of the 26- and 52-week self-reported diets was related to yearly changes in weight and glycemic status-related outcomes from 8 to 52 weeks; the average of the 26-, 52-, and 104-week self-reported diets was related to yearly changes in weight and glycemic status-related outcomes from 8 to 104 weeks; the average of the 26-, 52-,104, and 156-week self-reported diets was related to yearly changes in weight and

glycemic status-related outcomes from 8 to 156 weeks. Cumulative average protein intake from urinary nitrogen and accelerometry-measured physical activity were calculated using the same method as diet.

In the above calculation, 26-week diet and physical activity was used to estimate the average self-reported dietary intake, protein intake from urinary nitrogen, and accelerometry-measured physical activity from 8 to 26 weeks, taking into account that: 1) dietary diaries were not collected at 8 weeks, ie, the end of phase 1 because dietary instruction in each arm had not started; and 2) we hypothesized that dietary intake did not change much at the start of WLM, ie, from 8 to 16 weeks, because participants were still being given the dietary composition and food choice guidance eg, daily eating plans and cook books (2). By 26 weeks, we assumed their diet would closest to the target of each arm. In addition, a total of 17 group visits, with decreasing frequency as the study progresses, were held throughout the trial to improve diet and physical activity modification (3). High-frequency lifestyle modification visits (6 visits) were conducted from 8 to 26 weeks to improve compliance.

Time-dependent Cox non-proportional-hazard regression models were used to evaluate the association of Gl, GL, and fiber with type 2 diabetes or CVD incidence. The models were adjusted for the same confounders, except for weight-related or glycemic outcomes at 8 weeks, in the linear mixed models.

References

1. http://www.who.int/diabetes/publications/diagnosis_diabetes2006/en/. Accessed July 19, 2017

2. Fogelholm M, Larsen TM, Westerterp-Plantenga M, Macdonald I, Martinez JA, Boyadjieva N, Poppitt S, Schlicht W, Stratton G, Sundvall J. PREVIEW: prevention of diabetes through lifestyle intervention and population studies in Europe and around the world. design, methods, and baseline participant description of an adult cohort enrolled into a three-year randomised clinical trial. Nutrients 2017;9:632

3. Kahlert D, Unyi-Reicherz A, Stratton G, Meinert Larsen T, Fogelholm M, Raben A, Schlicht W. PREVIEW behavior modification intervention toolbox (PREMIT): a study protocol for a psychological element of a multicenter project. Front Psychol 2016;7:1136

Supplementary Table 1 Glycemic index (GI) databases

Intervention center	GI database
Denmark (University of Copenhagen)	The GI data were derived from a number of sources, including Diogenes GI Table–Danish foods, PREVIEW generic GI list* and www.glycemicindex.com
Finland (University of Helsinki)	The GI data were derived from the databases in following hierarchy: a. The National (Finnish) GI Database produced by National Institute for Health and Welfare b. PREVIEW generic GI list c. University of Sydney online GI database: www.glycemicindex.com/index.php d. Other published GI values available
The Netherlands (University of Maastricht)	The GI data were derived from PREVIEW generic GI list, GI Foundation GI database†, University of Sydney online GI database, and Other published GI values available
The U.K. (University of Nottingham)	The GI data were derived from the local database Diogenes GI Table–UK foods, then the PREVIEW generic GI list, then other resources with the exception of the University of Sydney online GI database and GIF databases
Spain (University of Navarra)	The GI data were calculated automatically by the software, using the GI data from the GI Foundation as source
Bulgaria (Medical University of Sofia)	The GI data were derived from the local database Diogenes GI Table–UK and Greece foods, PREVIEW generic GI list, GI Foundation GI database, University of Sydney online GI database, and other resources
Australia (University of Sydney)	The GI data were derived from University of Sydney online GI database
New Zealand (University of Auckland)	The GI data were derived from University of Sydney online GI database

*The generic food list includes GI values for 150 food items that are considered the same from country to country. Using this generic food list can increase consistency within the cohorts. †The GI Foundation GI database is an Australian database consisting of 5,650 food items, that is more subjective because many foods were never tested and therefore assigned a value that was considered appropriate, albeit by two experts in the area.

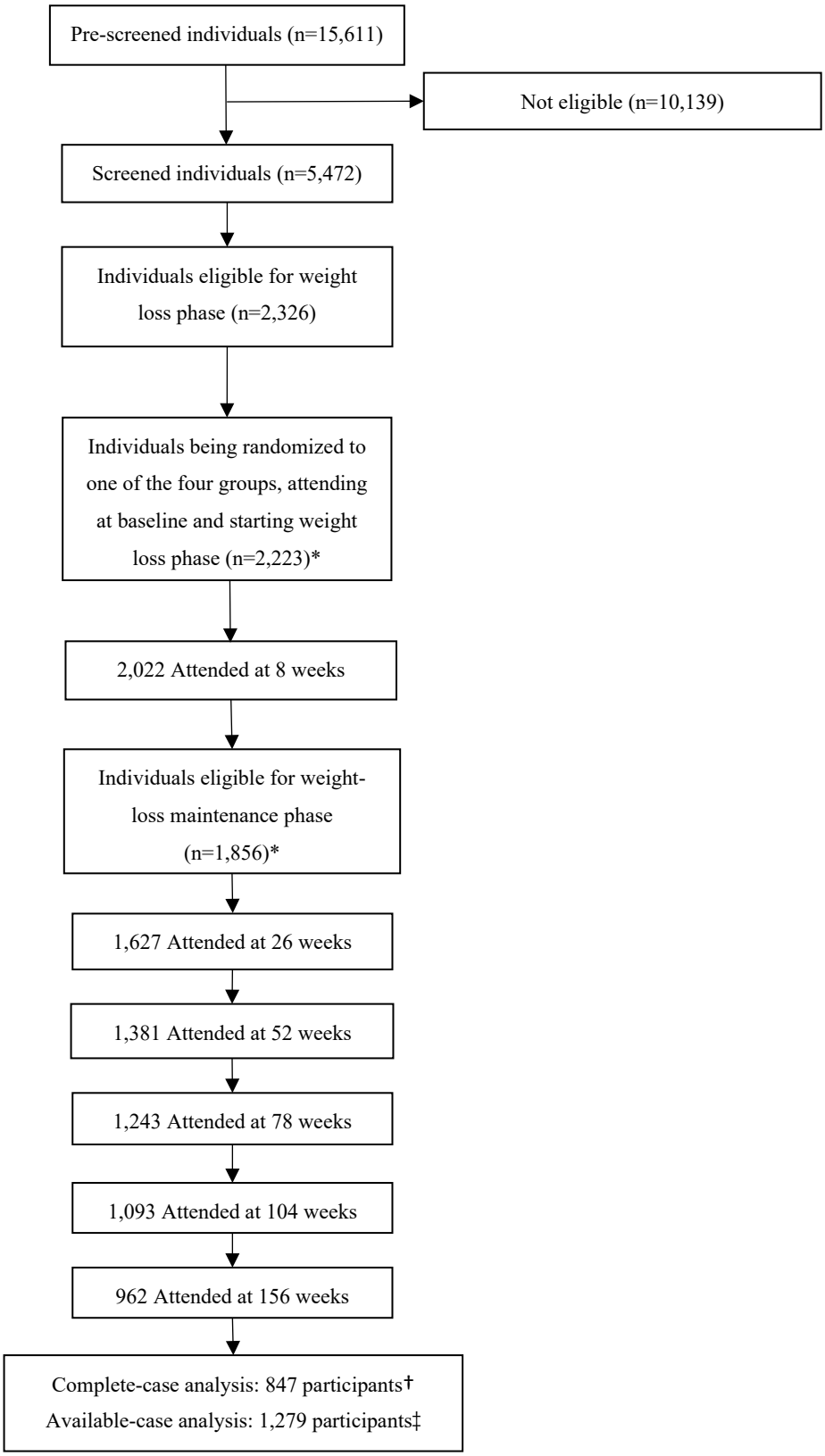
Supplementary Table 2 Calculations for cumulative average dietary intake, physical activity, yearly changes in body weight and markers of glycemic status, and tertiles of dietary glycemic index (GI), glycemic load (GL), and fiber

Intervals	Cumulative average dietary intake and protein intake from urinary nitrogen	Cumulative average physical activity	Yearly changes in body weight and markers of glycemic status	Tertiles of GI, GL, and fiber
8–26 weeks	Values at 26 weeks	Values at 26 weeks	Values at 26 weeks - values at 8 weeks	The division of tertiles was based on cumulative average GI, GL, and fiber at 8–26 weeks
8–52 weeks	(Values at 26 weeks + values at 52 weeks)/2	(Values at 26 weeks + values at 52 weeks)/2	Values at 52 weeks - values at 8 weeks	The division of tertiles was based on cumulative average GI, GL, and fiber from 8–52 weeks
8–104 weeks	(Values at 26 weeks + values at 52 weeks + values at 104 weeks)/3	(Values at 26 weeks + values at 52 weeks + values at 104 weeks)/3	Values at 104 weeks - values at 8 weeks	The division of tertiles was based on cumulative average GI, GL, and fiber from 8–104 weeks
8–156 weeks	(Values at 26 weeks + values at 52 weeks + values at 104 weeks + values at 156 weeks)/4	(Values at 26 weeks + values at 52 weeks + values at 104 weeks + values at 156 weeks)/4	Values at 156 weeks - values at 8 weeks	The division of tertiles was based on cumulative average GI, GL, and fiber from 8–156 weeks

Supplementary Table 3 Hazard ratios (HR and 95% CI) for type 2 diabetes and cardiovascular disease according to glycemic index (GI), glycemic load (GL), and fiber (n=1279)

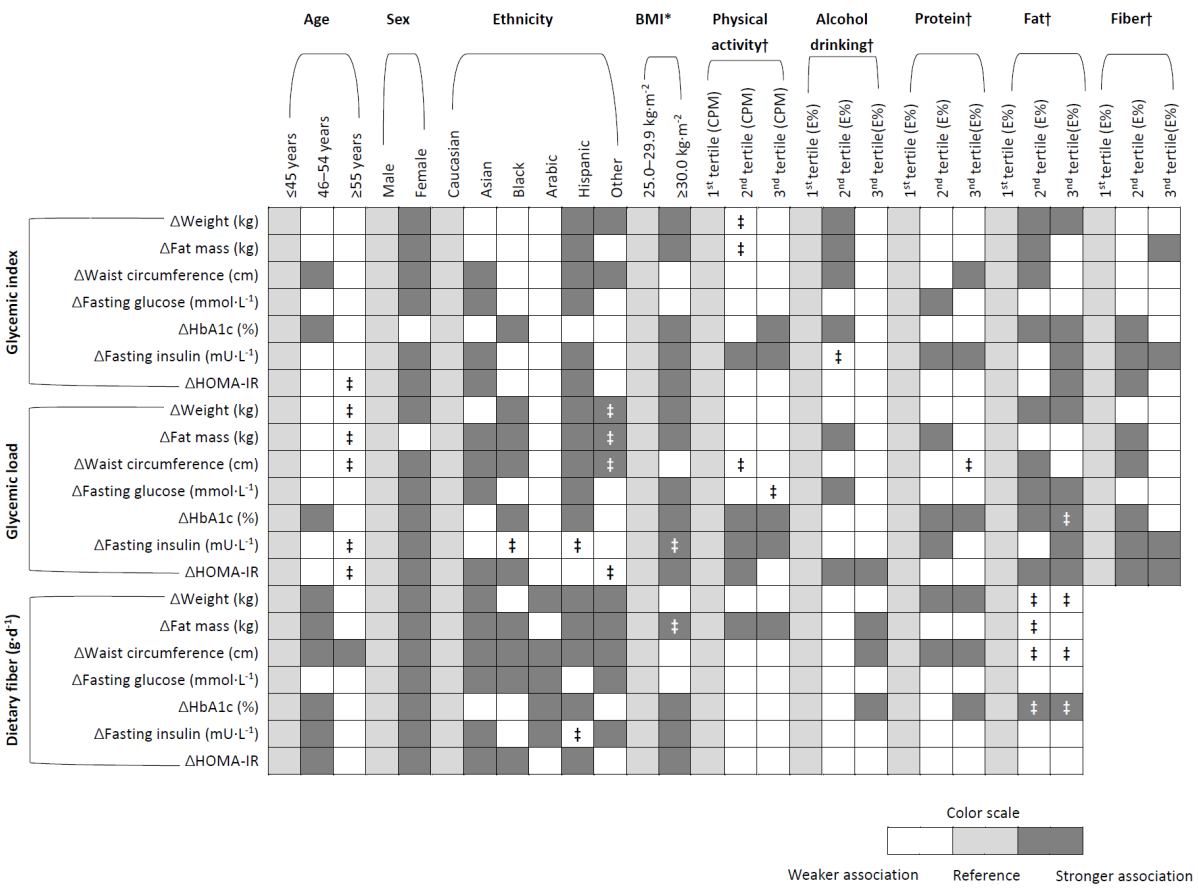
	GI		GL		Fiber	
	HR (95% CI)*	*P*-value	HR (95% CI)*	*P*-value	HR (95% CI)*	*P*-value
Type 2 diabetes						
Model 1	1.32 (0.63, 2.77)	0.463	1.00 (0.78, 1.28)	0.999	0.85 (0.48, 1.51)	0.575
Model 2	2.81 (0.81, 9.68)	0.103	3.41 (1.02, 11.37)	0.046	0.28 (0.06, 1.31)	0.106
Model 3	2.69 (0.77, 9.40)	0.122	3.24 (0.94, 11.10)	0.062	0.28 (0.06, 1.36)	0.114
Cardiovascular disease						
Model 1	0.55 (0.21, 1.49)	0.241	1.00 (0.78, 1.28)	0.491	0.73 (0.31, 1.72)	0.474
Model 2	0.34 (0.10, 1.14)	0.081	0.38 (0.12, 1.19)	0.097	1.57 (0.11, 22.63)	0.739
Model 3	2.70 (0.47, 15.50)	0.107	0.40 (0.13, 1.30)	0.129	1.67 (0.13, 22.03)	0.698

Analyses were performed using a time-dependent Cox non-proportional-hazard regression model. Model 1 was adjusted for age, sex, ethnicity, BMI at 8 weeks, and intervention center. Model 2 was additionally adjusted for accelerometry-measured physical activity and self-reported energy intake (kcal·day^{-1}) and dietary components including percentage of energy from fat, protein, carbohydrate or fiber, and alcohol (all in E%). Model 3 was additionally adjusted for changes in body weight. *HR per 10-unit increment in GI or 20-unit increment in GL or 10-g·day^{-1} increment in fiber.

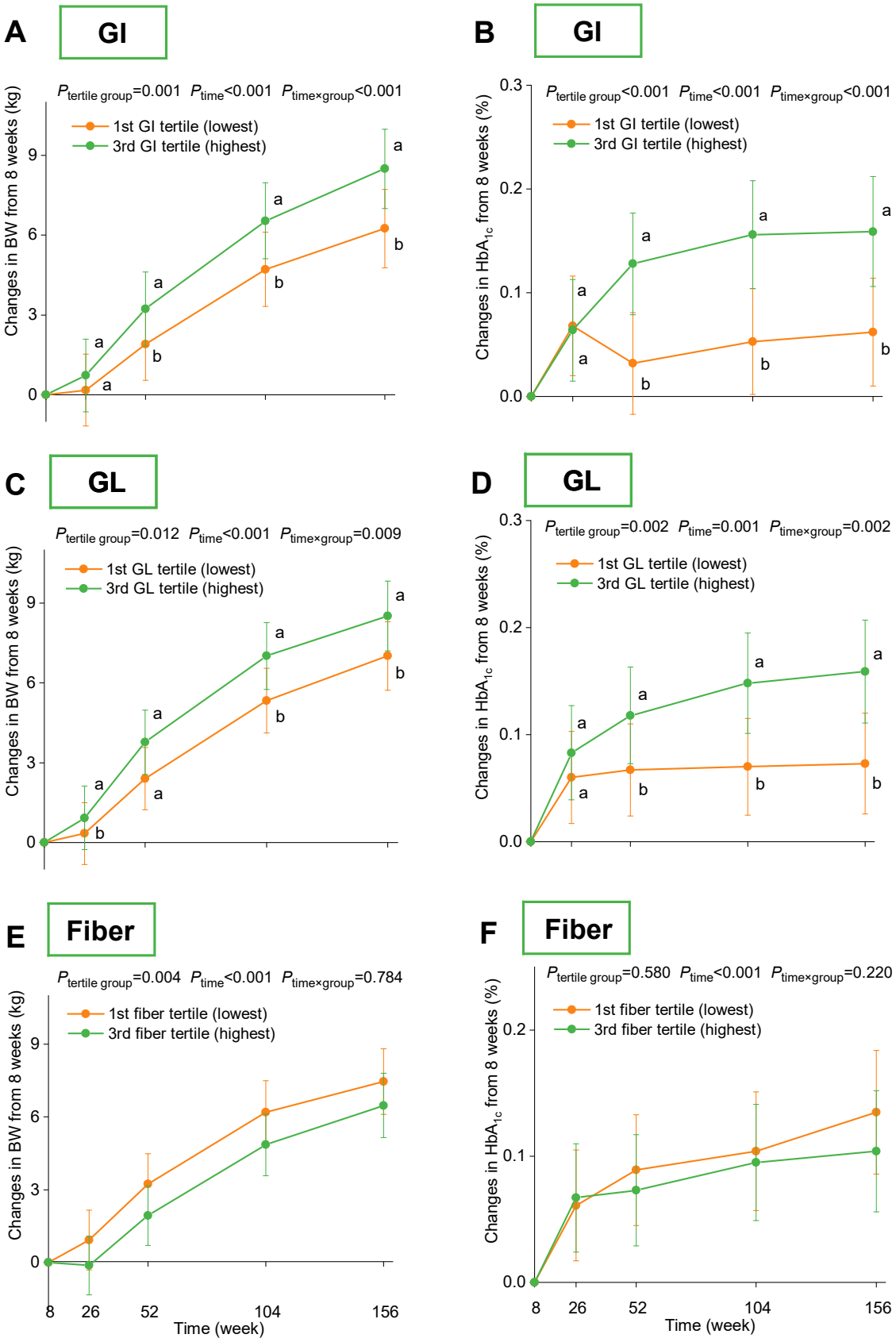


Supplementary Figure 1 Study flow diagram. *A total of 2,224 participants started the weight loss and 1,857 started weight-loss maintenance phases, but one withdrew consent and requested data deletion. †115 completers with unavailable GI and fiber data and/or implausible energy intake data (<600 or >3,500 kcal·day^{-1} for women and <800 or >4,200 kcal·day^{-1} for men) were excluded. ‡578 participants entering weight-loss maintenance

phase with unavailable GI and fiber data and/or implausible energy intake data (<600 or >3,500 kcal·day^{-1} for women and <800 or >4,200 kcal·day^{-1} for men).

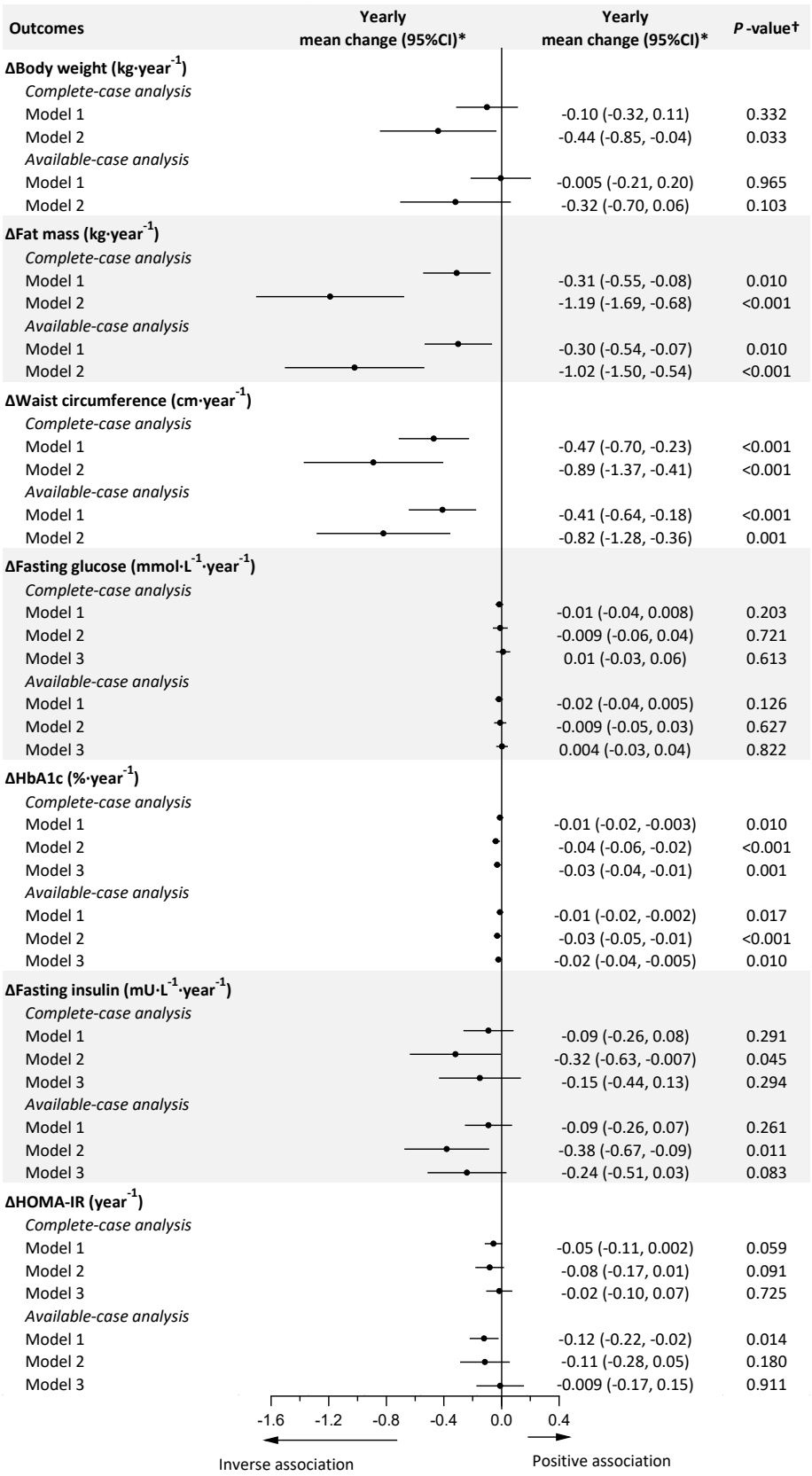


Supplementary Figure 2 Heatmap of longitudinal associations of cumulative average glycemic index (GI), glycemic load (GL), and fiber intake with yearly weight regain and changes in markers of glycemic status during weight-loss maintenance, stratified by age, sex, ethnicity, BMI at the start of weight-loss maintenance (8 weeks), accelerometry-measured physical activity, and self-reported dietary intake. Analyses were performed using a linear mixed model with repeated measurements adjusted for age, sex, ethnicity, anthropometric outcomes or body composition or markers of glycemic status at 8 weeks, BMI at 8 weeks, time-varying accelerometry-measured physical activity and time-varying self-reported energy intake (kcal·day^{-1}) and dietary components including percentage of energy from fat, protein, fiber, and alcohol (all in E%) as fixed effects and intervention center and participant-ID as random effects. For markers of glycemic status, the models were additionally adjusted for time-varying yearly weight change. Dietary GI or GL or fiber by subgroups interaction terms were added into the model. *Participants were stratified by BMI at 8 weeks. †Participants were stratified by accelerometry-measured physical activity and self-reported dietary intake at each time point. ‡Significant differences in associations between the reference group and others. BMI, body mass index; CPM, counts per minute; HbA_{1c}, glycosylated hemoglobin A_{1c}; HOMA-IR, homeostatic model assessment of insulin resistance.



Supplementary Figure 3 Changes in body weight and markers for glycemic status overtime during weight-loss maintenance by highest and lowest tertiles of cumulative average glycemic index (GI), glycemic load (GI), and fiber. Values are estimated marginal mean and 95% CI in changes in BW (kg) (A) and HbA_{1c} (%) (B) by GI

tertiles, changes in BW (kg) (C) and HbA_{1c} (%) (D) by GL tertiles, and changes in BW (kg) (E) and HbA_{1c} (%) (F) by fiber tertiles. Analyses were performed using a linear mixed model with repeated measurements adjusted for age, sex, ethnicity, anthropometric outcomes or body composition or markers of glycemic status at the start of weight-loss maintenance (8 weeks), BMI at 8 weeks, time, time-varying accelerometry-measured physical activity, and time-varying self-reported energy intake ($kcal \cdot day^{-1}$) and dietary components including percentage of energy from fat, protein, fiber or carbohydrate, and alcohol (all in E%) as fixed effects and participant-ID and intervention centre as random effects. For markers of glycemic status, the models were additionally adjusted for time-varying weight change. Time by tertile group interaction terms were added. Main effects, time effects, and tertile by group interaction were reported. *Post hoc* analyses with pairwise comparisons were performed to compare the tertiles at each time point, where appropriate. Values with the different lowercase letters (a and b) were significantly different, $P<0.05$. BMI, body mass index; BW, body weight; HbA_{1c}, glycosylated hemoglobin A_{1c}.



Supplementary Figure 4 Longitudinal associations of cumulative average fiber intake (each 10 g·day^{-1}) with yearly weight regain and changes in markers of glycemic status during weight-loss maintenance. Analyses were performed using a linear mixed model with repeated measurements. Model 1 was adjusted for age, sex, ethnicity, weight- or glycemic status-related outcomes at the start of weight-loss maintenance (8 weeks), BMI at

8 weeks, and time as fixed effects and intervention center and participant-ID as random effects. Model 2 was additionally adjusted for time-varying accelerometry-measured physical activity and time-varying self-reported energy intake (kcal·day^{-1}) and dietary components including percentage of energy from fat, protein, carbohydrate, and alcohol (all in E%). Model 3 was additionally adjusted for time-varying yearly changes in body weight. *Yearly mean change and 95% CI indicating the amount of increase in anthropometric outcomes or body composition or markers of glycemic status increased per year by 10-g·day^{-1} increment in fiber. †*P*-values for main effects. BMI, body mass index; HbA_{1c}, glycosylated hemoglobin A_{1c}; HOMA-IR, homeostatic model assessment of insulin resistance.

Appendices

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