

## **Adherence to *a priori* dietary indexes and baseline prevalence of cardiovascular risk factors in the PREDIMED-Plus randomised trial**

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## **Abstract**

**Purpose:** Cardiovascular disease remains the global leading cause of death. We evaluated at baseline the association between the adherence to 8 *a priori* high-quality dietary scores and the prevalence of individual and clustered cardiovascular risk factors (CVRF) in the PREDIMED-Plus cohort.

**Methods:** All PREDIMED-Plus participants (6874 men and women aged 55 to 75 years, with overweight/obesity and metabolic syndrome) were assessed. The prevalence of 4 CVRF (hypertension, obesity, diabetes and dyslipidaemia), using standard diagnoses criteria, were considered as outcomes. The adherence to 8 *a priori* defined dietary indexes was calculated. Multivariable models were fitted to estimate differences in mean values of factors and prevalence ratios for individual and clustered CVRF.

**Results:** Highest conformity to any dietary pattern did not show inverse associations with hypertension. The modified Mediterranean Diet Score (PR=0.95; 95% CI 0.90-0.99), Mediterranean Diet Adherence Score (MEDAS) (PR=0.94; 95% CI 0.89-0.98), the pro-vegetarian dietary pattern (PR=0.95; 95% CI 0.90-0.99) and the Alternate Healthy Eating Index 2010 (PR=0.92; 95% CI 0.87-0.96) were inversely associated with prevalence of obesity. We identified significant inverse trend among participants who better adhered to the MEDAS and the Prime Diet Quality Score in the mean number of CVRF across categories of adherence. Better adherence to several high-quality dietary indexes was associated with better blood lipid profiles and anthropometric measures.

**Conclusions:** Highest adherence to dietary quality indexes, especially Mediterranean-style and PDQS scores, showed marginal associations with lower prevalence of individual and clustered CVRF among elderly adults with metabolic syndrome at high risk of cardiovascular disease.

**Keywords:** Hypertension; Obesity; Diabetes mellitus; Dyslipidemias; Dietary pattern; Mediterranean diet

## Introduction

Cardiovascular disease (CVD) remains the top cause of death and burden of disease, with an estimated global prevalence of 422 million cases in 2015 [1]. Several major causal risk factors for CVD have been identified, including hypertension, type 2 diabetes (T2D), dyslipidaemia, obesity and cigarette smoking [2-4], and higher burden of risk factors is associated with a rising lifetime risk for CVD [5,6]. According to the most important previous population-based study which assessed a representative sample of the Spanish population, the estimated prevalence of hypertension in Spain was 33.1%, the prevalence of dyslipidaemia was 50.3%, the prevalence of T2D was 6.9% and the prevalence of obesity was 23% [7,8].

In the past years, there has been an increasing interest in studying holistic dietary approaches to disease prevention [9]. The use of hypothesis-oriented (*a priori*) dietary scores based on available evidence is appealing, as they capture dietary complexity, circumvent nutritional individual confounders by including them in the score, and capture possible effect modification among nutritional variables. The approach to build these patterns consists in summarizing the diet by means of a single score that results from a function of different components (foods, food groups or a combination of food and nutrients), that are selected based on prior knowledge or scientific evidence [10,11]. Limitations of this approach are the equal weight usually given to each component of the diet scores, thus assuming the same importance for each of them, and its inability to explain the physiological processes mediating its health effects [12].

Several investigations have documented the benefits of adhering to dietary patterns as defined by *a priori* diet-quality index scores. In the Mediterranean SUN cohort, greater adherence to a pro-vegetarian pattern or a DASH-style diet was associated to reduced risk of metabolic syndrome [13]. In 3 distinct US cohorts, better conformity to 4 high-quality dietary indexes showed consistent inverse associations with all-cause and CVD mortality [14-16], and individuals with higher scores, compared to those with lower ones in 3 out of 4 indexes showed a significant lower incidence of T2D in a multi-ethnic cohort [17].

However, despite the above-cited evidence, investigations focused on studying the associations of a broad range of *a priori* dietary indexes with cardiovascular risk in the same sample are still scarce. Therefore, within the framework of the PREDIMED-Plus trial, we cross-sectionally examined the association between adherence to 8 *a priori* high-quality dietary scores and the baseline prevalence of individual and clustered cardiovascular risk factors (CVRF), including hypertension, T2D, obesity, and dyslipidaemia.

## Material and methods

The PREDIMED-Plus [18] is a six-year, multicentre, parallel-group, randomised trial of combined dietary and physical activity intervention for primary CVD prevention in individuals with metabolic syndrome. The Research Ethics Committees of all participating institutions approved the study protocol, which followed the standards of the Declaration of Helsinki, including written informed consent provided by all participants. The trial was registered in 2014 at the International Standard Randomized Controlled Trial Registry (ISRCTN89898870).

### *Participants and recruitment*

After the institutional review board of all participating institutions approved the study protocol, the selection process began by identifying names of potential participants from the records of more than 200 primary care health centres. The clinical records of these persons were individually reviewed to exclude those who did not meet eligibility criteria. Eligible participants were community-dwelling men and women aged 55-75 and 60-75 years, respectively, free of CVD at baseline, who were overweight or obese (body mass index [BMI]  $\geq 27$  and  $< 40$  kg/m<sup>2</sup>) and met at least 3 criteria for the metabolic syndrome (fasting glucose  $\geq 100$  mg/dl, triglycerides  $\geq 150$  mg/dl, HDL-cholesterol  $< 40$  mg/dl in men or  $< 50$  mg/dl in women, blood pressure  $\geq 130/85$  mmHg, abdominal obesity in a Caucasian population  $\geq 80$  cm in women and  $\geq 94$  cm in men, or in a South American population  $\geq 80$  cm in women and  $\geq 90$  cm in men) [19]. Participants with a documented history of previous cardiovascular disease, cancer, impossibility to follow the recommended diet (due to cultural beliefs, swallowing disorders, or other reasons) or those who had any other condition that may interfere with the adherence to the study protocol were excluded. Family doctors approached them via telephone call or during clinical visits, and if participants were interested in participating, a face-to-face interview was scheduled to explain the purpose and characteristics of the study. We recruited 6874 participants from October 2013 to December 2016 in 23 Spanish centres [18].

Participants were randomly allocated in a 1:1 ratio to an intensive weight-loss intervention group, based on an energy-restricted Mediterranean diet adapted to each participant needs in order to encourage their compliance, physical activity promotion and behavioural support, or a control group encouraged to adhere to an unrestricted-energy Mediterranean diet (MedDiet), without any advice to increase physical activity, and receiving conventional health care. In the present study, we excluded

participants out of the predefined energy intake limits by Willett (<500 or >3500 kcal for women, <800 or >4200 kcal for men) [20] (n=254).

This is a cross-sectional assessment conducted with the baseline data of the PREDIMED-Plus trial. Data from the present study were collected only at the baseline visit. This visit took place after a 4-week run-in period and immediately before subsequent randomization into the aforementioned groups. In this visit, anthropometric measurements (weight, height, waist and hip circumferences) and blood pressure were recorded, and biological samples (blood samples, morning spot urines samples and nail samples) were collected. Participants filled a general information questionnaire to collect information on medical history, family history and use of medication, a MedDiet questionnaire, and physical activity questionnaires. In this visit, participants underwent a physical activity evaluation, the chair test, which records the number of times a participant comes from a sit position to a full standing position in 30 seconds, and assess functional strength which approximates to the way the body works in everyday life. Participants assigned to the intervention group also received a pedometer to self-monitor the number of steps they walk each day [18].

#### *Dietary assessment*

Usual diet during the past year was assessed with a 143-item semi-quantitative food frequency questionnaire which was previously and repeatedly validated in Spain and assessed food habits in the past year [21-23]. Frequencies of consumption of the food items were reported on an incremental scale with 9 levels (never or almost never, 1-3 times/month, once per week, 2-4 times/wk, 5-6 times/wk, once per day, 2-3 times/d, 4-6 times/d, and >6 times/d). The questionnaire included the typical portion sizes (weights) for all food items. Reported frequencies of food consumption were converted into frequencies per day, and multiplied by the weight of the typical portion size indicated to obtain the intake in g/d [22]. The FFQ was completed by participants assisted by the dietitian, at baseline, in the third screening visit, at 6 months of follow-up, and yearly thereafter [18].

We tested 8 previously published dietary indexes. The Mediterranean Diet Score (MDS) included 9 components (8 food groups and a ratio of monounsaturated to saturated lipids), scored 0 or 1 point if their intake (measured in g/d) was below or above the sex-specific median [24]. The modified Mediterranean Diet Score (mMDS) and the Mediterranean-like Dietary Score (MLDS) were calculated according to the tertile distribution of food consumption, except for red wine [25]. We also computed the 14-point Mediterranean Diet Adherence Screener (MEDAS), previously used in the PREDIMED trial

[26]; the Pro-vegetarian food pattern (PVG), defined as a dietary index that tries to capture a preference for plant-derived foods instead of animal origin foods [27]; the Alternate Healthy Eating Index 2010 (AHEI-2010), based on foods and nutrients associated with lower risk of chronic disease in clinical and epidemiological investigations [28]; the Carbohydrate Quality Index (CQI), which estimates the quality of dietary carbohydrates [29]; and the Prime Diet Quality Score (PDQS), based on the Prime Screen questionnaire developed for clinical use to quickly assess diet quality [30]. Further information on the composition and calculations of these dietary indexes can be found in Online resource 1. We categorised participants according to their adherence to each of these dietary scores into rough quartiles of adherence (low, low-medium, medium-high and high adherence).

Given the current state of the art in nutritional epidemiology, that is focused in whole dietary patterns with several definitions of a high-quality dietary pattern, we included several of them (eight in total) to better appraise the effect of high-quality dietary patterns on CVRF and to be able to compare them. However, for the sake of brevity we selected 2 of them for the main manuscript and present the associations for the rest of them in the supplementary material.

#### *Measurements and outcomes*

A general questionnaire was used to obtain information on socio-demographic variables, smoking status, medical conditions (T2D), medication use, and family history of illness. Physical activity was measured using the validated Minnesota-REGICOR Short Physical Activity questionnaire [31]. Participants also underwent the 30-s chair stand test, a field test to assess functional strength which approximates to the way the body works in everyday life.

Anthropometric variables were measured by trained personnel according to the PREDIMED-Plus protocol. Weight and height were measured with high-quality electronic calibrated scales and a wall-mounted stadiometer, respectively. BMI was calculated by dividing the weight (kg) by height squared ( $m^2$ ). Obesity was defined as a BMI  $\geq 30$  kg/ $m^2$ . Waist circumference was measured halfway between the last rib and the iliac crest by using an anthropometric tape. All anthropometric variables were determined in duplicate, and the mean value of both measurements was used.

Blood pressure was measured in triplicate with a validated semi-automatic oscillometer (Omron HEM-705CP, the Netherlands) after 5 minutes of rest while the participant was in a seated position. A participant was considered hypertensive if the average of the three measurements of systolic blood

pressure was  $\geq 130$  mmHg or  $\geq 85$  mmHg for diastolic blood pressure, or if the participant reported use antihypertensive drugs.

Blood samples were collected after an overnight fast and stored at  $-80^{\circ}\text{C}$  in a central laboratory until analysis. Biochemical analyses were performed on fasting plasma glucose, total cholesterol, HDL-cholesterol and triglyceride concentrations in local laboratories using standard enzymatic methods. T2D was diagnosed by standard methods [32]. Current diabetes was defined as previous diagnosis of diabetes self-reported at inclusion, or baseline glycated haemoglobin (HbA1c)  $\geq 6.5$  %, use of antidiabetic medication, or having fasting glucose  $>126$  mg/dl in the screening visit (three contacts during the run-in period prior randomization where trained staff evaluated the likelihood of participants to attend the scheduled sessions and complete correctly the assessment tools. In these visits, anthropometric and biochemical measurements were recorded [18]) plus fasting glucose  $>126$  mg/dl at baseline visit. Dyslipidaemia was defined as having either hypercholesterolemia (total cholesterol  $\geq 240$  mg/dl) [33], or hypertriglyceridemia (total triglycerides  $\geq 150$  mg/dl), or low HDL-cholesterol ( $<40$  mg/dl in men or  $<50$  mg/dl in women).

#### *Statistical analysis*

We performed a descriptive analysis of general characteristics according to quartiles of adherence to each of the 8 dietary indexes. Categorical variables were presented as percentages, and compared with the Chi squared test. We tested quantitative variables for normality using the Shapiro-Wilk test, and given that most data were not normally distributed, quantitative variables were shown as medians and interquartile range (percentiles 25-75), and differences were tested with the Kruskal-Wallis test.

We fitted logistic regression models and, given the high prevalence of CVRF, instead of presenting the odds ratios (OR), we used a correction method [34] to estimate prevalence ratios (PR) and their 95% confidence intervals (95% CI). The correction calculates the PR as the quotient between the OR and a denominator comprised by  $[(1-P_0)+(P_0*OR)]$  where  $P_0$  is the prevalence in the reference category. As dependent variables we used each of the four binary variables (hypertension, T2D, obesity, and dyslipidaemia), or another binary variable representing the simultaneous presence of several clustered CVRF. The independent variable (adherence to each of the 8 dietary indexes) was categorized in roughly quartiles (low, low-medium, medium-high, and high), and it was introduced in the models by means of 3



dummy variables for the 3 upper levels, leaving the lowest category of adherence to each index as the reference.

Potential confounders included as covariates were sex, age, smoking status (current, former or never), family history of CVD, obesity and T2D (yes/no), total energy intake (kcal/d, continuous), physical activity (METs-min/week, continuous), educational level (primary or less, secondary, or university), marital status (married, yes/no), living alone (yes/no), being retired (yes/no), previous weight-loss through dieting (yes/no), and centre (categorised in quartiles by number of participants). We conducted further analyses additionally adjusting for use of anti-hypertensive medication and lipid lowering drugs. We used robust variance estimators to account for intra-cluster correlations in all regression models, considering as clusters the members of the same household, and adjusted for multiple testing, using the Simes' multiple testing procedure and showing the corrected p-values [35].

Tests of linear trends across quartiles of adherence to each of the 8 dietary indexes were conducted, assigning the median value of each quartile and considering them as continuous variables.

In addition, we fitted linear regression models with the adherence to the dietary indexes (measured as continuous variables) as the independent variable to estimate adjusted differences in mean levels of CVRF clinical measurements (blood pressure, fasting glucose levels, BMI, waist circumference, LDL-cholesterol, HDL-cholesterol and triglycerides levels) for 1 standard deviation (SD) difference in the respective dietary pattern. Additional linear regression models were fitted to assess the differences for 1 SD difference of intake of food groups (in g/d) positively scored in most indexes (vegetables, fruits, cereals, legumes, nuts, fish and olive oil, intake measured as continuous variables) in mean levels of CVRF clinical measurements.

All corrected p-values lower than 0.05 were considered statistically significant. Analyses were performed using STATA version 13.0 (StataCorp, College Station, TX, USA).

## **Results**

Per study protocol, most CVRF were highly prevalent: over 80% of participants were hypertensive, over 70% were obese, and over 90% had dyslipidaemia. Also, by study design nearly 30% of participants had T2D. In addition, 95.1% of participants had at least 2 CVRF, 66.6% had at least 3 CVRF, and 17.8% had all 4 clustered CVRF.

General characteristics of the study participants are shown in Table 1 and Online resources 2 to 4. Participants in the upper quartile of adherence to the 8 dietary indexes, compared to those in the lower

quartile, were more likely to be older, women (except in the MDS, where men showed greater conformity, and the mMDS and PVG, where no significant differences were found), prone to be more physically active, and more likely to report a family history of premature coronary heart disease (except in the MDS, mMDS, PVG and CQI, where no significant differences were shown). They also tended to have lower diastolic blood pressure (though the trend was reversed in the MDS and MEDAS), lower BMI (though the trend was reversed in the CQI) and triglycerides levels, and higher HDL-cholesterol levels.

Prevalence ratios for individual CVRF according to categories of adherence to the dietary indexes are presented in Tables 2 (MEDAS) and 3 (PDQS) and Online resources 5 to 10 (MDS, mMDS, MLDS, PVG, AHEI-2010 and CQI).

Participants who showed the highest adherence, compared to the lowest, did not show a significantly reduced prevalence of hypertension across any of the 8 dietary indexes evaluated.

Participants classified in the upper quartile of conformity to several high-quality dietary patterns, compared to those in the lowest quartile, showed significant inverse associations with obesity prevalence, and inverse linear trends across quartiles of adherence. The PRs were 0.95 (95% CI 0.90-0.99; corrected p for trend=0.048) for the mMDS (21-28 points vs.  $\leq 16$  points); 0.94 (95% CI 0.89-0.98; corrected p for trend=0.008) for the MEDAS (9-14 points vs.  $\leq 6$  points), 0.95 (95% CI 0.90-0.99; corrected p for trend=0.088) for the PVG (40-42 points vs.  $\leq 36$  points), and 0.92 (95% CI 0.87-0.96; corrected p for trend<0.001) for the AHEI-2010 (76-98 points vs.  $\leq 63$  points). However, participants who showed the highest adherence (compared to the poorest) to the other 4 indexes did not show a significantly lower prevalence of obesity.

No significant inverse associations were detected between closer adherence to any of the 8 dietary indexes and dyslipidaemia or T2D. Nevertheless, we found a significantly increased prevalence of T2D in participants with the highest adherence to the MLDS (PR=1.24; 95% CI 1.11-1.38; corrected p for trend=0.001), AHEI-2010 (PR=1.15; 95% CI 1.03-1.28; corrected p for trend=0.079), and CQI (PR=1.16; 95% CI 1.04-1.29; corrected p for trend=0.020).

When we assessed the mean number of risk factors across categories of adherence to each of the 8 high-quality dietary indexes, we only identified significant inverse trends among participants who better adhered to the MEDAS and the PDQS (Figs. 1 and 2).

To address a possible reverse causality bias by known baseline diabetes status (participants who had received a diagnosis of diabetes, especially those recently diagnosed, may tend to show better

adherence to healthy dietary patterns than non-diabetic participants), we conducted an additional analysis excluding T2D from the count of CVRF (but further adjusting for T2D). Our speculations about changes in dietary habits after a diabetes diagnosis are not in agreement with the results reported on lifestyle and diet by Chong *et al.* [36], but they are consistent with many other findings [37-39]. We found a reduced prevalence for having 2 or more clustered CVRF in participants who better adhered to the MEDAS (PR=0.97; 95% CI 0.95-0.99) and those who showed a medium-to-high adherence to the mMDS (PR=0.98; 95% CI 0.95-1.00), and PDQS (PR=0.98; 95% CI 0.96-1.00). In addition, participants who better adhered to the MLDS (PR=0.92; 95% CI 0.85-0.98), MEDAS (PR=0.90; 95% CI 0.84-0.95), AHEI-2010 (PR=0.90; 95% CI 0.84-0.96), and PDQS (PR=0.92; 95% CI 0.86-0.99) showed a significantly lower prevalence of having 3 clustered CVRF (Online resource 11).

To address the role of medication on dietary habits, we conducted an analysis additionally adjusting for use of anti-hypertensive medication and lipid lowering drugs. Our findings did not change substantially. However, those participants who had the highest adherence, compared to the poorest, to the MLDS (PR=0.93; 95% CI 0.86-0.98; corrected p for trend=0.026) showed a significantly reduced prevalence of hypertension (Online resource 12).

When we fitted linear regression models adjusted for the above-mentioned potential confounders, we found that only better conformity to the CQI was significantly associated with lower mean systolic blood pressure, with  $\beta=-1.063$  mmHg (-1.488 to -0.638; corrected p<0.001). On the contrary, a higher average systolic blood pressure was found for each 1-point SD for better adherence to the MEDAS ( $\beta=+0.523$  mmHg; 95% CI +0.112 to +0.933; corrected p=0.013). Likewise, participants with a better conformity to the CQI showed a lower average diastolic blood pressure ( $\beta=-0.485$  mmHg; 95% CI -0.724 to -0.246; corrected p<0.001), while higher diastolic blood pressure was observed for each 1-point SD higher adherence to the MDS ( $\beta=+0.426$  mmHg; 95% CI +0.174 to +0.677; corrected p=0.003) and MEDAS ( $\beta=+0.672$  mmHg; 95% CI +0.432 to +0.911; corrected p<0.001). Moreover, participants who showed better adherence to most dietary indexes had lower average BMI, waist circumference and triglycerides levels and higher average HDL-cholesterol levels, while we did not observe significant changes in average blood glucose and LDL-cholesterol levels across any of the dietary indexes evaluated (Online resource 13).

The individual assessment of each individual food component (amounts consumed, in g/d) with SBP among those foods which were positively scored in most dietary scores, showed that vegetables and

nuts exhibited the strongest inverse association among all these food items. Specifically, for each 1-SD in the consumption of vegetables, the observed average difference in SBP was  $-0.702$  mmHg; 95% CI  $-1.124$  to  $-0.279$ ; corrected  $p=0.003$ , and for each 1-SD in the consumption of nuts the average difference in SBP was  $-0.552$  mmHg; 95% CI  $-0.972$  to  $-0.132$ ; corrected  $p=0.025$ . Moreover, only 1-point SD difference in the intake of vegetables was associated with a significant decrease in DBP ( $\beta=-0.384$  mmHg; 95% CI  $-0.625$  to  $-0.143$ ; corrected  $p=0.004$ ). A difference of 1-point SD of intake of nuts was associated with lower BMI ( $\beta=-0.244$  kg/m<sup>2</sup>; 95% CI  $-0.325$  to  $-0.164$ ; corrected  $p<0.001$ ). Also, higher intake of nuts ( $\beta=-0.604$  cm; 95% CI  $-0.817$  to  $-0.391$ ; corrected  $p<0.001$ ) and fruits ( $\beta=-0.310$  cm; 95% CI  $-0.530$  to  $-0.090$ ; corrected  $p=0.013$ ) reduced average waist circumference. In addition, increased intakes of vegetables and fish were associated with higher average levels of HDL-cholesterol. No significant changes were observed according to differences (1-SD) in the intake of any food group and average blood glucose or triglycerides levels across any of the 8 dietary indexes evaluated (Online resource 14).

## Discussion

In this cross-sectional study of older participants with overweight or obesity and metabolic syndrome conducted within the framework of the PREDIMED-Plus trial, we found that participants who reported the highest adherence, compared to the poorest, to previously published high-quality dietary indexes, showed modest reductions in the prevalence of some individual or clustered CVRF.

We only found a lower hypertension prevalence in participants who had better adherence to the MLDS after adjusting for anti-hypertensive and lipid lowering medication, although paradoxically better conformity to the MDS and the MEDAS was associated with elevated average SBP and DBP in this cross-sectional assessment. When we assessed differences in median adherence to each pattern in participants who were and were not treated with anti-hypertensive medication, significant differences were found only in the median adherence to the MLDS across groups (data not shown). Therefore, to what extent anti-hypertensive medication might explain these findings remains uncertain. Several studies have reported that closer adherence to dietary patterns characterised by the high consumption of vegetables, fruit, nuts, whole grain cereals, legumes and fish, and low consumption of meat products showed favourable effects on blood pressure [40-42], presumably due to the consumption of polyphenol-rich foods and reduced intake of detrimental foods [43,44].

Participants with the highest levels of adherence to Mediterranean-style dietary indexes (mMDS and MEDAS), the AHEI-2010, and with moderate-to-high adherence to the PVG showed the lowest prevalence of obesity. Moreover, most of the 8 *a priori* dietary indexes evaluated were significantly related to lower average BMI and waist circumference, in line with prior studies. In a cross-sectional assessment of the PREDIMED trial, consistent inverse associations between adherence to the MedDiet and 3 indexes of obesity (BMI, waist circumference and waist-to-height ratio) were found [45]. In the EPIC-Italy prospective cohort study, highest adherence to a typical Italian Mediterranean diet, compared to poorest adherence, was associated with lower average weight gain and a reduced risk of becoming overweight or obese [46]. Similarly, the Healthy Eating Index (HEI) and its modified versions showed inverse associations with BMI and waist circumference [47]. We hypothesize that an increased consumption of low energy-dense foods (and extra virgin olive oil or nuts, despite their high energy-dense profile) [48], as well as fibre-rich foods that promote satiety and reduce energy intake [49], can account for the beneficial effects of these dietary patterns on obesity.

Despite the lack of significant associations between a higher adherence to the Mediterranean-style dietary indexes and dyslipidaemia, we observed positive associations between better conformity to the MedDiet (assessed with most Mediterranean-style scores) and higher HDL-cholesterol levels, which concurs with prior evidence. In a Spanish cohort, participants who better adhered to a MedDiet pattern showed improved plasma lipid profiles in comparison to participants with poorer adherence [50]. Likewise, in the PREDIMED trial, participants allocated to the interventions group with MedDiet enriched with either nuts or extra-virgin olive oil had improved lipoprotein profiles, with a shift towards less atherogenic patterns [51,52].

Though past investigations have consistently reported that adherence to healthy diets predicted a reduced risk for developing T2D [53-55], in our study we did not find any evidence of inverse associations between better conformity to any of the 8 dietary patterns assessed and lower plasma glucose levels, probably due to reverse causality bias, given the known diabetic status by participants at baseline. Moreover, when adherence was evaluated with the MLDS, AHEI-2010 and CQI indexes we found an increased prevalence of T2D, and the dose-response shape across quartiles of adherence in MLDS and CQI indexes showed a significant positive linear trend. Given the cross-sectional study design, these results suggest the possible existence of a reverse causation bias, i.e., participants with diabetes self-aware about their health status may adopt healthier lifestyles and consequently report better adherence to high-

quality dietary patterns. In addition, we cannot discard some social desirability effect, that can be present to some extent in self-reported dietary intakes [56]. Thus, participants may tend to present themselves in a more favorable way, reporting higher intake of beneficially-perceived food components, and lower intakes of supposedly detrimental food groups.

When excluding T2D from the considered CVRF, we found inverse associations between better conformity to high-quality dietary indexes and lower prevalence of all 3 remaining clustered CVRF. Our findings are in agreement with previous studies reporting that better adherence to healthy dietary patterns were associated with a lowered risk for exhibiting a clustering of CVRF or the metabolic syndrome [57-60].

Altogether, the MEDAS index showed the best performance among all evaluated dietary indexes. Participants who best adhered to the MEDAS showed the lowest prevalence of obesity. In addition, we found an inverse linear trend across quartiles of adherence in the mean number of CVRF. The beneficial synergistic combination of antioxidants, polyphenols (reducing vascular oxidative stress and inflammation), minerals, and phytochemicals [61,62], and the high content of dietary fibre (controlling glycemic and insulin responses because of its effects on gastric emptying and macronutrient absorption from the gut [63]) and n-3 polyunsaturated and monounsaturated fatty acids (with known anti-inflammatory effects, and also by means of increasing HDL-cholesterol and reducing triglycerides levels [64]) may explain the beneficial effect of plant-based dietary patterns on metabolic syndrome and its components.

The present study shows a variety of findings across dietary indexes and outcomes. This variety could be attributed to the variability across dietary scores because they included different components, and the different cut-off points. All this might lead to a variable within-subject degree of adherence depending on the index used [65].

A major strength of this study is the use of 8 previously published dietary indexes, widely used and recognized. However, our study also has limitations. First, the potential reverse causation bias is a major limitation inherent to the cross-sectional study design. Second, the study population, including older adults with the metabolic syndrome, limits the generalizability of our findings to younger or healthier populations. In addition, we did not use a specific adapted cut-off value to define obesity in this elderly population, and this issue is duly acknowledged. Other limitation was the possible seasonal variation in the dietary patterns of study participants. However, we did not expect great variations on

dietary patterns, as participants completed the FFQ taking into account the whole previous year. Finally, the use of self-reported dietary information might lead to some degree of misclassification.

To conclude, our findings suggest that some of the high-quality dietary patterns evaluated might be factors potentially useful for addressing CVRF, even when they are already present. Further longitudinal studies are necessary to establish the causal relationships between better conformity to these dietary patterns and cardiovascular risk.

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**Table 1.** General characteristics according to categories of adherence to the Mediterranean Diet Adherence Screener, Alternate Healthy Eating Index 2010 and the Prime Diet Quality Score in the PREDIMED-PLUS cohort [26,28,30].

Characteristics	Mediterranean Diet Adherence Screener (MEDAS)				Alternate Healthy Eating Index 2010 (AHEI-2010)				Prime Diet Quality Score (PDQS)			
	Low (≤6)	Low-medium (7)	Medium- high (8)	High (9-14)	Low (≤63)	Low-medium (64-69)	Medium- high (70-75)	High (76-98)	Low (≤19)	Low- medium (20-21)	Medium- high (22-24)	High (25-36)
n	2084	1370	1283	1883	1809	1683	1571	1557	2226	1359	1806	1229
Hypertension (%)	86.5	86.3	86.7	84.7	85.9	85.0	86.2	86.9	86.5	86.5	85.1	85.6
Diabetes (%)	28.2	31.4	27.6	29.0	27.5	30.1	27.9	30.5	28.9	31.9	28.2	26.9*
Obesity (%)	76.4	72.5	73.6	70.5*	76.0	75.0	72.4	69.6*	74.5	73.6	73.1	71.5
Dyslipidaemia (%)	92.5	90.7	90.9	90.2	91.9	90.7	90.6	91.3	91.6	91.5	90.4	91.1
Age (years) Median (IQR) <sup>a</sup>	64 (61-68)	65 (61-69)	65 (61-69)	65 (62-69)*	64 (60-68)	65 (61-68)	66 (62-69)	66 (62-70)*	64 (61-68)	65 (61-68)	65 (62-69)	65 (62-69)*
Women (%)	43.6	47.9	50.9	51.8*	34.9	48.1	54.4	57.7*	36.5	47.2	53.7	62.5*
Body-mass index (kg/m <sup>2</sup> ) Median (IQR)	32.5 (30.1-35.1)	32.1 (29.8-34.9)	32.3 (29.8-35.2)	32.3 (29.6-34.4)*	32.4 (30.1-35)	32.4 (30-35)	32.3 (29.7-35)	32.3 (29.5-34.4)*	32.3 (29.9-35)	32.2 (29.9-35)	32 (29.8-34.7)	32 (29.6-34.8)
Weight (kg) Median (IQR)	87.3 (78.9-97)	85.1 (77.5-94.4)	85.9 (77.0-94.9)	85.9 (75.6-93.1)*	88.8 (80.4-98)	86.1 (77.8-95.3)	84.5 (76.5-93.5)	84.5 (74.5-91.6)*	87.7 (79.5-96.9)	85.8 (77.8-94.6)	84.3 (76.2-93.9)	84.3 (74.5-92.4)*
Waist (cm) Median (IQR)	108 (102-115)	107 (101.3-114.3)	107 (101-114)	107 (100-112.3)*	108.7 (102.5-115.5)	107.3 (101.8-114.3)	106.5 (100.6-114)	106.5 (99.4-112)*	108.4 (102.3-115.5)	107 (101.8-114)	106 (100.3-113)	106 (99-112.5)*
Waist-to-height ratio Median (IQR)	66.0 (62.3-70)	65.7 (62.1-70)	65.8 (61.9-70.1)	65.8 (61.7-69.3)*	65.7 (62-69.9)	66 (62.3-70.1)	65.6 (61.8-70.1)	65.6 (61.8-69.2)*	66 (62.2-70.3)	65.7 (62.2-69.8)	65.5 (61.8-69.5)	65.5 (61.8-69.7)*
Smoking												
Current smoker (%)	14.8	12.0	11.9	10.3*	15.2	13.7	10.3	9.7*	15.8	12.1	11.0	8.4*
Former smoker (%)	43.0	43.6	43.1	43.7	48.9	43.7	40.3	39.6	45.9	44.3	42.5	38.9
Highest attained educational level												
Primary school or less	47.2	51.2	49.7	50.3*	43.1	48.8	53.7	53.0*	46.9	49.1	52.1	50.3*
Complete secondary	31.6	27.8	29.4	25.8	32.6	28.4	27.7	25.6	30.3	29.9	27.1	26.9
University	21.3	21.0	20.9	24.0	24.4	22.8	18.6	21.4	22.8	21.0	20.8	22.9
Non-European origin (%)	3.6	2.6	1.7	1.6*	3.7	2.1	2.0	1.9*	2.9	2.4	1.6	2.9*

Willingness to change diet Median (IQR)	3 (2-3)	3 (2-3)	3 (2-3)	3 (3-3)*	3 (2-3)	3 (3-3)	3 (3-3)	3 (3-3)	3 (2-3)	3 (3-3)	3 (3-3)	3 (3-3)
Married (%)	75.6	75.5	78.0	76.8	77.1	76.2	76.4	75.9	77.2	79.0	75.8	73.1*
Living alone (%)	12.0	11.2	13.2	13.0	10.8	11.9	13.2	13.7*	10.5	10.3	13.3	16.6*
Retired (%)	51.6	57.2	58.5	57.8*	53.2	55.3	56.4	58.9*	54.9	53.2	57.0	58.7*
Self-reported previous depression (%)	21.3	21.0	20.3	20.2	19.2	21.0	21.6	21.3	19.2	19.7	21.3	23.8*
Family history of premature CHD <sup>b</sup> (%)	14.0	17.9	17.1	18.4*	14.6	18.7	15.7	18.0*	14.2	16.2	17.9	19.9*
Family history of type 2 diabetes (%)	41.2	40.4	42.3	41.6	39.4	41.6	42.2	42.6	40.7	42.2	40.9	42.5
Family history of obesity (%)	49.2	50.1	48.2	49.4	48.7	50.0	48.2	50.0	48.6	47.8	49.8	51.2
Leisure time physical activity (METs <sup>c</sup> /min-week) Median (IQR)	1682 (839-3217)	1948 (879-3357)	1979 (920-3592)	1979 (1254-3984)*	1736 (839-3337)	1904 (865-3427)	2098 (1059-3580)	2098 (1119-3742)*	1727 (839-3197)	1958 (892-3484)	2098 (1049-3657)	2098 (1229-4005)*
Chair test (#/30 sec) Median (IQR)	13 (10-16)	13 (10-15)	13 (10-15)	13 (11-16)*	13 (11-16)	13 (11-15)	13 (10-15)	13 (11-16)*	13 (11-16)	13 (11-16)	13 (10-16)	13 (10-15)
Total energy intake (kcal/d) Median (IQR)	2355 (1994-2771)	2289 (1913-2688)	2304 (1948-2668)	2304 (1996-2719)*	2479 (2076-2900)	2294 (1912-2674)	2234 (1898-2636)	2234 (1991-2653)*	2371 (1999-2779)	2317 (1957-2737)	2318 (1983-2674)	2318 (1919-2653)*
Carbohydrate intake (%E <sup>d</sup> ) Median (IQR)	41.3 (36.7-46.1)	41.3 (36.5-45.9)	40.9 (36.5-45.8)	40.9 (35.4-44.3)*	41.6 (36.4-46.3)	41.3 (36.4-45.9)	41.2 (36.7-45.7)	41.2 (35.3-43.9)*	40.8 (35.8-45.5)	41.2 (36.3-46.1)	40.9 (36.4-45.6)	40.9 (36.4-45.1)
Protein intake (%E) Median (IQR)	16.0 (14.4-17.8)	16.3 (14.6-18.3)	16.6 (14.9-18.4)	16.6 (14.9-18.6)*	15.9 (14.2-17.8)	16.5 (14.7-18.4)	16.6 (14.9-18.4)	16.6 (15.0-18.5)*	15.5 (13.9-17.2)	16.3 (14.7-18.0)	16.7 (15.1-18.5)	16.7 (15.8-19.3)*
Fat intake (%E) Median (IQR)	39.2 (34.7-43.6)	39.3 (34.6-43.7)	39.0 (34.4-43.7)	39.0 (35.4-44.5)*	38.0 (33.8-42.4)	39.0 (34.2-43.4)	39.4 (35.0-43.9)	39.4 (36.8-45.6)*	39.6 (34.9-44.0)	39.2 (34.5-43.7)	39.4 (34.8-43.9)	39.4 (35.0-43.8)
Previous weight-loss dieting (%)	43.3	41.8	44.8	41.7	42.6	44.9	41.4	42.2	39.2	43.0	44.0	47.6*

\* p<0.05

<sup>a</sup> IQR: interquartile range, quartiles 25-75; <sup>b</sup> Family history of premature coronary heart disease assessed in screening phase with a positive answer by the participant to a question about a myocardial infarction in next of kin that was included in the general questionnaire; <sup>c</sup> MET: Metabolic equivalent of task; <sup>d</sup> E: energy intake



**Table 2.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to the Mediterranean Diet Adherence Screener (MEDAS) [26].

	Low ( $\leq 6$ ) n=2084	Low-medium (7) n=1370	Medium-high (8) N=1283	High (9-14) n=1883	Corrected p for trend
Hypertension, %	86.5	86.3	86.7	84.7	
Sex and age adjusted	1 (ref.)	0.99 (0.96-1.02)	1.00 (0.97-1.02)	0.97 (0.94-1.00)*	0.037
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.96-1.02)	1.00 (0.97-1.03)	0.97 (0.94-1.00)	0.124
Diabetes, %	28.2	31.4	27.6	29.0	
Sex and age adjusted	1 (ref.)	1.11 (1.00-1.23)	0.99 (0.88-1.10)	1.03 (0.93-1.14)	0.921
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.14 (1.02-1.26)	1.00 (0.89-1.12)	1.08 (0.98-1.20)	0.619
Obesity, %	76.4	72.5	73.6	70.5	
Sex and age adjusted	1 (ref.)	0.95 (0.91-0.99)*	0.96 (0.92-1.00)	0.92 (0.88-0.96)*	<0.001
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.95 (0.91-0.99)*	0.96 (0.92-1.01)	0.94 (0.89-0.98)*	0.008
Dyslipidaemia, %	92.5	90.7	90.9	90.2	
Sex and age adjusted	1 (ref.)	0.98 (0.96-1.00)	0.98 (0.96-1.00)	0.98 (0.95-1.00)*	0.023
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.95-1.00)	0.98 (0.96-1.01)	0.98 (0.96-1.00)	0.302

\* Corrected  $p < 0.05$

<sup>a</sup> Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), and node (categorised in quartiles by number of participants).

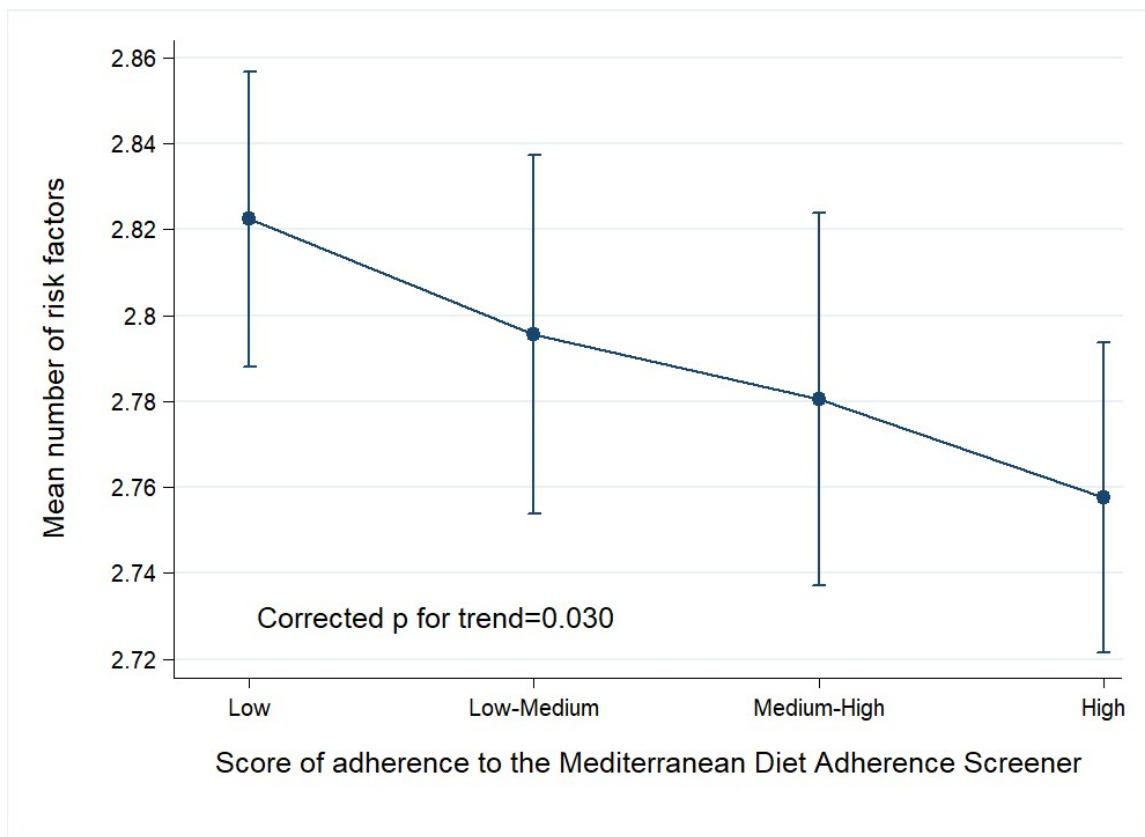
**Table 3.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to the Prime Diet Quality Score [30].

	Low ( $\leq 19$ )	Low-medium (20-21)	Medium-high (22-24)	High (25-36)	Corrected p for trend
	n=2226	n=1359	N=1806	n=1229	
Hypertension, %	86.5	86.5	85.1	85.6	
Sex and age adjusted	1 (ref.)	1.00 (0.97-1.03)	0.98 (0.95-1.00)	0.98 (0.95-1.01)	0.117
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.97-1.02)	0.98 (0.95-1.00)	0.98 (0.95-1.01)	0.218
Diabetes, %	28.9	31.9	28.2	26.9	
Sex and age adjusted	1 (ref.)	1.13 (1.02-1.25)*	1.01 (0.91-1.11)	0.98 (0.87-1.09)	0.625
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.13 (1.02-1.25)	1.02 (0.92-1.13)	1.00 (0.88-1.12)	0.954
Obesity, %	74.5	73.6	73.1	71.5	
Sex and age adjusted	1 (ref.)	0.98 (0.94-1.02)	0.97 (0.94-1.01)	0.95 (0.90-0.99)*	0.018
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.94-1.02)	0.98 (0.93-1.01)	0.95 (0.91-1.00)	0.101
Dyslipidaemia, %	91.6	91.5	90.4	91.1	
Sex and age adjusted	1 (ref.)	1.00 (0.97-1.02)	0.99 (0.96-1.01)	0.99 (0.97-1.01)	0.300
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.97-1.02)	0.99 (0.96-1.01)	0.99 (0.97-1.01)	0.572

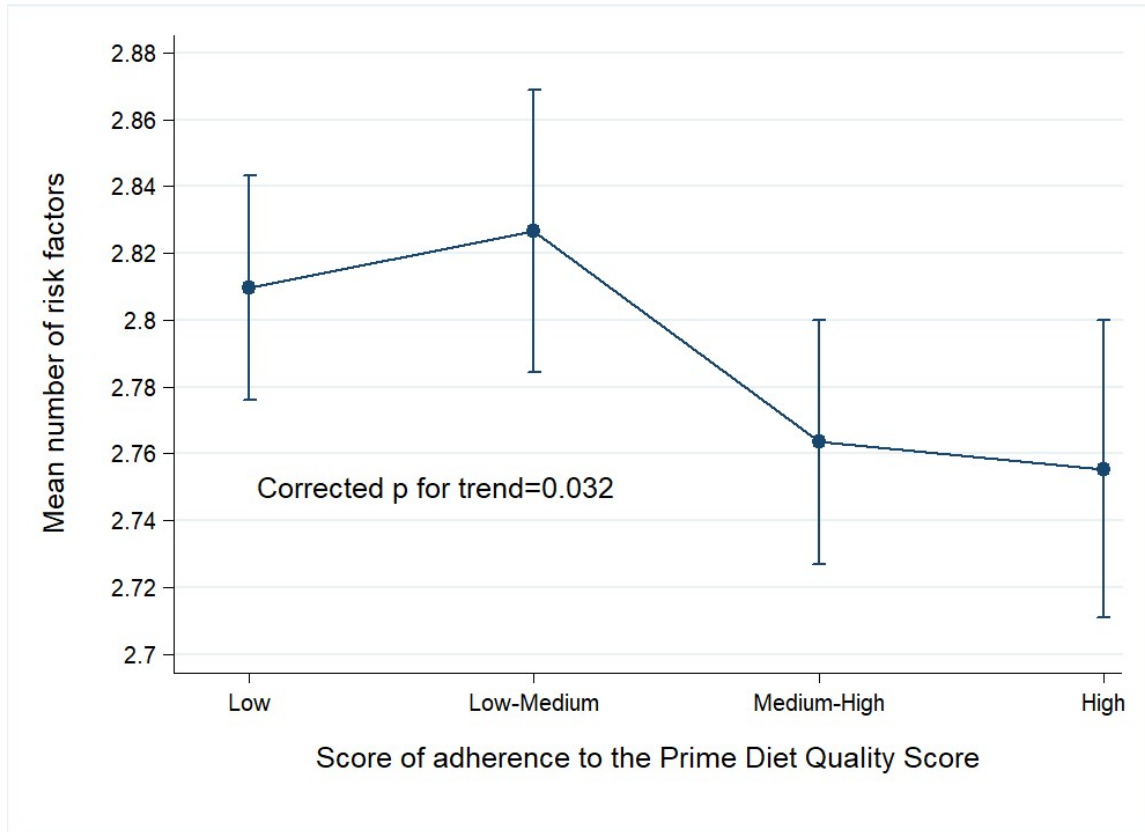
\* Corrected  $p < 0.05$

<sup>a</sup> Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), and node (categorised in quartiles by number of participants).

**Fig. 1** Mean number of cardiovascular risk factors (hypertension, T2D, obesity and dyslipidaemia) according to quartiles of adherence to the Mediterranean Diet Adherence Screener (MEDAS)



**Fig. 2** Mean number of cardiovascular risk factors (hypertension, T2D, obesity and dyslipidaemia) according to quartiles of adherence to the Prime Diet Quality Score (PDQS)



**Online resource 1.** Calculation of food patterns and dietary indexes.

<b>Index</b>	<b>Reference</b>	<b>Index calculation</b>	<b>Range</b>
MDS	[24]	To build the Mediterranean Diet Score, we assigned a value of 0 or 1 to each of 9 components with the use of the sex-specific median as the cut-off. For beneficial components (“vegetables”, “legumes”, “fruits and nuts”, “cereals”, “fish” and “ratio of monounsaturated to saturated fats”), participants whose consumption was below the median were assigned a value of 0, and a value of 1 if the consumption was at or above the median. On the contrary, for detrimental components (“meat, poultry” and “dairy products”), participants whose consumption was below the median were assigned a value of 1, and for those whose consumption was at or above the median were assigned a value of 0. For “ethanol”, a value of 1 was assigned to men who consumed 10-50 g/day and to women who consumed 5-25 g/day.	0-9
mMDS	[25]	This score was calculated according to tertile distribution of food consumption, except for “red wine”. For “cereals”, “fruit”, “vegetables”, “legumes”, “fish”, “olive oil” and “nuts”, the lowest tertile was scored 1 point, medium 2, and the highest tertile of consumption 3 points. For “meat” (including poultry and sausages) and “dairy products” the score was inverted (the highest tertile of consumption was scored 1 point, and the lowest 3). Moderate “red wine” consumption (up to 20 g/d) was scored 3 points, while exceeding this upper limit, or reporting no “red wine” consumption was coded as 0.	9-30
MLDS	[25]	This score was constructed by adding 3 food groups (“sugar-sweetened carbonated beverages and added sugars”, “pastries” and “fast food”) to the components of the mMDS. These food groups were scored inversely, as detrimental components. “High-fat dairy products” were omitted as a negative component, and “low-fat dairy products” were included in the beneficial food group. Also, “poultry” and “rabbit” were excluded from the “meat and sausage” food group.	12-39
MEDAS	[26]	This score consists of 12 questions on food consumption frequency and 2 questions on food intake habits considered characteristics of a Spanish Mediterranean diet. One point was given for: 1) using olive oil as principal source of fat for cooking, 2) preferring white meat over red meat, 3) consuming 4 or more tablespoons of olive oil/d, 4) 2 or more servings of vegetables/d, 5) 3 or more pieces of fruit/d, 6) <1 serving of red meat or sausages/d, 7) <1 serving of animal fat/d, 8) <1 cup of sugar-sweetened beverages/d, 9) 7 or more servings of red wine/wk, 10) 3 or more servings of pulses/wk, 11) 3 or more servings of fish/wk, 12) fewer than 2 commercial pastries/wk, 13) 3 or more servings of nuts/wk, 14) 2 or more servings/wk of a dish	0-14

		with a traditional sauce of tomatoes, garlic, onion or leeks sautéed in olive oil. Each question was scored 0 if the condition was not met.	
PVG	[27]	To build this score, we adjusted the consumption of 7 food groups from plant origin (“fruit”, “vegetables”, “nuts”, “cereals”, “legume”, “olive oil” and “potatoes”) and 5 food groups from animal origin (“added animal fats”, “eggs”, “fish”, “dairy products” and “meats and meat products”) for total energy intake by using the residual method separately for men and women. The energy-adjusted estimates were ranked according to their sex-specific quintiles. The quintile values for animal products were reversed (assigning 5 points for the first quintile, and successively until the value of 1 for the fifth quintile). Subsequently, the quintile values of plant foods and reverse quintile values of animal foods were summed.	12-60
AHEI-2010	[28]	11 food groups and nutrients (“vegetables”, “fruit”, “whole grains”, “sugar-sweetened beverages and fruit juice”, “nuts and legumes”, “red/processed meat”, “trans fat”, “long-chain (n-3) fats”, “polyunsaturated fats acids”, “sodium”, and “alcohol”), associated consistently with lower risk of chronic disease in clinical and epidemiological investigations, were scored from 0 (worst) to 10 (best) points. The rationale for scoring criteria and cut-offs was based on guidelines and literature. All scoring decisions were determined <i>a priori</i> .	0-110
CQI	[29]	To construct this score, we considered four criteria: the ratio of carbohydrates from whole grains to carbohydrates from total grains (“whole grains”, “refined grains” and “products prepared with refined flours”), the glycaemic index (negatively weighted), the ratio of solid carbohydrates to total (solid and liquid) carbohydrates, and total dietary fibre intake (g/d). We categorised each item into quintiles, and subsequently values of all four criteria were summed.	4-20
PDQS	[30]	To build this score, for consumption of healthy foods (“dark leafy green vegetables”, “cruciferous vegetables”, “carrots”, “other vegetables”, “whole citrus fruits”, “other whole fruits”, “legumes”, “nuts”, “poultry”, “fish”, “eggs”, “whole grains”, and “liquid vegetable oils”) we assigned 0 points for 0-1 serving/wk, 1 point for 2-3 servings/wk and 2 points for $\geq 4$ servings/wk. For unhealthy food groups (“red meat”, “potatoes”, “processed meat”, “whole milk dairy”, “refined grains and baked goods”, “sugar sweetened beverages”, “fried foods obtained away from home”, and “desserts and ice cream”) scoring was reversed (0 points for $\geq 4$ servings/wk, 1 point for 2/3 servings/wk, and 2 points for 0-1 serving/wk).	0-42

MDS: Mediterranean Diet Score; mMDS: Modified Mediterranean Diet Score; MLDS: Mediterranean-like Dietary Score; MEDAS: Mediterranean Diet Adherence Screener; PVG: Pro-vegetarian food pattern; AHEI-2010: Alternate Healthy Eating Index 2010; CQI: Carbohydrate Quality Index; PDQS: Prime Diet Quality Score.

**Online resource 2.** Additional characteristics according to categories of adherence to the Mediterranean Diet Adherence Screener, Alternate Healthy Eating Index 2010 and the Prime Diet Quality Score in the PREDIMED-PLUS cohort [26,28,30].

Characteristics	Mediterranean Diet Adherence Screener (MEDAS)				Alternate Healthy Eating Index 2010 (AHEI-2010)				Prime Diet Quality Score (PDQS)			
	Low (≤6)	Low-medium (7)	Medium-high (8)	High (9-14)	Low (≤63)	Low-medium (64-69)	Medium-high (70-75)	High (76-98)	Low (≤19)	Low-medium (20-21)	Medium-high (22-24)	High (25-36)
n	2084	1370	1283	1883	1809	1683	1571	1557	2226	1359	1806	1229
Total cholesterol (mg/dl) Median (IQR <sup>a</sup> )	195 (170-223)	193 (168-220)	196 (171-221)	196 (171-219)	195 (170-222)	195 (169-221)	193 (169-219)	193 (171-221)	194 (169-221)	195 (168-220)	195 (170-220)	195 (174-223)
LDL cholesterol (mg/dl) Median (IQR)	120 (98-144)	117 (95-139)	119 (98-142)	119 (98-141)	120 (99-143)	118 (97-141)	119 (97-141)	119 (97-143)	118 (97-143)	119 (96-141)	118 (98-140)	118 (99-145)
HDL cholesterol (mg/dl) Median (IQR)	46 (39-53)	47 (40-55)	47 (40-55)	47 (41-55)*	45 (38-53)	47 (40-55)	47 (40-54)	47 (41-56)*	46 (39-53)	46 (39-55)	47 (40-55)	47 (41-56)*
Triglycerides (mg/dl) Median (IQR)	142 (107-186)	137 (103-182)	136 (104-178)	136 (99-170)*	140 (107-184)	135 (102-180)	135 (103-179)	135 (100-172)*	140 (106-186)	137 (105-180)	132 (100-173)	132 (99-174)*
Fasting blood glucose (mg/dl) Median (IQR)	106 (96-122)	107 (97-124)	106 (94-121)	106 (96-120)	107 (96-122)	107 (96-124)	106 (95-121)	106 (96-122)	107 (96-123)	107 (96-124)	106 (95-121)	106 (95-119)*
Systolic blood pressure (mmHg) Median (IQR)	138.3 (128.3-148.7)	137.3 (128.3-148.3)	138.7 (128-150.7)	138.7 (128.3-150.7)	138 (128.7-149.3)	138.3 (128-149.3)	139 (128.1-149.7)	139 (128-149.7)	138.3 (128.3-149)	139.2 (128.7-150.3)	138.3 (128.3-150)	138.3 (127.3-148.3)
Diastolic blood pressure (mmHg) Median (IQR)	80.3 (73.7-87.3)	80.3 (74-87)	81.3 (74.7-88)	81.3 (74.7-87.3)*	81.7 (74.7-88.7)	80.7 (74.3-87)	80.7 (74-87.7)	80.7 (73.7-86)*	81 (74.3-87.7)	81.7 (74.7-88.3)	80.7 (73.7-87.3)	80.7 (74-86.3)*
Monounsaturated fatty acid (g/d) Median (IQR)	52.5 (41.8-62.1)	52.6 (40.5-62.6)	52.3 (41.2-62.9)	52.3 (44.5-66.9)*	53.6 (41.6-63.8)	51.8 (40.7-62)	52.3 (41.5-62.2)	52.3 (44.7-67)*	53.6 (42.4-63.9)	53 (41.3-63)	53.5 (42.6-63.7)	53.5 (41-63.4)
Polyunsaturated fatty acid (g/d) Median (IQR)	14.9 (11.5-19.1)	15.1 (11.8-19.8)	15.4 (12.2-20)	15.4 (13.4-21.7)*	14.2 (11.3-17.7)	14.2 (11.3-17.6)	15.4 (12.2-19.8)	15.4 (16.0-24.7)*	14.8 (11.8-19)	15 (11.9-19.3)	15.9 (12.6-20.7)	15.9 (13.3-22.1)*
Saturated fatty acid (g/d) Median (IQR)	27.2 (21.9-33.6)	24.9 (19.7-30.9)	24.3 (19.2-29.5)	24.3 (19.6-29.2)*	28.3 (22.3-34.7)	25 (20-30.7)	23.8 (19-29.3)	23.8 (19.3-28.7)*	27.3 (22.1-33.8)	25.2 (20.3-30.9)	24.3 (19.6-29.9)	24.3 (18.1-27.5)*
Dietary fibre intake (g/d) Median (IQR)	22.1 (18-27.5)	24.3 (19.5-30)	25.4 (20.6-31.6)	25.4 (22.5-33.8)*	20.8 (16.8-25.9)	23.4 (19.1-28.8)	25.6 (21.5-31.1)	25.6 (24.6-35.8)*	20.2 (16.5-24.4)	23.6 (19.9-28.5)	27.1 (22.7-32.4)	27.1 (26.8-38.8)*
Vegetables (g/d) Median (IQR)	262 (200-351)	303 (222-397)	309 (237-405)	309 (267-446)*	244 (189-319)	296 (229-378)	323 (245-420)	323 (285-479)*	242 (186-313)	298 (229-280)	335 (255-429)	335 (315-498)*
Fruits (g/d) Median (IQR)	281 (175-402)	314 (214-449)	341 (236-476)	341 (257-521)*	221 (140-326)	300 (211-422)	370 (265-499)	370 (324-557)*	242 (150-367)	314 (221-439)	361 (255-494)	361 (309-573)*
Legumes (g/d) Median (IQR)	16 (12-25)	16 (12-25)	21 (16-25)	21 (16-29)*	16 (12-25)	16 (12-25)	21 (16-25)	21 (16-29)*	16 (12-21)	16 (12-25)	21 (16-25)	21 (16-29)*
Cereals (g/d) Median (IQR)	125 (92-204)	125 (92-204)	125 (92-204)	125 (87-204)	196 (92-213)	125 (89-204)	119 (92-204)	119 (87-196)*	130 (92-204)	136 (92-204)	123 (92-204)	123 (87-200)*
Meat (g/d) Median (IQR)	152 (115-195)	138 (108-177)	135 (107-175)	135 (106-166)*	159 (120-204)	143 (112-178)	133 (105-167)	133 (98-161)*	149 (115-189)	142 (109-183)	137 (106-173)	137 (101-162)*
Fish (g/d) Median (IQR)	82 (57-115)	91 (64-124)	101 (72-132)	101 (81-146)*	85 (60-122)	95 (68-128)	99 (71-103)	99 (75-139)*	78 (56-110)	93 (64-123)	106 (77-137)	106 (87-153)*
Dairy products (g/d) Median (IQR)	305 (225-470)	303 (218-465)	306 (218-500)	306 (215-479)	312 (224-518)	303 (217-489)	302 (215-434)	302 (219-431)*	291 (214-431)	305 (224-468)	315 (221-500)	315 (221-519)*

Nuts (g/d) Median (IQR)	6 (2-13)	8 (2-21)	8 (4-25)	8 (6-30)*	4 (0-8)	6 (2-13)	13 (4-23)	13 (17-38)*	4 (2-12)	8 (2-17)	13 (4-28)	13 (8-32)*
Olive oil (g/d) Median (IQR)	35 (25-50)	50 (25-50)	50 (25-50)	50 (25-50)*	50 (25-50)	50 (25-50)	50 (25-50)	50 (25-50)	50 (25-50)	50 (25-50)	50 (25-50)	50 (25-50)
Alcohol intake (g/d) Median (IQR)	6 (1-15)	4 (1-13)	4 (1-14)	4 (1-16)	9 (2-26)	5 (1-15)	4 (1-12)	4 (1-11)*	7 (1-23)	4 (1-15)	4 (1-12)	4 (1-10)*

\* p<0.05

<sup>a</sup> IQR: interquartile range, quartiles 25-75



**Online resource 3.** General characteristics according to categories of adherence to the Mediterranean Diet Score, Modified Mediterranean Diet Score and Mediterranean-like Dietary Score in the PREDIMED-PLUS cohort [24,25].

Characteristics	Mediterranean Diet Score (MDS)				Modified Mediterranean Diet Score (mMDS)				Mediterranean-like Dietary Score (MLDS)			
	Low (≤3)	Low-medium (4)	Medium-high (5)	High (6-9)	Low (≤16)	Low-medium (17-18)	Medium-high (19-20)	High (21-28)	Low (≤22)	Low-medium (23-25)	Medium-high (26-27)	High (28-38)
n	2088	1541	1470	1521	1999	1639	1529	1453	1741	2000	1264	1615
Hypertension (%)	86.1	86.6	85.8	85.3	86.7	85.6	85.3	86.0	86.6	85.2	87.5	85.1
Diabetes (%)	29.5	28.4	29.2	28.6	30.1	27.3	29.9	28.4	26.4	29.3	30.3	30.3*
Obesity (%)	74.7	75.0	72.0	71.3*	75.3	73.3	73.3	70.9*	74.2	73.6	73.7	72.1
Dyslipidemia (%)	91.5	91.8	91.1	90.1	91.9	91.1	90.7	90.6	92.0	90.3	91.5	91.0
Age (years) Median (IQR <sup>a</sup> )	65 (61-68)	65 (61-69)	65 (61-69)	65 (62-69)*	65 (61-68)	65 (61-69)	65 (62-69)	65 (62-69)*	64 (60-68)	65 (61-69)	65 (62-69)	65 (62-69)*
Women (%)	52.2	48.6	47.1	43.6*	47.6	47.3	49.4	48.9	38.4	47.4	52.5	56.5*
Body-mass index (kg/m <sup>2</sup> ) Median (IQR)	32.4 (29.9-35.1)	32.4 (30-35.3)	32 (29.7-34.7)	32 (29.6-34.3)*	32.3 (30-35)	32.2 (29.8-35)	32.3 (29.8-35)	32.3 (29.6-34.5)*	32.2 (29.9-35)	32.3 (29.8-35)	32.1 (29.8-35)	32.1 (29.7-34.6)
Weight (kg) Median (IQR)	85.7 (77.5-95.2)	85.8 (77.3-95.3)	85.6 (77.3-94.9)	85.6 (76.8-94)	86 (78-95.5)	86.3 (78-95.5)	85 (76.7-93.9)	85 (76.2-94.5)*	87.7 (79-96.7)	85.7 (77.5-95)	85.4 (76.9-93.8)	85.4 (75.4-93.1)*
Waist (cm) Median (IQR)	107.5 (101.5-114.3)	107.5 (101.5-114.3)	106.5 (101-114)	106.5 (101-113)*	107.8 (101.5-114.5)	107.5 (102-114)	106.5 (101-114)	106.5 (100-113)*	108.2 (102.1-115)	107 (101.5-114)	107 (101.3-114)	107 (99.8-112.4)*
Waist-to-height ratio Median (IQR)	66.2 (62.2-70.2)	65.8 (62.1-70.4)	65.4 (62-69.4)	65.4 (61.7-69.2)*	65.9 (62.1-70.1)	65.8 (61.9-69.9)	66 (62.2-70.3)	66 (61.8-69.1)*	65.7 (61.9-70)	65.8 (62-69.9)	66 (62.2-70)	66 (61.9-69.3)*
Smoking												
Current smoker (%)	13.3	11.4	12.1	12.4*	13.9	12.2	11.3	11.6	16.2	11.6	11.9	9.5*
Former smoker (%)	40.2	44.6	43.2	46.6	42.5	44.3	41.7	45.2	44.1	44.6	41.7	42.4
Highest attained educational level												
Primary school or less	50.1	50.1	49.5	47.7	49.4	48.9	51.3	47.8	44.9	49.5	52.6	51.6*
Complete secondary	29.4	28.7	28.6	27.9	29.0	29.6	27.9	28.2	31.3	29.3	26.8	26.8
University	20.6	21.2	21.9	24.4	21.6	21.5	20.9	24.0	23.8	21.3	20.6	21.7
Non-European origin (%)	4.0	1.6	1.7	1.9*	3.4	1.9	2.1	2.1*	4.1	2.0	1.9	1.7*
Willingness to change diet Median (IQR)	3 (2-3)	3 (3-3)	3 (3-3)	3 (2-3)	3 (3-3)	3 (3-3)	3 (2-3)	3 (2-3)	3 (2-3)	3 (3-3)	3 (3-3)	3 (3-3)
Married (%)	72.4	76.2	78.4	80.1*	74.1	76.6	76.3	79.4*	75.2	76.3	76.3	77.9
Living alone (%)	14.4	12.3	11.2	10.8*	13.7	11.8	11.9	11.6	12.5	11.3	12.8	13.1
Retired (%)	52.8	55.4	57.4	59.0*	53.2	55.6	57.0	58.5*	51.8	56.2	57.8	58.2*
Self-reported previous depression (%)	23.5	20.1	20.3	18.1*	22.4	19.5	21.8	18.7*	20.0	21.1	21.4	20.5
Family history of premature CHD <sup>b</sup> (%)	14.9	17.3	17.3	17.9	15.5	16.7	16.5	18.4	13.8	16.9	18.5	18.1*
Family history of type 2 diabetes (%)	42.8	44.3	38.0	39.7*	42.0	41.1	41.5	40.7	38.1	42.7	42.6	42.3*
Family history of obesity (%)	50.0	50.9	50.3	45.4*	47.9	50.6	48.9	49.8	47.8	49.0	49.1	51.1

Leisure time physical activity (METs <sup>c</sup> /min-week) Median (IQR)	1703 (839-3189)	1913 (913-3395)	2072 (1018-3608)	2072 (1168-4034)*	1703 (839-3233)	1918 (948-3504)	2188 (1098-3783)	2188 (1098-3706)*	1692 (839-3245)	1916 (913-3432)	2098 (1042-3624)	2098 (1129-3856)*
Chair test (#/30 sec) Median (IQR)	13 (10-16)	13 (11-16)	13 (11-15)	13 (11-16)*	13 (10-16)	13 (11-16)	13 (10-15)	13 (11-16)	13 (11-16)	13 (11-16)	13 (10-15)	13 (11-16)
Total energy intake (kcal/d) Median (IQR)	2211 (1860-2621)	2302 (1933-2702)	2352 (2027-2715)	2352 (2127-2819)*	2127 (1799-2544)	2307 (1961-2680)	2374 (2030-2749)	2374 (2215-2911)*	2256 (1892-2657)	2317 (1959-2707)	2313 (1950-2670)	2313 (2081-2808)*
Carbohydrate intake (%E <sup>d</sup> ) Median (IQR)	40.3 (35.2-45.4)	40.4 (36-45.5)	41 (36.3-45.3)	41 (37.7-46)*	40.4 (35.2-45.5)	40.4 (35.8-45.2)	41.2 (36.6-45.7)	41.2 (37.4-46)*	40.3 (35.3-45.1)	40.6 (35.9-45.4)	40.8 (36.5-45.5)	40.8 (37.3-46.2)*
Protein intake (%E) Median (IQR)	16.7 (15-18.7)	16.5 (14.7-18.4)	16.4 (14.7-18.4)	16.4 (14.3-17.6)*	16.6 (14.7-18.7)	16.4 (14.6-18.4)	16.4 (14.6-18.2)	16.4 (14.7-17.8)*	15.6 (13.9-17.4)	16.2 (14.5-18)	16.9 (15.2-18.7)	16.9 (15.4-18.8)*
Fat intake (%E) Median (IQR)	40.2 (35.2-44.9)	39.4 (34.7-44.2)	39.4 (34.7-43.7)	39.4 (34.6-42.6)*	39 (34.2-43.7)	39.5 (34.8-43.8)	39.5 (34.8-44.1)	39.5 (35.6-43.8)*	39.8 (35.1-44.2)	39.7 (34.9-44.1)	39.4 (34.8-43.7)	39.4 (34.6-43.5)*
Previous weight-loss dieting (%)	45.4	43.3	42.2	39.4*	44.6	43.6	41.1	41.4	40.1	44.3	43.3	43.6

\* p<0.05

<sup>a</sup> IQR: interquartile range, quartiles 25-75; <sup>b</sup> Family history of premature coronary heart disease assessed in screening phase with a positive answer by the participant to a question about a myocardial infarction in next of kin that was included in the general questionnaire; <sup>c</sup> MET: Metabolic equivalent of task; <sup>d</sup> E: energy intake

**Online resource 4.** General characteristics according to categories of adherence to the Pro-vegetarian food pattern and Carbohydrate Quality Index in the PREDIMED-PLUS cohort [27,29].

Characteristics	Pro-vegetarian food pattern (PVG)				Carbohydrate Quality Index (CQI)			
	Low (≤36)	Low-medium (37-39)	Medium-high (40-42)	High (43-58)	Low (≤9)	Low-medium (10-11)	Medium-high (12-14)	High (15-19)
n	2095	1616	1534	1375	1966	1369	1813	1472
Hypertension (%)	85.5	86.3	86.2	86.0	87.4	84.9	86.1	84.9
Diabetes (%)	29.6	29.1	28.4	28.5	28.0	29.0	29.2	30.0
Obesity (%)	76.0	73.5	71.1	71.7*	73.8	72.9	72.9	73.8
Dyslipidemia (%)	92.1	90.8	90.9	90.5	92.1	90.3	90.9	91.0
Age (years) Median (IQR <sup>a</sup> )	64 (61-68)	65 (61-69)	65 (62-69)	65 (62-69)*	65 (61-68)	65 (61-69)	65 (61-68)	65 (62-69)*
Women (%)	48.9	48.3	48.0	47.4	37.2	44.9	52.0	61.3*
Body-mass index (kg/m <sup>2</sup> ) Median (IQR)	32.4 (30.1-35.3)	32.3 (29.8-34.9)	31.9 (29.6-34.7)	31.9 (29.7-34.6)*	32.1 (29.8-34.9)	32.2 (29.7-34.8)	32.2 (29.8-34.9)	32.2 (29.9-35)
Weight (kg) Median (IQR)	86.7 (78-96)	86.2 (77.7-95.2)	84.5 (76.7-93.8)	84.5 (76.1-94)*	87 (78.8-95.8)	85.7 (77.2-95)	85.5 (76.9-95.1)	85.5 (76-93.3)*
Waist (cm) Median (IQR)	107.8 (102-114.5)	107.2 (101.5-114)	106.5 (101-113.4)	106.5 (100.3-113)*	107.8 (102-114.5)	107 (101.3-114.5)	107 (101-114)	107 (100-113)*
Waist-to-height ratio Median (IQR)	66.1 (62.2-70.2)	65.9 (62.1-69.8)	65.4 (61.9-69.9)	65.4 (61.8-69)*	65.5 (62-69.8)	65.7 (61.8-69.8)	65.7 (62.1-70)	65.7 (62-69.8)
Smoking								
Current smoker (%)	13.3	12.4	10.9	12.5*	15.6	13.2	11.0	8.8*
Former smoker (%)	45.0	42.4	41.7	43.9	44.0	44.5	43.9	40.7
Highest attained educational level								
Primary school or less	45.1	50.3	52.9	51.1*	50.0	48.1	49.1	50.2*
Complete secondary	30.6	29.6	26.0	27.8	29.0	31.9	27.5	26.9
University	24.3	20.2	21.1	21.2	21.1	20.0	23.4	22.9
Non-European origin (%)	3.1	1.9	2.0	2.8	2.5	2.2	2.9	2.0
Willingness to change diet Median (IQR)	3 (3-3)	3 (3-3)	3 (3-3)	3 (2-3)	3 (2-3)	3 (2-3)	3 (3-3)	3 (3-3)
Married (%)	74.6	74.3	76.9	81.1*	78.3	77.2	76.0	73.6*
Living alone (%)	14.3	12.8	11.5	9.8*	10.7	11.8	12.1	15.4*
Retired (%)	52.9	57.1	58.6	55.9*	56.2	57.3	54.0	56.3
Self-reported previous depression (%)	21.9	21.7	20.4	18.3	18.4	18.4	21.6	25.0*
Family history of premature CHD <sup>b</sup> (%)	15.6	16.8	16.9	18.0	16.0	16.1	16.6	18.3
Family history of type 2 diabetes (%)	43.2	40.3	38.7	42.8*	40.4	40.8	41.5	43.1
Family history of obesity (%)	50.2	50.1	48.5	47.6	47.7	46.5	50.8	51.9*

Leisure time physical activity (METs <sup>c</sup> /min-week) Median (IQR)	1778 (839-3356)	1906 (944-3441)	2014 (954-3580)	2014 (1119-3918)*	1727 (851-3329)	2014 (993-3636)	2093 (982-3564)	2093 (1093-3727)*
Chair test (#/30 sec) Median (IQR)	13 (11-16)	13 (11-15)	13 (10-15)	13 (11-16)*	13 (11-16)	13 (11-16)	13 (11-16)	13 (10-15)*
Total energy intake (kcal/d) Median (IQR)	2115 (1777-2518)	2284 (1964-2666)	2400 (2071-2785)	2400 (2253-2907)*	2324 (1972-2680)	2368 (1986-2788)	2316 (1917-2720)	2316 (2007-2702)*
Carbohydrate intake (%E <sup>d</sup> ) Median (IQR)	38.9 (34-44)	40.5 (36.2-45.2)	41.8 (37.4-46)	41.8 (38.2-46.9)*	42 (37.2-46.2)	41.1 (35.7-45.5)	40.4 (35.4-45.3)	40.4 (36.2-44.8)*
Protein intake (%E) Median (IQR)	17.6 (15.8-19.7)	16.6 (15.0-18.4)	15.9 (14.4-17.6)	15.9 (13.7-16.6)*	15.8 (14.1-17.4)	16 (14.4-18.1)	16.6 (15-18.6)	16.6 (15.5-19.1)*
Fat intake (%E) Median (IQR)	39.6 (34.5-44.3)	39.3 (34.7-43.9)	39.3 (35-43.8)	39.3 (35.3-43.4)	38.7 (34.3-43)	39.6 (34.8-44.1)	39.7 (34.9-44.3)	39.7 (35.6-44.1)*
Previous weight-loss dieting (%)	48.0	42.7	40.3	37.9*	35.0	40.9	46.2	51.0*

\* p<0.05

<sup>a</sup> IQR: interquartile range, quartiles 25-75; <sup>b</sup> Family history of premature coronary heart disease assessed in screening phase with a positive answer by the participant to a question about a myocardial infarction in next of kin that was included in the general questionnaire; <sup>c</sup> MET: Metabolic equivalent of task; <sup>d</sup> E: energy intake

**Online resource 5.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to the Mediterranean Diet Score (MDS) [24].

	Low ( $\leq 3$ ) n=2088	Low-medium (4) n=1541	Medium-high (5) N=1470	High (6-9) n=1521	Corrected p for trend
Hypertension, %	86.1	86.6	85.8	85.3	
Sex and age adjusted	1 (ref.)	1.00 (0.98-1.03)	0.99 (0.96-1.02)	0.98 (0.95-1.01)	0.188
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.98-1.03)	0.99 (0.96-1.02)	0.99 (0.96-1.02)	0.499
Diabetes, %	29.5	28.4	29.2	28.6	
Sex and age adjusted	1 (ref.)	0.95 (0.86-1.06)	0.97 (0.87-1.08)	0.94 (0.85-1.04)	0.304
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.96 (0.86-1.07)	1.02 (0.91-1.13)	1.01 (0.90-1.12)	0.859
Obesity, %	74.7	75.0	72.0	71.3	
Sex and age adjusted	1 (ref.)	1.01 (0.97-1.04)	0.97 (0.93-1.01)	0.96 (0.92-1.00)	0.019
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.01 (0.97-1.05)	0.97 (0.93-1.01)	0.99 (0.94-1.03)	0.369
Dyslipidemia, %	91.5	91.8	91.1	90.1	
Sex and age adjusted	1 (ref.)	1.01 (0.98-1.02)	1.00 (0.98-1.02)	0.99 (0.97-1.01)	0.262
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.98-1.02)	1.00 (0.97-1.02)	0.99 (0.97-1.01)	0.523

\* Corrected p<0.05

<sup>a</sup> Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), and node (categorised in quartiles by number of participants).

**Online resource 6.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to the modified Mediterranean Diet Score (mMDS) [25].

	Low ( $\leq 16$ )	Low-medium (17-18)	Medium-high (19-20)	High (21-28)	Corrected p for trend
	n=1999	n=1639	N=1529	n=1453	
Hypertension, %	86.7	85.6	85.3	86.0	
Sex and age adjusted	1 (ref.)	0.98 (0.95-1.01)	0.98 (0.95-1.00)	0.99 (0.96-1.01)	0.234
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.96-1.01)	0.98 (0.94-1.00)	0.99 (0.96-1.02)	0.620
Diabetes, %	30.1	27.3	29.9	28.4	
Sex and age adjusted	1 (ref.)	0.90 (0.81-1.00)	0.99 (0.89-1.09)	0.94 (0.84-1.04)	0.285
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.91 (0.81-1.01)	1.04 (0.93-1.15)	1.00 (0.89-1.12)	0.915
Obesity, %	75.3	73.3	73.3	70.9	
Sex and age adjusted	1 (ref.)	0.97 (0.93-1.01)	0.97 (0.93-1.01)	0.94 (0.90-0.98)*	0.008
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.97 (0.93-1.01)	0.98 (0.94-1.02)	0.95 (0.90-0.99)*	0.048
Dyslipidemia, %	91.9	91.1	90.7	90.6	
Sex and age adjusted	1 (ref.)	0.99 (0.97-1.01)	0.99 (0.97-1.01)	0.99 (0.96-1.01)	0.228
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.97-1.01)	0.99 (0.97-1.01)	0.99 (0.97-1.01)	0.609

\* Corrected  $p < 0.05$

<sup>a</sup> Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), and node (categorised in quartiles by number of participants).

**Online resource 7.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to the Mediterranean-like Dietary Score (MLDS) [25].

	Low ( $\leq 22$ )	Low-medium (23-25)	Medium-high (26-27)	High (28-38)	Corrected p for trend
	n=1741	n=2000	N=1264	n=1615	
Hypertension, %	86.6	85.2	87.5	85.1	
Sex and age adjusted	1 (ref.)	0.98 (0.95-1.00)	1.00 (0.97-1.03)	0.97 (0.94-1.00)	0.135
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.94-1.00)	1.00 (0.97-1.03)	0.97 (0.94-1.00)	0.295
Diabetes, %	26.4	29.3	30.3	30.3	
Sex and age adjusted	1 (ref.)	1.13 (1.02-1.24)*	1.18 (1.05-1.31)*	1.19 (1.06-1.31)*	0.002
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.12 (1.00-1.24)	1.18 (1.04-1.32)*	1.24 (1.11-1.38)*	0.001
Obesity, %	74.2	73.6	73.7	72.1	
Sex and age adjusted	1 (ref.)	0.99 (0.95-1.03)	0.99 (0.95-1.03)	0.97 (0.92-1.01)	0.126
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.94-1.02)	0.99 (0.94-1.03)	0.97 (0.92-1.01)	0.299
Dyslipidemia, %	92.0	90.4	91.5	91.0	
Sex and age adjusted	1 (ref.)	0.98 (0.96-1.00)	1.00 (0.97-1.02)	0.99 (0.97-1.01)	0.485
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.96-1.00)	0.99 (0.97-1.02)	0.99 (0.97-1.01)	0.709

\* Corrected  $p < 0.05$

<sup>a</sup> Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), and node (categorised in quartiles by number of participants).

**Online resource 8.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to the Pro-vegetarian dietary pattern (PVG) [27].

	Low ( $\leq 36$ )	Low-medium (37-39)	Medium-high (40-42)	High (43-58)	Corrected p for trend
	n=2095	n=1616	N=1534	n=1375	
Hypertension, %	85.5	86.3	86.2	86.0	
Sex and age adjusted	1 (ref.)	1.00 (0.98-1.03)	1.00 (0.97-1.03)	1.00 (0.97-1.02)	0.809
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.01 (0.98-1.03)	1.00 (0.97-1.03)	1.01 (0.98-1.04)	0.613
Diabetes, %	29.6	29.1	28.4	28.5	
Sex and age adjusted	1 (ref.)	0.97 (0.88-1.08)	0.95 (0.85-1.05)	0.95 (0.85-1.06)	0.253
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.88-1.10)	1.01 (0.90-1.12)	1.00 (0.89-1.12)	0.923
Obesity, %	76.0	73.5	71.1	71.7	
Sex and age adjusted	1 (ref.)	0.97 (0.93-1.01)	0.94 (0.90-0.98)*	0.95 (0.90-0.99)*	0.002
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.93-1.01)	0.95 (0.90-0.99)*	0.96 (0.92-1.01)	0.088
Dyslipidemia, %	92.1	90.8	90.9	90.5	
Sex and age adjusted	1 (ref.)	0.99 (0.97-1.01)	0.99 (0.97-1.01)	0.99 (0.96-1.01)	0.178
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.96-1.01)	0.99 (0.97-1.01)	0.99 (0.96-1.01)	0.464

\* Corrected  $p < 0.05$

<sup>a</sup> Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), and node (categorised in quartiles by number of participants).



**Online resource 9.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to the Alternate Healthy Eating Index 2010 (AHEI-2010) [28].

	Low ( $\leq 63$ )	Low-medium (64-69)	Medium-high (70-75)	High (76-98)	Corrected p for trend
	n=1809	n=1683	N=1571	n=1557	
Hypertension, %	85.9	85.0	86.2	86.9	
Sex and age adjusted	1 (ref.)	0.99 (0.95-1.01)	1.00 (0.96-1.02)	1.00 (0.97-1.03)	0.943
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.95-1.01)	0.99 (0.96-1.02)	1.00 (0.97-1.03)	0.924
Diabetes, %	27.5	30.1	27.9	30.5	
Sex and age adjusted	1 (ref.)	1.12 (1.01-1.24)*	1.05 (0.94-1.17)	1.15 (1.03-1.27)*	0.027
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.11 (0.99-1.23)	1.04 (0.92-1.16)	1.15 (1.03-1.28)*	0.079
Obesity, %	76.0	75.0	72.4	69.6	
Sex and age adjusted	1 (ref.)	0.98 (0.94-1.02)	0.95 (0.90-0.99)*	0.91 (0.86-0.95)*	<0.001
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.94-1.02)	0.95 (0.91-0.99)	0.92 (0.87-0.96)*	<0.001
Dyslipidemia, %	91.9	90.7	90.6	91.3	
Sex and age adjusted	1 (ref.)	0.99 (0.96-1.01)	0.99 (0.96-1.01)	1.00 (0.97-1.02)	0.617
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.96-1.01)	0.99 (0.96-1.01)	1.00 (0.97-1.02)	0.930

\* Corrected  $p < 0.05$

<sup>a</sup> Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), and node (categorised in quartiles by number of participants).

**Online resource 10.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to the Carbohydrate Quality Index (CQI) [29].

	Low ( $\leq 9$ ) n=1966	Low-medium (10-11) n=1369	Medium-high (12-14) N=1813	High (15-19) n=1472	Corrected p for trend
Hypertension, %	87.4	84.9	86.1	84.9	
Sex and age adjusted	1 (ref.)	0.97 (0.94-1.00)*	0.99 (0.96-1.01)	0.97 (0.94-1.00)*	0.092
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.97 (0.94-1.00)	0.99 (0.96-1.01)	0.98 (0.95-1.00)	0.428
Diabetes, %	28.0	29.0	29.2	30.0	
Sex and age adjusted	1 (ref.)	1.05 (0.94-1.17)	1.08 (0.98-1.19)	1.13 (1.02-1.25)*	0.022
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.07 (0.95-1.20)	1.10 (0.99-1.22)	1.16 (1.04-1.29)*	0.020
Obesity, %	73.8	72.9	72.9	73.9	
Sex and age adjusted	1 (ref.)	0.99 (0.94-1.03)	0.98 (0.94-1.02)	0.99 (0.95-1.03)	0.604
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.94-1.03)	0.96 (0.92-1.01)	0.97 (0.92-1.02)	0.279
Dyslipidemia, %	92.1	90.3	90.9	91.0	
Sex and age adjusted	1 (ref.)	0.98 (0.95-1.00)	0.99 (0.96-1.00)	0.99 (0.96-1.01)	0.236
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.96-1.01)	0.99 (0.96-1.00)	0.99 (0.96-1.01)	0.470

\* Corrected  $p < 0.05$

<sup>a</sup> Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), and node (categorised in quartiles by number of participants).

**Online resource 11.** Prevalence ratios for clustered cardiovascular risk factors (hypertension, obesity and dyslipidaemia) according to categories of adherence to *a priori* dietary scores.

<b>Mediterranean Diet Score (MDS) [24]</b>	<b>Low (<math>\leq 3</math>)</b>	<b>Low-medium (4)</b>	<b>Medium-high (5)</b>	<b>High (6-9)</b>	<b>Corrected p for trend</b>
	n=2088	n=1541	n=1470	n=1521	
2 or more risk factors, %	94.0	93.9	93.4	92.3	
Sex and age adjusted	1 (ref.)	1.00 (0.98-1.01)	0.99 (0.97-1.01)	0.98 (0.96-1.00)	0.050
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.98-1.01)	1.00 (0.98-1.01)	0.98 (0.96-1.00)	0.182
3 risk factors, %	58.4	59.8	55.6	54.4	
Sex and age adjusted	1 (ref.)	1.03 (0.97-1.08)	0.95 (0.90-1.01)	0.94 (0.88-0.99)	0.011
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.03 (0.97-1.08)	0.95 (0.89-1.01)	0.97 (0.91-1.03)	0.244
<b>Modified Mediterranean Diet Score (mMDS) [25]</b>	<b>Low (<math>\leq 16</math>)</b>	<b>Low-medium (17-18)</b>	<b>Medium-high (19-20)</b>	<b>High (21-28)</b>	<b>Corrected p for trend</b>
	n=1999	n=1639	n=1529	n=1453	
2 or more risk factors, %	94.5	93.7	92.3	93.1	
Sex and age adjusted	1 (ref.)	0.99 (0.97-1.01)	0.98 (0.95-0.99)*	0.98 (0.96-1.00)	0.038
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.97-1.01)	0.98 (0.95-1.00)*	0.99 (0.96-1.00)	0.142
3 risk factors, %	59.8	56.4	57.1	54.5	
Sex and age adjusted	1 (ref.)	0.94 (0.89-1.00)	0.95 (0.90-1.01)	0.91 (0.85-0.97)*	0.006
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.95 (0.89-1.01)	0.96 (0.91-1.02)	0.93 (0.87-0.99)	0.053
<b>Mediterranean-like Dietary Score (MLDS) [25]</b>	<b>Low (<math>\leq 22</math>)</b>	<b>Low-medium (23-25)</b>	<b>Medium-high (26-27)</b>	<b>High (28-38)</b>	<b>Corrected p for trend</b>
	n=1741	n=2000	n=1264	n=1615	
2 or more risk factors, %	94.2	93.1	93.6	93.0	
Sex and age adjusted	1 (ref.)	0.99 (0.97-1.00)	0.99 (0.97-1.01)	0.98 (0.96-1.00)	0.153
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.96-1.00)	0.99 (0.97-1.01)	0.98 (0.96-1.00)	0.218

3 risk factors, %	58.9	56.2	59.1	55.1	
Sex and age adjusted	1 (ref.)	0.95 (0.89-1.00)	0.99 (0.93-1.05)	0.92 (0.86-0.98)*	0.042
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.94 (0.88-0.99)	0.99 (0.92-1.05)	0.92 (0.85-0.98)*	0.087

<b>Mediterranean Diet Adherence Screener (MEDAS) [26]</b>	<b>Low (≤6)</b>	<b>Low-medium (7)</b>	<b>Medium-high (8)</b>	<b>High (9-14)</b>	<b>Corrected p for trend</b>
	n=2084	n=1370	n=1283	n=1883	
2 or more risk factors, %	95.1	92.6	93.8	92.1	
Sex and age adjusted	1 (ref.)	0.97 (0.95-0.99)*	0.99 (0.96-1.00)	0.97 (0.94-0.98)*	<0.001
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.97 (0.95-0.99)*	0.99 (0.96-1.00)	0.97 (0.95-0.99)*	0.015
3 risk factors, %	60.5	57.2	57.6	53.3	
Sex and age adjusted	1 (ref.)	0.94 (0.89-1.00)	0.95 (0.89-1.00)	0.87 (0.82-0.93)*	<0.001
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.94 (0.88-1.00)	0.95 (0.89-1.01)	0.90 (0.84-0.95)*	0.002

<b>Pro-vegetarian dietary pattern (PVG) [27]</b>	<b>Low (≤36)</b>	<b>Low-medium (37-39)</b>	<b>Medium-high (40-42)</b>	<b>High (43-58)</b>	<b>Corrected p for trend</b>
	n=2095	n=1616	n=1534	n=1375	
2 or more risk factors, %	94.3	93.2	92.2	93.9	
Sex and age adjusted	1 (ref.)	0.99 (0.97-1.00)	0.98 (0.95-0.99)*	0.99 (0.97-1.01)	0.194
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.97-1.01)	0.98 (0.96-1.00)	1.00 (0.98-1.01)	0.552
3 risk factors, %	59.5	57.6	56.1	54.3	
Sex and age adjusted	1 (ref.)	0.97 (0.91-1.02)	0.94 (0.89-1.00)	0.91 (0.85-0.97)*	0.004
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.92-1.03)	0.96 (0.90-1.02)	0.95 (0.88-1.01)	0.139

<b>Alternate Healthy Eating Index 2010 (AHEI-2010) [28]</b>	<b>Low (≤63)</b>	<b>Low-medium (64-69)</b>	<b>Medium-high (70-75)</b>	<b>High (76-98)</b>	<b>Corrected p for trend</b>
	n=1809	n=1683	n=1571	n=1557	
2 or more risk factors, %	94.0	93.4	93.1	93.2	
Sex and age adjusted	1 (ref.)	0.99 (0.97-1.01)	0.99 (0.96-1.00)	0.99 (0.96-1.00)	0.162
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.97-1.01)	0.99 (0.97-1.01)	0.99 (0.97-1.01)	0.386

3 risk factors, %	59.9	57.5	56.1	54.7	
Sex and age adjusted	1 (ref.)	0.95 (0.89-1.00)	0.92 (0.86-0.98)*	0.89 (0.84-0.95)*	<0.001
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.94 (0.88-1.00)	0.92 (0.86-0.98)*	0.90 (0.84-0.96)*	0.003

<b>Carbohydrate Quality Index (CQI) [29]</b>	<b>Low (≤9)</b>	<b>Low-medium (10-11)</b>	<b>Medium-high (12-14)</b>	<b>High (15-19)</b>	<b>Corrected p for trend</b>
	n=1966	n=1369	n=1813	n=1472	
2 or more risk factors, %	94.3	92.6	93.3	93.4	
Sex and age adjusted	1 (ref.)	0.98 (0.96-1.00)	0.99 (0.97-1.01)	0.99 (0.97-1.01)	0.469
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.96-1.00)	0.99 (0.97-1.00)	0.99 (0.96-1.00)	0.332
3 risk factors, %	59.1	55.7	56.8	56.6	
Sex and age adjusted	1 (ref.)	0.94 (0.88-0.99)	0.95 (0.90-1.00)	0.94 (0.88-1.00)	0.106
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.94 (0.88-1.00)	0.93 (0.88-0.99)	0.93 (0.87-0.99)	0.084

<b>Prime Diet Quality Score (PDQS) [30]</b>	<b>Low (≤19)</b>	<b>Low-medium (20-21)</b>	<b>Medium-high (22-24)</b>	<b>High (25-36)</b>	<b>Corrected p for trend</b>
	n=2226	n=1359	n=1806	n=1229	
2 or more risk factors, %	94.1	93.9	92.4	93.4	
Sex and age adjusted	1 (ref.)	1.00 (0.98-1.01)	0.98 (0.96-1.00)*	0.99 (0.97-1.01)	0.099
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.98-1.01)	0.98 (0.96-1.00)*	0.99 (0.97-1.01)	0.182
3 risk factors, %	58.7	57.8	56.3	55.0	
Sex and age adjusted	1 (ref.)	0.98 (0.92-1.03)	0.95 (0.89-1.00)	0.92 (0.86-0.98)*	0.005
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.97 (0.90-1.02)	0.94 (0.89-1.00)	0.92 (0.86-0.99)*	0.020

\* Corrected p<0.05

<sup>a</sup> Adjusted for age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), diabetes status, and node (categorised in quartiles by number of participants).

**Online resource 12.** Prevalence ratios for individual cardiovascular risk factors according to categories of adherence to *a priori* dietary scores.

<b>Mediterranean Diet Score (MDS) [24]</b>	<b>Low (<math>\leq 3</math>)</b>	<b>Low-medium (4)</b>	<b>Medium-high (5)</b>	<b>High (6-9)</b>	<b>Corrected p for trend</b>
	n=2088	n=1541	n=1470	n=1521	
Hypertension, %	86.1	86.6	85.8	85.3	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.95-1.03)	1.00 (0.95-1.03)	0.98 (0.93-1.03)	0.891
Diabetes, %	29.5	28.4	29.2	28.6	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.87-1.09)	1.02 (0.91-1.14)	1.01 (0.90-1.13)	0.788
Obesity, %	74.7	75.0	72.0	71.3	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.01 (0.97-1.05)	0.97 (0.93-1.01)	0.99 (0.94-1.03)	0.378
Dyslipidaemia, %	91.5	91.8	91.1	90.1	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.01 (0.99-1.03)	1.00 (0.97-1.02)	0.99 (0.96-1.01)	0.481
<b>Modified Mediterranean Diet Score (mMDS) [25]</b>	<b>Low (<math>\leq 16</math>)</b>	<b>Low-medium (17-18)</b>	<b>Medium-high (19-20)</b>	<b>High (21-28)</b>	<b>Corrected p for trend</b>
	n=1999	n=1639	n=1529	n=1453	
Hypertension, %	86.7	85.6	85.3	86.0	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.96-1.04)	0.97 (0.92-1.02)	0.98 (0.93-1.02)	0.656
Diabetes, %	30.1	27.3	29.9	28.4	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.92 (0.82-1.03)	1.04 (0.93-1.16)	1.00 (0.89-1.12)	0.935
Obesity, %	75.3	73.3	73.3	70.9	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.97 (0.93-1.01)	0.99 (0.94-1.03)	0.95 (0.90-0.99)*	0.045
Dyslipidaemia, %	91.9	91.1	90.7	90.6	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.97-1.01)	0.99 (0.96-1.01)	0.99 (0.96-1.01)	0.505
<b>Mediterranean-like Dietary Score (MLDS) [25]</b>	<b>Low (<math>\leq 22</math>)</b>	<b>Low-medium (23-25)</b>	<b>Medium-high (26-27)</b>	<b>High (28-38)</b>	<b>Corrected p for trend</b>
	n=1741	n=2000	n=1264	n=1615	
Hypertension, %	86.6	85.2	87.5	85.1	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.97 (0.93-1.01)	0.97 (0.91-1.02)	0.93 (0.86-0.98)*	0.026
Diabetes, %	26.4	29.3	30.3	30.3	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.12 (1.00-1.25)	1.16 (1.03-1.31)*	1.23 (1.10-1.37)*	0.002
Obesity, %	74.2	73.6	73.7	72.1	

Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.94-1.03)	0.99 (0.94-1.03)	0.97 (0.92-1.01)	0.309
Dyslipidaemia, %	92.0	90.4	91.5	91.0	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.95-1.00)	0.99 (0.96-1.01)	0.98 (0.96-1.01)	0.470
<b>Mediterranean Diet Adherence Screener (MEDAS) [26]</b>	<b>Low (≤6)</b>	<b>Low-medium (7)</b>	<b>Medium-high (8)</b>	<b>High (9-14)</b>	<b>Corrected p for trend</b>
	n=2084	n=1370	n=1283	n=1883	
Hypertension, %	86.5	86.3	86.7	84.7	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.93-1.03)	1.02 (0.97-1.05)	0.95 (0.89-0.99)	0.210
Diabetes, %	28.2	31.4	27.6	29.0	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.15 (1.03-1.28)*	1.01 (0.89-1.13)	1.09 (0.98-1.20)	0.530
Obesity, %	76.4	72.5	73.6	70.5	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.95 (0.91-0.99)*	0.97 (0.92-1.01)	0.94 (0.89-0.98)*	0.008
Dyslipidaemia, %	92.5	90.7	90.9	90.2	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.95-1.00)	0.98 (0.96-1.01)	0.98 (0.96-1.00)	0.216
<b>Pro-vegetarian dietary pattern (PVG) [27]</b>	<b>Low (≤36)</b>	<b>Low-medium (37-39)</b>	<b>Medium-high (40-42)</b>	<b>High (43-58)</b>	<b>Corrected p for trend</b>
	n=2095	n=1616	n=1534	n=1375	
Hypertension, %	85.5	86.3	86.2	86.0	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.95-1.04)	1.02 (0.98-1.06)	1.02 (0.97-1.06)	0.306
Diabetes, %	29.6	29.1	28.4	28.5	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.89-1.10)	1.01 (0.90-1.13)	1.02 (0.90-1.14)	0.838
Obesity, %	76.0	73.5	71.1	71.7	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.97 (0.93-1.01)	0.95 (0.91-0.99)*	0.96 (0.92-1.00)	0.067
Dyslipidaemia, %	92.1	90.8	90.9	90.5	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.96-1.01)	0.99 (0.97-1.01)	0.99 (0.96-1.01)	0.500
<b>Alternate Healthy Eating Index 2010 (AHEI-2010) [28]</b>	<b>Low (≤63)</b>	<b>Low-medium (64-69)</b>	<b>Medium-high (70-75)</b>	<b>High (76-98)</b>	<b>Corrected p for trend</b>
	n=1809	n=1683	n=1571	n=1557	
Hypertension, %	85.9	85.0	86.2	86.9	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.92-1.02)	0.98 (0.93-1.03)	1.00 (0.95-1.04)	0.996
Diabetes, %	27.5	30.1	27.9	30.5	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.11 (0.99-1.24)	1.05 (0.93-1.17)	1.15 (1.03-1.29)*	0.072

Obesity, %	76.0	75.0	72.4	69.6	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.94-1.03)	0.95 (0.91-0.99)*	0.91 (0.87-0.96)*	<0.001
Dyslipidaemia, %	91.9	90.7	90.6	91.3	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.96-1.01)	0.99 (0.96-1.01)	1.00 (0.97-1.02)	0.888
<b>Carbohydrate Quality Index (CQI) [29]</b>	<b>Low (≤9)</b>	<b>Low-medium (10-11)</b>	<b>Medium-high (12-14)</b>	<b>High (15-19)</b>	<b>Corrected p for trend</b>
	n=1966	n=1369	n=1813	n=1472	
Hypertension, %	87.4	84.9	86.1	84.9	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.93-1.02)	0.99 (0.94-1.02)	0.98 (0.93-1.02)	0.954
Diabetes, %	28.0	29.0	29.2	30.0	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.08 (0.96-1.20)	1.11 (1.00-1.23)	1.18 (1.05-1.31)*	0.014
Obesity, %	73.8	72.9	72.9	73.9	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.99 (0.94-1.03)	0.96 (0.92-1.01)	0.97 (0.92-1.02)	0.307
Dyslipidaemia, %	92.1	90.3	90.9	91.0	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.96-1.01)	0.98 (0.96-1.00)	0.99 (0.96-1.01)	0.488
<b>Prime Diet Quality Score (PDQS) [30]</b>	<b>Low (≤19)</b>	<b>Low-medium (20-21)</b>	<b>Medium-high (22-24)</b>	<b>High (25-36)</b>	<b>Corrected p for trend</b>
	n=2226	n=1359	n=1806	n=1229	
Hypertension, %	86.5	86.5	85.1	85.6	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.93-1.02)	0.95 (0.89-0.99)	0.96 (0.90-1.00)	0.123
Diabetes, %	28.9	31.9	28.2	26.9	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.13 (1.01-1.25)	1.04 (0.93-1.15)	1.01 (0.89-1.13)	0.933
Obesity, %	74.5	73.6	73.1	71.5	
Multivariate adjusted <sup>a</sup>	1 (ref.)	0.98 (0.94-1.02)	0.97 (0.93-1.01)	0.95 (0.90-1.00)	0.076
Dyslipidaemia, %	91.6	91.5	90.4	91.1	
Multivariate adjusted <sup>a</sup>	1 (ref.)	1.00 (0.97-1.02)	0.99 (0.96-1.01)	0.99 (0.97-1.02)	0.559

\* Corrected p<0.05

<sup>a</sup> Adjusted for age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), use of anti-hypertensive medication and lipid lowering drugs, and node (categorised in quartiles by number of participants).



**Online resource 13.** Linear regression coefficients (95% CI) showing associations between the adherence to the dietary indexes (for 1-point SD difference) and mean levels of cardiovascular risk factors measured as continuous variables [24-30].

	<b>MDS</b>	<b>mMDS</b>	<b>MLDS</b>	<b>MEDAS</b>	<b>PVG</b>	<b>AHEI-2010</b>	<b>CQI</b>	<b>PDQS</b>
SBP (mmHg)	+0.192 (-0.233; +0.617)	-0.369 (-0.801; +0.063)	-0.231 (-0.662; +0.201)	+0.523 (+0.112; +0.933)*	-0.451 (-0.885; -0.017)	-0.067 (-0.488; +0.354)	-1.063 (-1.488; -0.638)‡	-0.194 (-0.616; +0.228)
DBP (mmHG)	+0.426 (+0.174; +0.677)‡	-0.227 (-0.476; +0.023)	-0.118 (-0.361; +0.124)	+0.672 (+0.432; +0.911)‡	+0.014 (-0.243; +0.270)	-0.017 (-0.264; +0.230)	-0.485 (-0.724; -0.246)‡	+0.187 (-0.062; +0.435)
Glycaemia (mg/dl)	-0.572 (-1.303; +0.160)	-0.542 (-1.260; +0.177)	+0.237 (-0.457; +0.930)	+0.104 (-0.647; +0.854)	-0.628 (-1.346; +0.091)	+0.045 (-0.647; +0.737)	+0.740 (+0.036; +1.443)	-0.532 (-1.254; +0.190)
BMI (kg/m <sup>2</sup> )	-0.116 (-0.196; -0.036)‡	-0.112 (-0.194; -0.030)*	-0.107 (-0.188; -0.026)*	-0.156 (-0.236; -0.076)‡	-0.149 (-0.233; -0.066)‡	-0.217 (-0.296; -0.137)‡	-0.050 (-0.132; +0.031)	-0.150 (-0.232; -0.068)‡
Waist circumference (cm)	-0.422 (-0.631; -0.213)‡	-0.424 (-0.641; -0.208)‡	-0.433 (-0.646; -0.219)‡	-0.440 (-0.651; -0.230)‡	-0.532 (-0.754; -0.310)‡	-0.484 (-0.695; -0.274)‡	-0.048 (-0.264; +0.167)	-0.494 (-0.708; -0.280)‡
LDL-cholesterol (mg/dl)	-0.008 (-0.953; +0.937)	+0.045 (-0.900; +0.991)	-0.479 (-1.311; +0.353)	+0.220 (-0.746; +1.186)	-0.724 (-1.622; +0.173)	-1.234 (-2.341; -0.128)	-0.359 (-1.309; +0.591)	-0.594 (-1.565; +0.377)
HDL-cholesterol (mg/dl)	+0.850 (+0.573; +1.127)‡	+0.472 (+0.190; +0.754)‡	+0.361 (+0.088; +0.634)*	+0.410 (+0.125; +0.695)*	-0.039 (-0.328; +0.249)	+0.109 (-0.169; +0.388)	+0.352 (+0.080; +0.623)*	+0.259 (-0.022; +0.541)
Triglycerides (mg/dl)	+0.055 (-1.837; +1.947)	-1.121 (-3.097; +0.854)	-2.534 (-4.482; -0.587)*	-2.580 (-4.602; -0.557)*	+1.120 (-0.860; +3.101)	-1.670 (-3.570; +0.230)	-3.000 (-5.038; -0.963)*	-1.843 (-3.964; +0.277)

\* Corrected p<0.05; ‡ Corrected p<0.01

Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), use of anti-hypertensive medication and lipid lowering drugs, and node (categorised in quartiles by number of participants).

MDS: Mediterranean Diet Score; mMDS: modified Mediterranean Diet Score; MLDS: Mediterranean-like Dietary Score; MEDAS: Mediterranean Diet Adherence Screener; PVG: pro-vegetarian dietary pattern; AHEI-2010: Alternate Healthy Eating Index 2010; CQI: Carbohydrate Quality Index; PDQS: Prime Diet Quality Score. SBP: systolic blood pressure; DBP: diastolic blood pressure; SD: standard deviation; BMI: body mass index.

**Online resource 14.** Linear regression coefficients (95% CI) showing associations between intake of food groups (for 1-point SD difference) and mean levels of cardiovascular risk factors measured as continuous variables.

	<b>Vegetables</b>	<b>Fruits</b>	<b>Cereals</b>	<b>Legumes</b>	<b>Nuts</b>	<b>Fish</b>	<b>Olive oil</b>
SBP (mmHg)	-0.702 (-1.124; -0.279) <sup>‡</sup>	+0.092 (-0.347; +0.532)	+0.096 (-0.400; +0.591)	-0.238 (-0.669; +0.193)	-0.552 (-0.972; -0.132) <sup>*</sup>	+0.080 (-0.338; +0.499)	+1.207 (+0.755; +1.658) <sup>‡</sup>
DBP (mmHG)	-0.384 (-0.625; -0.143) <sup>‡</sup>	+0.509 (+0.253; +0.765) <sup>‡</sup>	+0.624 (+0.336; +0.912) <sup>‡</sup>	-0.033 (-0.269; +0.202)	-0.202 (-0.451; +0.048)	-0.143 (-0.391; +0.104)	+0.095 (-0.163; +0.353)
Glycaemia (mg/dl)	+0.105 (-0.631; +0.841)	-0.627 (-1.317; +0.064)	+0.096 (-0.724; +0.915)	+0.095 (-0.598; +0.789)	-0.251 (-0.910; +0.409)	+0.539 (-0.172; +1.249)	+0.592 (-0.168; +1.352)
BMI (kg/m <sup>2</sup> )	+0.005 (-0.075; +0.086)	-0.061 (-0.143; +0.021)	+0.032 (-0.064; +0.128)	+0.057 (-0.029; +0.143)	-0.244 (-0.325; -0.164) <sup>‡</sup>	-0.016 (-0.099; +0.066)	+0.076 (-0.011; +0.163)
Waist circumference (cm)	-0.010 (-0.224; +0.205)	-0.310 (-0.530; -0.090) <sup>*</sup>	-0.168 (-0.420; +0.085)	+0.111 (-0.106; +0.328)	-0.604 (-0.817; -0.391) <sup>‡</sup>	+0.032 (-0.185; +0.248)	+0.122 (-0.112; +0.356)
LDL-cholesterol (mg/dl)	-0.542 (-1.539; +0.454)	-1.048 (-2.048; -0.047)	+0.462 (-0.841; +1.764)	-0.765 (-1.759; +0.228)	-0.185 (-1.157; +0.787)	-0.055 (-1.146; +1.036)	-0.106 (-1.245; +1.033)
HDL-cholesterol (mg/dl)	+0.544 (+0.267; +0.820) <sup>‡</sup>	-0.091 (-0.379; +0.197)	-0.425 (-0.737; -0.113) <sup>*</sup>	+0.267 (-0.021; +0.555)	+0.061 (-0.213; +0.335)	+0.777 (+0.492; +1.063) <sup>‡</sup>	-0.421 (-0.711; -0.131) <sup>*</sup>
Triglycerides (mg/dl)	-0.579 (-2.624; +1.466)	-2.180 (-4.079; -0.282)	+1.673 (-0.585; +3.932)	+0.776 (-1.262; +2.813)	-0.641 (-2.548; +1.266)	-1.727 (-3.724; +0.269)	+1.295 (-0.856; +3.445)

\* Corrected p<0.05; ‡ Corrected p<0.01

Adjusted for sex, age (continuous), smoking (never smoked, current, former), family history of cardiovascular disease, obesity and type 2 diabetes (yes/no), energy intake (continuous), physical activity (continuous), educational level (primary, secondary and university), married (yes/no), living alone (yes/no), retired (yes/no), previously weight-loss dieting (yes/no), use of anti-hypertensive medication and lipid lowering drugs, and node (categorised in quartiles by number of participants).

SBP: systolic blood pressure; DBP: diastolic blood pressure; SD: standard deviation; BMI: body mass index.