Association of Planetary Health Diet with decreased risk of all-cause mortality and environmental benefits: insights from a multi-national prospective cohort study

Table of Contents

Supplementary methods

Study population

This prospective cohort study used individual-level data from the National Health and Nutrition Examination Survey (NHANES) (2005–06 to 2017–18, seven cycles in total) and the UK Biobank. The NHANES is a cross-sectional survey to assess health and nutritional status of the civilian, non-institutionalized US population residing in 50 states and the District of Columbia using a multistage probability sampling procedure[1]. Beginning in 1999, the NHANES became a continuous program and examines a nationally representative sample of approximately 5,000 persons each year[1]. The UK Biobank is a large-scale, population-based prospective cohort study that recruited over 0.5 million individuals, mainly aged 40–69 years, throughout the UK between 2006 and 2010[2]. At recruitment, participants completed a touchscreen questionnaire covering medical, dietary, and lifestyle information, took physical measurements, and provided biological samples[2]. Details of the surveys have been reported elsewhere[1,2].

Of the 142,301 participants recruited at baseline (aged 40–69 years with at least two dietary assessments), we excluded pregnant women (n = 38), those with invalid dietary intake and extreme energy intake (NHANES: <500 or >8,000 kcal/d; UK Biobank: <800 or >5,000 kcal/d for males and <500 or >4,000 kcal/d for females) (n = 1,293), those who died in the survey cycle (NHANES) or before the first dietary assessment (UK Biobank) (n = 243), and those with missing information on mortality status and covariates (n = 9,597) (**Figure S1**). A total of 131,130 participants were finally included in this study, including 14,345 from the NHANES and 116,785 from the UK Biobank.

NHANES and the UK Biobank were approved by the Ethics Review Board of the National Center for Health Statistics and the North West Multi-Center Research Ethics Committee, respectively. All participants provided written informed consent at the time of enrolment. The data used in this study were de-identified and publicly accessible; thus, ethical approval was not required. This study was in accordance with the Declaration of Helsinki.

Dietary intake and Planetary Health Diet Index

NHANES participants were asked to recall all foods and beverages they consumed during the previous day. Data from the Food Patterns Equivalents Database were used to assign food items to 37 food pattern components using a food composition table[3]. The Food Patterns Equivalents Database assigned single-ingredient food items to the corresponding components or disaggregated multiple-ingredient foods into gram weights of their component ingredients using standard recipe files[4]. In the UK Biobank, a total of five dietary assessments were conducted from April 2009 to June 2012 using the Oxford WebQ, a web-based 24-h dietary assessment tool[5].

Participants were asked their consumption of more than 200 foods and drinks during the prior 24-h period. The consumption of each food item (in grams) was calculated by multiplying the portion size of each food by the amount of consumption[6]. To mitigate recall bias, dietary intake data were obtained from at least two dietary assessments and an average of dietary recalls was used in this study.

PHD was measured by the Planetary Health Diet Index (PHDI), which was calculated based on the midpoint of the recommended intake of each dietary component in the EAT–*Lancet* report[7]. This score comprises 14 dietary components, including whole grains, whole fruits, non-starchy vegetables, nuts and seeds, legumes (non-soy legumes and soybean products), unsaturated oils, starchy vegetables, dairy, red and processed meat, poultry, eggs, seafood, saturated fats, and added sugars and fruit juice[7]. The first six dietary components are adequacy components that are encouraged to consume more, whereas the latter eight are optimum/moderation components that are discouraged from consumption[7]. Due to a lack of information, unsaturated oils component was excluded in the assessment of the PHDI in the UK Biobank. Each food category was scored on a scale from 0 point (minimum) to 10 points (maximum) based on a diet of 2,500 kcal/d (**Table S1**) and consumption levels between the minimum and the maximum were scored proportionately. Accordingly, the possible ranges of the PHDI were 0–140 points for the NHANES and 0–130 points for the UK Biobank, respectively. A higher PHDI indicates a greater adherence to the PHD. PHDI was then categorized into quartiles (NHANES: Quartile 1 20–62, Quartile 2 63–71, Quartile 3 72–83, and Quartile 4 84–129; UK Biobank: Quartile 1 33–71, Quartile 2 72–76, Quartile 3 77–83, and Quartile 4 84–111). Quartiles 1–4 were denoted low, lower-middle, upper-middle, and high, respectively.

Environmental impacts

Individual-level diet-related environmental impacts were calculated based on a global food-systems model[8], including greenhouse gas emissions, cropland use, and freshwater use. Briefly, environmental impacts of each food item in the PHD were calculated by multiplying the average environmental impacts per gram (**Table S2**) by the amount of food consumed. Greenhouse gas emissions focused on non-CO_2 emissions of agriculture (particularly, methane and nitrous oxide), whereas cropland and freshwater use referred to the consumption of cropland and surface water and groundwater, respectively[8]. Greenhouse gas emissions were expressed as kilogram CO_2 equivalent, cropland use as meters squared, and freshwater use as meters cubed.

Mortality

Mortality data of NHANES adult participants were obtained from the National Death Index through Dec 31, 2019[9]. Data on UK Biobank participants who have died were obtained from the National Health Service Digital (England and Wales) and the National Health Service Central Register (Scotland)[10]. Person-time was estimated from the date of interview (NHANES) or the last dietary assessment (UK Biobank) to the date of death, loss to follow-up, or end of follow-up (NHANES: Dec 31, 2019[9]; UK Biobank: Dec 31, 2022[10]), whichever came earlier.

Covariates

Covariates included age at baseline, sex (male or female), education level (non-university degree or college/university degree), socioeconomic status (low, middle, or high), smoking status (never, former, or current), alcohol consumption (no or yes), physical activity (no, low intensity, or high intensity), body mass index, multimorbidity (no or yes), and total energy intake (the mean of total dietary intake). Multimorbidity was defined as having two or more self-reported chronic diseases, including both physical and mental disorders. Chronic conditions included in two surveys can be found in **Table S3**. Total energy intake was regarded as one of the covariates to control for confounding and decrease extraneous variation in dietary intake. Data were harmonised for covariates across surveys (**Table S3**).

Statistical analysis

Baseline characteristics of the participants were summarized according to quartiles of the PHDI and presented as mean ± standard deviation, median (interquartile range), or frequencies (percentages). The between-group differences were compared using Analysis of Variance or Kruskal-Wallis test for continuous variables and Chi-square test for categorical variables. The distribution of environmental impacts was also summarized by quartiles of the PHDI.

The relationship between quartiles of the PHDI and mortality risk was analyzed using Cox proportional hazards models, where adjusted hazard ratios along with their corresponding 95% confidence intervals were reported. Consistent with a prior study[11], to ensure that the NHANES data used in our investigation (2005–2018) were nationally representative, this study used weights that the National Center for Health Statistics suggests, which were calculated as 1/7 × two-day dietary sample weight (WTDR2D). Cox proportional hazards models were additionally stratified by survey cycle for the NHANES. Proportional hazards assumption was verified using Schoenfeld residuals. For each survey cohort, we fitted four progressively adjusted models: (1) Model 1, crude model; (2) Model 2, adjusted for sociodemographic variables (age, sex, education level, and socioeconomic status); (3) Model 3, further adjusted for lifestyle factors (smoking status, alcohol consumption, physical activity, and total energy intake); and (4) Model 4, additionally adjusted for multimorbidity. Based on fully adjusted model (Model 4), we separately examined if the PHDI and mortality had a dose-response relationship in two cohorts using an adjusted restricted cubic spline with four knots. Mediation analysis was then performed using R package ‘mediation’ to investigate whether body mass index mediated the association of the PHD with mortality risk, adjusted for all covariates.

Linear regression models were employed to analyze the association of the PHD with greenhouse gas emissions and freshwater use, controled for age, sex, and total energy intake. *P* values for trend were assessed by treating median value of each quartile of the PHDI as a continuous variable. Ordinal logistic regression model was used to investigate the impact of the PHD on cropland use, controled for age, sex, and total energy intake.

A series of additional analyses were conducted to test the robustness of the results. We implemented subgroup analyses to identify whether the effect of the PHD on mortality varied across age (<65 vs ≥65 years), sex, socioeconomic status, and

multimorbidity. The following sensitivity analyses were then performed: (1) reran the main analysis when age was treated as a categorical variable (<65 and ≥65 years) and (2) participants who died in the initial two years of follow-up were excluded to further minimize the possibility of reverse causality.

We did primary analysis for each cohort and random-effects meta-analysis was then used to pool the results across two surveys, with the between-study heterogeneity tested using I^2 statistics. All statistical analyses were performed using STATA/MP 17.0 and R 4.4.3. Any results with a two-sided $p \leq 0.05$ were considered as statistically significant.

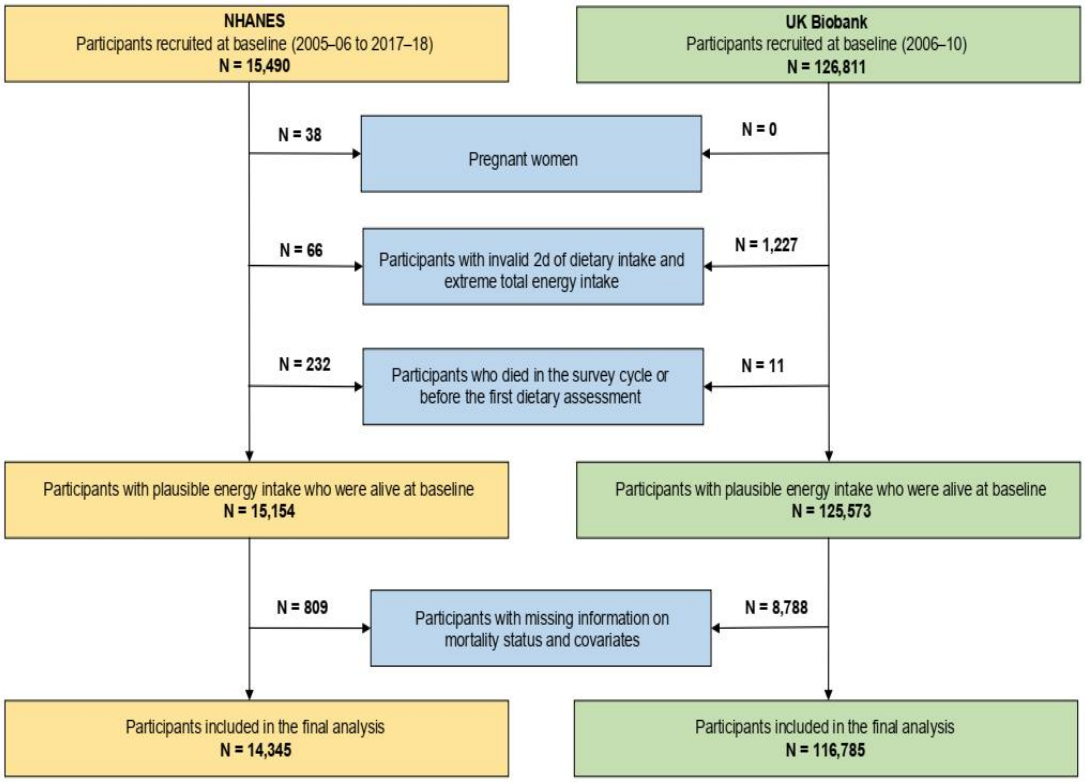

Figure S1. Flowchart of participant selection for two survey cohorts.
NHANES, National Health and Nutrition Examination Survey.

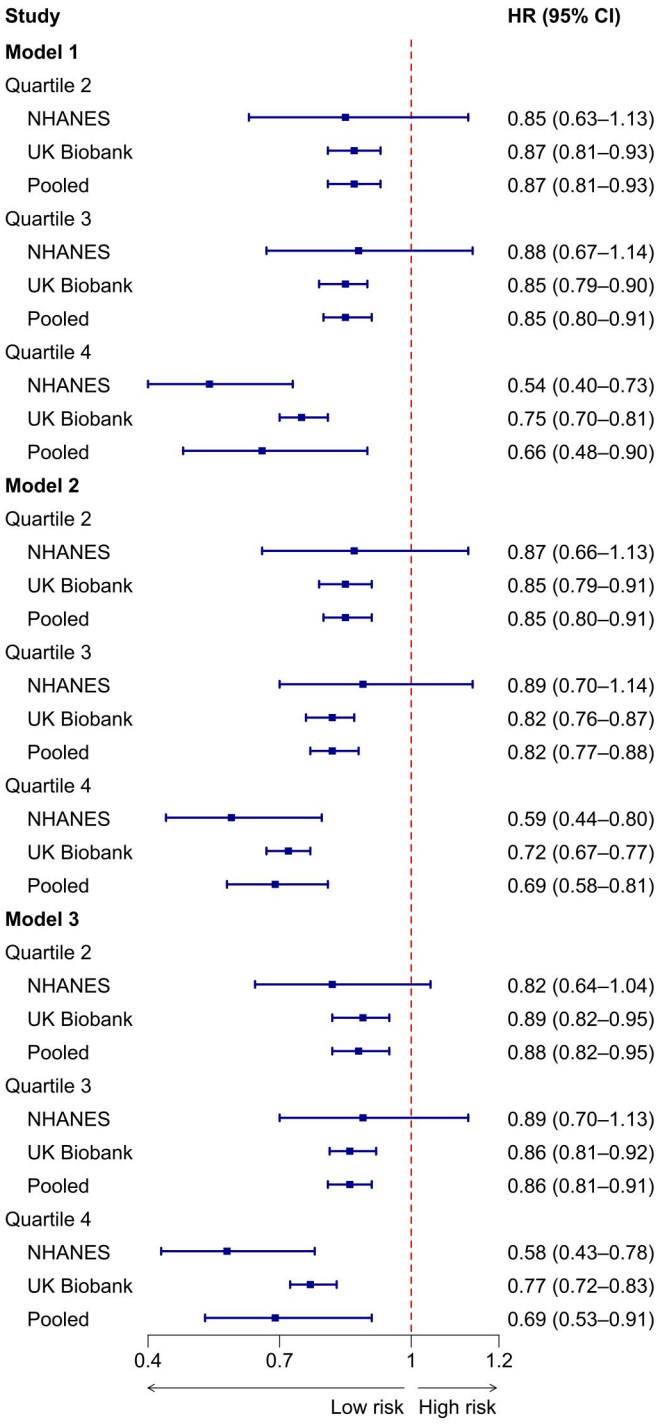

Figure S2. Crude and partially adjusted models on the association of the Planetary Health Dietary Index with mortality risk (Hazard ratio (95% confidence interval)).

NHANES, National Health and Nutrition Examination Survey. Model 1 was a crude model. Model 2 was adjusted for age, sex, education level, and socioeconomic status. Model 3 was additionally adjusted for smoking status, alcohol consumption, physical activity, and total energy intake. Quartiles 2–4 denote lower-middle, upper-middle, and high adherence to the Planetary Health Diet, respectively. Quartile 1 (Low) as the reference group.

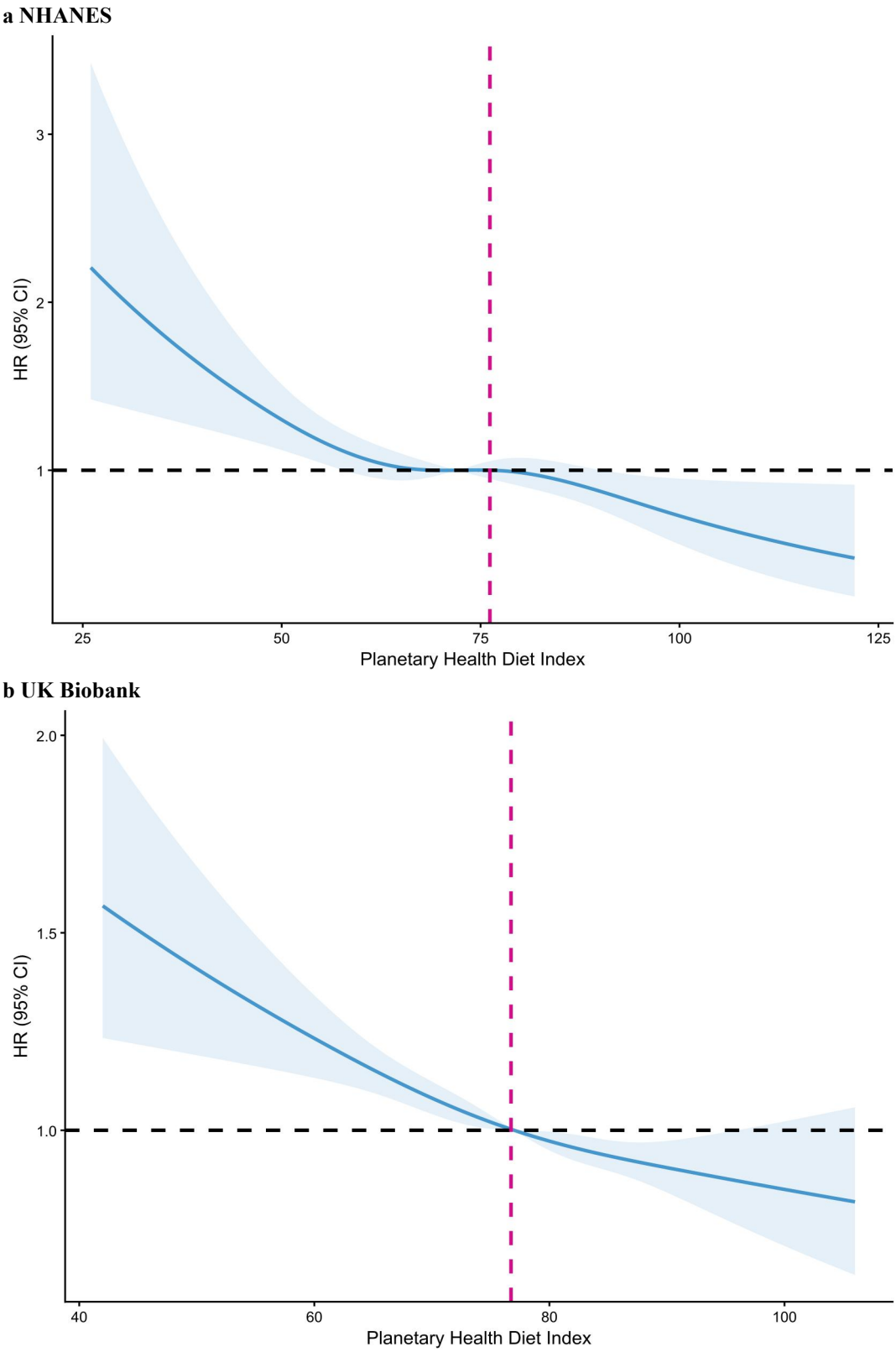

Figure S3. Dose-response relationship between the Planetary Health Diet Index and risk of mortality.

NHANES, National Health and Nutrition Examination Survey. Hazard ratio (95% confidence interval) was estimated by a restricted cubic spline Cox regression model, adjusted for age, sex, education level, socioeconomic status, smoking, alcohol consumption, physical activity, multimorbidity, and total energy intake (p values for nonlinearity were 0.1877 and 0.5456, respectively).

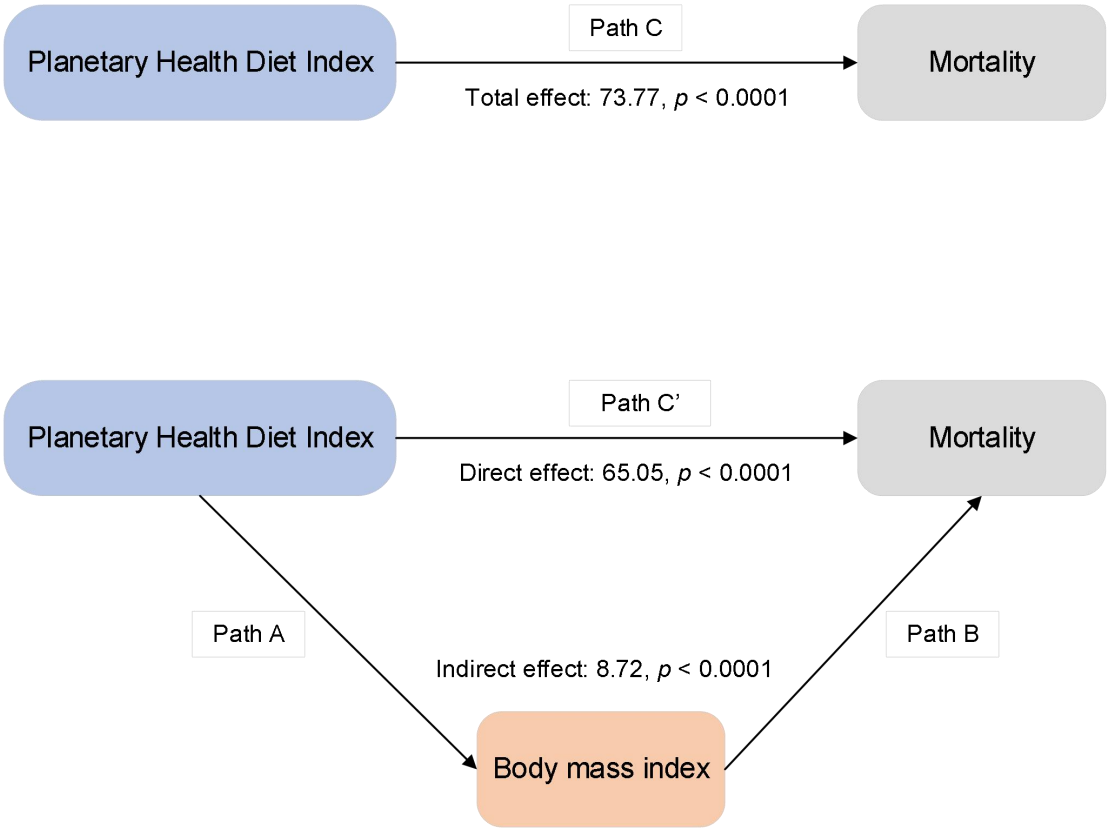

Figure S4. Mediation analysis on the role of body mass index in the relationship between the Planetary Health Diet Index and mortality.

Table S1. Scoring criteria for the Planetary Health Diet Index.

Dietary components[1]	**Category minimum score** (0 point)	**Category maximum score** (10 points)
National Health and Nutrition Examination Survey		
Adequacy components		
Whole grains	0 gram	≥75 grams for women ≥90 grams for men
Whole fruits (excludes fruit juice)	0 gram	≥200 grams
Non-starchy vegetables	0 gram	≥300 grams
Nuts and seeds	0 gram	≥50 grams
Legumes		
Non-soy legumes[2,3]	0 gram	≥100 grams
Soybean products[2,3]	0 gram	≥50 grams
Unsaturated oils	0% of total energy intake	≥10% of total energy intake
Moderation components		
Starchy vegetables	≥200 grams	≤50 grams
Dairy[4]	≥4.08 cup-equivalents	≤1.02 cup-equivalents
Red and processed meat	≥300 grams	≤14 grams
Poultry	≥58 grams	≤29 grams
Eggs	≥120 grams	≤12 grams
Seafood	≥50 grams	≤15 grams
Saturated fats	≥21% of total energy intake	≤3.5% of total energy intake
Added sugars and fruit juice	≥25% of total energy intake	≤5% of total energy intake
UK Biobank		
Adequacy components		
Whole fruits	0 gram	≥200 grams
Non-starchy vegetables	0 gram	≥300 grams
Nuts and seeds	0 gram	≥50 grams
Legumes		
Non-soy legumes[3]	0 gram	≥100 grams
Soybean products[3]	0 gram	≥50 grams
Fish	0 gram	≥28 grams
Optimum components		
Whole grains	0 gram	≥75 grams for women ≥90 grams for men
Dairy foods	≥1000 grams	≤250 grams
Eggs	≥120 grams	≤13 grams
Starchy vegetables	≥200 grams	≤50 grams
Poultry	≥100 grams	≤29 grams
Moderation components		
Red and processed meat	≥100 grams	≤14 grams
Saturated fats[5]	≥10% of total energy intake	0% of total energy intake
Added sugars and fruit juice	≥25% of total energy intake	≤5% of total energy intake

[1] Thresholds were based on the midpoint of the recommended range listed in EAT-*Lancet* Commission Scientific Report[7].
[2] Grams per day calculated from dry weight.
[3] To calculate the score for legumes component, non-soy and soy subcomponents were each weighted at 0.5.
[4] In Food Patterns Equivalent Database, 1 serving of dairy is equal to 245 g of whole-milk or derivative equivalent. In the EAT-*Lancet* report, scores were assigned ≤250 g whole-milk or derivative equivalent for the maximum score or ≥1000 g whole-milk or derivative equivalent for the minimum score.
[5] Saturated fats included palm oil, coconut oil, dairy fat (butter), margarine, lard, and tallow[12].

Table S2. Environmental footprints of food items (global average)[13].

Food items	**Greenhouse gas emissions** (kg CO_2 equivalent/kg)	**Cropland use** (m^2/kg)	**Freshwater use** (m^3/kg)
Whole grains	1.89	14.99	1.88
Whole fruits	0.28	2.97	0.77
Non-starchy vegetables	0.06	0.49	0.09
Nuts and seeds	0.71	6.39	0.43
Legumes	0.35	14.97	1.09
Seafood (Fish)	0.39	1.99	0.14
Unsaturated oils	1.52	15.47	0.72
Dairy	1.22	1.34	0.08
Red and processed meat	68.43	16.53	1.06
Poultry	1.41	6.59	0.40
Eggs	1.58	6.86	0.44
Starchy vegetables	0.07	0.69	0.04
Saturated fats	1.85	4.02	0.06
Added sugars and fruit juice	0.21	1.82	1.33

Table S3. Harmonized strategies for key variables included in the current study.

	Harmonized values	Measurements in two surveys	
		National Health and Nutrition Examination Survey	**UK Biobank**
Socioeconomic status	Low	Poverty Income Ratio <1.3[14]	Index of Multiple Deprivation scores: Tertile 3
	Middle	1.3–3.5[14]	Tertile 2
	High	>3.5[14]	Tertile 1
Education	Non-university degree	Education level: 1. Less than 9th grade 2. 9–11th grade (Includes 12th grade with no diploma) 3. High school graduate/GED or equivalent	Qualifications: 2. A levels/AS levels or equivalent 3. O levels/GCSEs or equivalent 4. CSEs or equivalent 5. NVQ or HND or HNC or equivalent 6. Other professional qualifications e.g. nursing, teaching
	College or university degree	4. Some college 5. College degree or higher	1. College or university degree
Smoking	Never	Smoked <100 cigarettes in life[15]	Current tobacco smoking: 0. No & Past tobacco smoking: 4. I have never smoked
	Former	Smoked ≥100 cigarettes in life but had quitted smoking[15]	Current tobacco smoking: 0. No & Past tobacco smoking: 1. Smoked on most or all days 2. Smoked occasionally 3. Just tried once or twice
	Current	Smoked ≥100 cigarettes in life and currently smoking cigarettes every day or some days[15]	Current tobacco smoking: 1. Yes, on most or all days 2. Only occasionally
Alcohol consumption	No	<12 alcohol drinks in life or a year	Alcohol intake frequency: 5. Special occasions only 6. Never
	Yes	≥12 alcohol drinks in a year	1. Daily or almost daily 2. Three or four times a week 3. Once or twice a week 4. One to three times a month
Physical activity	No	<1 metabolic equivalent of task (MET)-hour/week[16]	Not doing any moderate or vigorous activity[17]
	Low intensity	1–48 MET-h/week[16]	1–149 mins/week moderate, 1–74 mins/week vigorous, or 1–149 mins/week mixed (moderate + vigorous) activity[17]
	High intensity	>48 MET-h/week[16]	≥150 mins/week moderate, ≥75 mins/week vigorous, or ≥150 mins/week mixed activity[17]
Multimorbidity	Yes	Had ≥2 self-reported chronic diseases: hypertension, diabetes, stroke, thyroid problem, chronic lung disease (chronic bronchitis or emphysema), asthma, heart disease (congestive heart failure, coronary heart disease, angina/angina pectoris, or heart attack), cancer or malignancy, stomach or intestinal illness, liver condition, arthritis, and depression (Patient Health Questionnaire (PHQ-9) score	Had ≥2 self-reported chronic diseases: cardiovascular disease, respiratory disease, gastrointestinal/abdominal disease, renal disease, diabetes, neurological disorder, eye problem, musculoskeletal disorder, hematological disease, dermatological condition, immunological disorder, cancer, and psychological/psychiatric problem

		≥10)[18]	
	No	Had <2 above mentioned conditions	Had <2 above mentioned conditions

Table S4. Hazard ratio (95% confidence interval) of mortality risk by body mass index.

	NHANES	UK Biobank	Pooled
Body mass index (kg/m^2)	1.04 (0.91–1.17)	1.17 (1.13–1.22)	1.12 (1.00–1.25)

NHANES, National Health and Nutrition Examination Survey. Models were adjusted for age, sex, education level, socioeconomic status, smoking, alcohol consumption, physical activity, multimorbidity, and total energy intake.

Table S5. Association of the Planetary Health Diet Index with body mass index (coefficient (95% confidence interval)).

	NHANES	UK Biobank	Pooled
Planetary Health Diet Index	-0.004 (-0.006, -0.004)	-0.010 (-0.010, -0.009)	-0.009 (-0.015, -0.004)

NHANES, National Health and Nutrition Examination Survey. Models were adjusted for age, sex, education level, socioeconomic status, smoking, alcohol consumption, physical activity, multimorbidity, and total energy intake.

Table S6. Subgroup analysis on the association of the Planetary Health Dietary Index with mortality risk (Hazard ratio (95% confidence interval)).

Subgroup	Quartile	HR (95% CI)	*p*-value	*p* for interaction
NHANES				
Age				0.629
<65 years	Q2	0.75 (0.62–0.92)	0.005	
	Q3	0.75 (0.62–0.91)	0.003	
	Q4	0.55 (0.44–0.69)	<0.001	
≥65 years	Q2	0.92 (0.61–1.39)	0.689	
	Q3	0.97 (0.67–1.41)	0.882	
	Q4	0.71 (0.47–1.08)	0.107	
Sex				0.021
Male	Q2	0.84 (0.67–1.06)	0.134	
	Q3	1.09 (0.88–1.36)	0.411	
	Q4	0.63 (0.47–0.85)	0.002	
Female	Q2	0.78 (0.59–1.03)	0.080	
	Q3	0.68 (0.53–0.89)	0.005	
	Q4	0.67 (0.50–0.88)	0.004	
Socioeconomic status				0.056
Low	Q2	0.73 (0.55–0.96)	0.024	
	Q3	0.79 (0.61–1.03)	0.078	
	Q4	0.81 (0.60–1.10)	0.180	
Middle	Q2	0.77 (0.57–1.03)	0.075	
	Q3	0.80 (0.61–1.05)	0.114	
	Q4	0.54 (0.39–0.77)	0.001	
High	Q2	1.22 (0.83–1.81)	0.316	
	Q3	1.40 (0.97–2.00)	0.071	
	Q4	0.96 (0.65–1.44)	0.861	
Multimorbidity				0.750
No	Q2	0.81 (0.59–1.11)	0.195	
	Q3	0.76 (0.56–1.04)	0.086	
	Q4	0.67 (0.48–0.95)	0.024	
Yes	Q2	0.77 (0.62–0.95)	0.014	
	Q3	0.84 (0.69–1.03)	0.094	
	Q4	0.59 (0.46–0.74)	<0.001	
UK Biobank				
Age				0.570
<65 years	Q2	0.86 (0.62–0.92)	<0.001	
	Q3	0.82 (0.62–0.91)	<0.001	
	Q4	0.74 (0.44–0.69)	<0.001	
≥65 years	Q2	0.80 (0.61–1.39)	0.914	
	Q3	0.78 (0.67–1.41)	0.417	
	Q4	0.65 (0.47–1.08)	0.174	
Sex				0.962
Male	Q2	0.91 (0.67–1.06)	0.053	

	Q3	0.92 (0.88–1.36)	0.057	
	Q4	0.84 (0.47–0.85)	<0.001	
Female	Q2	0.91 (0.59–1.03)	0.102	
	Q3	0.89 (0.53–0.89)	0.030	
	Q4	0.82 (0.50–0.88)	<0.001	
Socioeconomic status				0.628
Low	Q2	0.88 (0.55–0.96)	0.061	
	Q3	0.83 (0.61–1.03)	0.003	
	Q4	0.76 (0.60–1.10)	<0.001	
Middle	Q2	0.90 (0.57–1.03)	0.076	
	Q3	0.83 (0.61–1.05)	0.001	
	Q4	0.71 (0.39–0.77)	<0.001	
High	Q2	0.84 (0.83–1.81)	0.006	
	Q3	0.88 (0.97–2.00)	0.020	
	Q4	0.8 (0.65–1.44)	<0.001	
Multimorbidity				0.055
No	Q2	0.89 (0.59–1.11)	0.054	
	Q3	0.95 (0.56–1.04)	0.313	
	Q4	0.83 (0.48–0.95)	0.003	
Yes	Q2	0.87 (0.62–0.95)	0.002	
	Q3	0.80 (0.69–1.03)	<0.001	
	Q4	0.72 (0.46–0.74)	<0.001	
Pooled				
Age				0.857
<65 years	Q2	0.84 (0.62–0.92)	<0.001	
	Q3	0.80 (0.62–0.91)	<0.001	
	Q4	0.70 (0.44–0.69)	<0.001	
≥65 years	Q2	0.81 (0.61–1.39)	0.002	
	Q3	0.80 (0.67–1.41)	<0.001	
	Q4	0.66 (0.47–1.08)	<0.001	
Sex				0.605
Male	Q2	0.90 (0.67–1.06)	0.020	
	Q3	0.93 (0.88–1.36)	0.073	
	Q4	0.80 (0.47–0.85)	<0.001	
Female	Q2	0.90 (0.59–1.03)	0.044	
	Q3	0.86 (0.53–0.89)	0.003	
	Q4	0.80 (0.50–0.88)	<0.001	
Socioeconomic status				0.252
Low	Q2	0.86 (0.55–0.96)	0.012	
	Q3	0.81 (0.61–1.03)	<0.001	
	Q4	0.74 (0.60–1.10)	<0.001	
Middle	Q2	0.88 (0.57–1.03)	0.021	
	Q3	0.82 (0.61–1.05)	<0.001	
	Q4	0.68 (0.39–0.77)	<0.001	

High	Q2	0.87 (0.83–1.81)	0.020	
	Q3	0.91 (0.97–2.00)	0.091	
	Q4	0.81 (0.65–1.44)	<0.001	
Multimorbidity				0.087
No	Q2	0.88 (0.59–1.11)	0.023	
	Q3	0.92 (0.56–1.04)	0.104	
	Q4	0.81 (0.48–0.95)	<0.001	
Yes	Q2	0.86 (0.62–0.95)	<0.001	
	Q3	0.81 (0.69–1.03)	<0.001	
	Q4	0.70 (0.46–0.74)	<0.001	

NHANES, National Health and Nutrition Examination Survey.

Table S7. Sensitivity analysis on individual and pooled effects of the Planetary Health Diet Index on mortality (Hazard ratio (95% confidence interval)).

Planetary Health Diet Index	NHANES	UK Biobank	Pooled
Sensitivity analysis 1			
Quartile 1			
Quartile 2	0.97 (0.73–1.28)	0.93 (0.86–1.00)	0.93 (0.87–1.00)
Quartile 3	1.06 (0.80–1.39)	0.93 (0.87–0.99)	0.94 (0.88–1.00)
Quartile 4	0.73 (0.53–1.00)	0.85 (0.79–0.91)	0.84 (0.79–0.90)
Sensitivity analysis 2			
Quartile 1			
Quartile 2	0.82 (0.64–1.04)	0.89 (0.83–0.97)	0.88 (0.82–0.95)
Quartile 3	0.90 (0.71–1.15)	0.88 (0.82–0.94)	0.88 (0.83–0.94)
Quartile 4	0.59 (0.44–0.80)	0.80 (0.74–0.87)	0.71 (0.53–0.95)

NHANES, National Health and Nutrition Examination Survey. Sensitivity analysis 1: age was treated as a categorical variable; Sensitivity analysis 2: excluded participants who died in the initial two years of follow-up. Quartiles 1–4 denote low, lower-middle, upper-middle, and high adherence to the Planetary Health Diet, respectively.

References

1. National Center for Health Statistics. About the National Health and Nutrition Examination Survey. 2023. https://www.cdc.gov/nchs/nhanes/about_nhanes.htm.
2. Sudlow C, Gallacher J, Allen N, et al. UK biobank: an open access resource for identifying the causes of a wide range of complex diseases of middle and old age. PLoS Med, 2015; 12(3), e1001779.
3. US Department of Agriculture, Agricultural Research Service, Beltsville Human Nutrition Research Center. Food Patterns Equivalents Database. 2024. https://www.ars.usda.gov/northeast-area/beltsville-md-bhnrc/beltsville-human-nutrition-research-center/food-surveys-research-group/docs/fped-databases/.
4. Bowman SA, Clemens JC, Friday JE, et al. Food Patterns Equivalents Database 2017–2018: Methodology and User Guide. Beltsville, MD: US Department of Agriculture, Agricultural Research Service, Beltsville Human Nutrition Research Center. 2020. https://www.ars.usda.gov/ARSUserFiles/80400530/pdf/fped/FPED_1718.pdf.
5. Liu B, Young H, Crowe FL, et al. Development and evaluation of the Oxford WebQ, a low-cost, web-based method for assessment of previous 24 h dietary intakes in large-scale prospective studies. Public Health Nutr, 2011; 14(11), 1998–2005.
6. Lu X, Wu L, Shao L, et al. Adherence to the EAT-Lancet diet and incident depression and anxiety. Nat Commun, 2024; 15(1), 5599.
7. Willett W, Rockström J, Loken B, et al. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. Lancet, 2019; 393(10170), 447–492.
8. Springmann M, Wiebe K, Mason-D'Croz D, et al. Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. Lancet Planet Health, 2018; 2(10), e451–e461.
9. National Center for Health Statistics Division of Analysis and Epidemiology. Continuous NHANES Public-use Linked Mortality Files. 2019. https://ftp.cdc.gov/pub/Health_Statistics/NCHS/datalinkage/linked_mortality/.
10. UK Biobank. Mortality data: linkage to death registries. 2023. https://biobank.ndph.ox.ac.uk/showcase/ukb/docs/DeathLinkage.pdf.
11. Huang S, He Q, Wang X, et al. Associations of the planetary health diet index (PHDI) with asthma: the mediating role of body mass index. BMC Public Health, 2024; 24(1), 2305.
12. Sotos-Prieto M, Ortolá R, Maroto-Rodriguez J, et al. Association between Planetary Health Diet and cardiovascular disease: a prospective study from the UK Biobank. Eur J Prev Cardiol, 2025; 32(5), 394–401.
13. Springmann M, Wiebe K, Mason-D'Croz D, et al. Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail. Lancet Planet Health, 2018; 2(10), e451–e461.
14. Yi J, Wang L, Guo X, et al. Association of Life's Essential 8 with all-cause and cardiovascular mortality among US adults: a prospective cohort study from the NHANES 2005–2014. Nutr Metab Cardiovasc Dis, 2023; 33(6), 1134–1143.
15. Jung S, Young HA, Simmens SJ, et al. The cross-sectional association between a sustainable diet index and obesity among US adults. Obesity (Silver Spring), 2023; 31(7), 1962–1971.
16. Tian X, Xue B, Wang B, et al. Physical activity reduces the role of blood cadmium

on depression: A cross-sectional analysis with NHANES data. Environ Pollut, 2022; 304, 119211.
17. Said MA, Verweij N, van der Harst P. Associations of combined genetic and lifestyle risks with incident cardiovascular disease and diabetes in the UK Biobank Study. JAMA Cardiol, 2018; 3(8), 693–702.
18. Patel JS, Oh Y, Rand KL, et al. Measurement invariance of the patient health questionnaire-9 (PHQ-9) depression screener in U.S. adults across sex, race/ethnicity, and education level: NHANES 2005-2016. Depress Anxiety, 2019; 36(9), 813–823.