

**Supplementary Table 1. Components and scoring methods of the dietary patterns.**

Dietary patterns	Component	Minimal score	Maximal score
		0	1
aMED	Vegetables	Below the median	Above the median
	Fruits	Below the median	Above the median
	Nuts	Below the median	Above the median
	Whole grains	Below the median	Above the median
	Legumes	Below the median	Above the median
	Fish	Below the median	Above the median
	Monounsaturated/saturated fat ratio	Below the median	Above the median
	Red and processed meats	Above the median	Below the median
	Alcohol	5 >alcohol >15 g/d	5 ≤alcohol ≤15 g/d
	Total	0	9
		0	1
RFS	1. Pome fruit (apples, pears)	Below 15 g/d	Above 15 g/d
	2. Berry fruit (berry)	Below 15 g/d	Above 15 g/d
	3. Citrus fruit (orange, satsuma, grapefruit)	Below 15 g/d	Above 15 g/d
	4. Stone fruit (nectarine, peach, plum, cherry, prune)	Below 15 g/d	Above 15 g/d
	5. Tropical and subtropical fruit (banana, pineapple, mango)	Below 15 g/d	Above 15 g/d
	6. Other fruit (other fruit, grape, melon, dried fruit, stewed fruit)	Below 15 g/d	Above 15 g/d
	7. Fruit juice (orange juice, grapefruit juice, pure fruit/vegetable juice)	Below 30 g/d	Above 30 g/d
	8. Green (lettuce, spinach, sprouts, watercress, cucumber, celery, courgette) and brassica vegetables (cabbage, cauliflower, broccoli)	Below 15 g/d	Above 15 g/d
	9. Legumes (pulses, broad bean)	Below 15 g/d	Above 15 g/d
	10. Carrot and root vegetables (carrot, turnip/swede, beetroot parsnip, onion, garlic,	Below 15 g/d	Above 15 g/d

	leek)		
	11. Starchy vegetables (boiled/baked potatoes [*butter/margarine added to potatoes, butternut squash], mashed potato, sweet potato, sweetcorn)	Below 15 g/d	Above 15 g/d
	12. Tomato and tomato products (fresh tomato, tinned tomato)	Below 15 g/d	Above 15 g/d
	13. Peas and beans (green bean, pea)	Below 15 g/d	Above 15 g/d
	14. Other vegetables (other vegetables, mushroom, sweet pepper, side salad, olives)	Below 15 g/d	Above 15 g/d
	15. Wholegrain (whole-wheat cereal, sliced bread (wholemeal), baguette (wholemeal), bap (wholemeal), bread roll [wholemeal])	Below 15 g/d	Above 15 g/d
	16. High fibre cereals (porridge, muesli, oat crunch, bran cereal) and wholegrain pasta and brown rice	Below 15 g/d	Above 15 g/d
	17. Poultry	Below 15 g/d	Above 15 g/d
	18. Fish (tinned tuna, oily fish, white fish, prawns, lobster/crab, shellfish)	Below 15 g/d	Above 15 g/d
	19. unsalted peanuts, unsalted nuts, types of spreads/sauces consumed [peanut butter] seeds), tofu, Quorn)	Below 15 g/d	Above 15 g/d
	20. 2%, 1% or skim milk (type of milk consumed (semi skimmed, skimmed, goat/sheep milk, powdered milk, cholesterol lowering))	Below 30 g/d	Above 30 g/d
	21. Low fat cheese and yogurt (Low fat hard cheese, low fat cheese spread, cottage cheese, yogurt [low fat yogurt consumer], goat's cheese)	Below 15 g/d	Above 15 g/d
	Total	0	21
		1	5
DASH	1. Fruits	Quintile 1	Quintile 5
	2. Vegetables	Quintile 1	Quintile 5
	3. Nuts and legumes	Tertile 1	Tertile 3
	4. Low-fat dairy	Tertile 1	Tertile 3
	5. Whole grains	Tertile 1	Tertile 3
	6. Sugar sweetened beverages	Tertile 3	Tertile 1

	7. Red and processed meats	Quintile 5	Quintile 1
	Total	7	35
		1	5
MIND <sup>1</sup>	1. Green Leafy Vegetables <sup>a</sup>	Tertile 1	Tertile 3
	2. Other Vegetables <sup>b</sup>	Quintile 1	Quintile 5
	3. Berries <sup>c</sup>	Below the median	Above the median
	4. Nuts	Below the median	Above the median
	5. Butter, Margarine	Above the median	Below the median
	6. Cheese	Quintile 5	Quintile 1
	7. Whole Grains	Quintile 1	Quintile 5
	8. Fish (not fried)	Tertile 1	Tertile 3
	9. Beans <sup>e</sup>	Below the median	Above the median
	10. Poultry (not fried)	Tertile 1	Tertile 3
	11. Red Meat and products <sup>g</sup>	Tertile 3	Tertile 1
	12. Fast Fried Food <sup>h</sup>	Tertile 3	Tertile 1
	13. Pastries & Sweets <sup>i</sup>	Quintile 5	Quintile 1
	14. Wine	The third quintile scores 5; the second and fourth quintile score 3; the first and fifth quintile score 1	
	Total	14	70

Notes: aMED, alternate Mediterranean diet score; RFS, recommended food score; DASH, dietary approaches to stop hypertension; MIND, Mediterranean-DASH intervention for neurodegenerative delay.

<sup>1</sup> Olive oil consumption was not included because it is not recorded in the UK Biobank

<b>Frailty phenotype</b>	<b>Self-reported question/ measurement in UK Biobank</b>	<b>Scoring</b>
<i>Weight loss</i>	“Compared with one year ago, has your weight changed?”	1=Yes, lost weight 0=Other
<i>Exhaustion</i>	“Over the past two weeks, how often have you felt tired or had little energy?”	1=More than half the days or nearly every day 0=Other
<i>Slowness</i>	“How would you describe your usual walking pace?”	1=Slow 0=Other
<i>Low physical activity</i>	Physical activity questionnaire, categorized into 4 levels: 1. none – no physical activity in the last 4 weeks 2. low – light DIY activity (e.g., pruning, watering the lawn) only in the last 4 weeks 3. medium – heavy DIY activity (e.g., weeding, lawn mowing, carpentry and digging), walking for pleasure, or other exercises in the last 4 weeks 4. high – strenuous sports in the last 4 weeks	1=None, or light activity with a frequency of once per week or less 0=Medium or heavy activity, or light activity more than once per week
<i>Weakness</i>	Measured grip strength (maximum value of either hand), stratified by sex and body mass index (BMI)	Women & BMI $\leq 23$ : 1=grip strength $\leq 17$ kg Women & BMI $>23-26$ : 1=grip strength $\leq 17.3$ kg Women & BMI $>26-29$ : 1=grip strength $\leq 18$ kg Women & BMI $>29$ : 1=grip strength $\leq 21$ kg Men & BMI $\leq 24$ : 1=grip strength $\leq 29$ kg Men & BMI $>24-26$ : 1=grip strength $\leq 30$ kg Men & BMI $>26-28$ : 1=grip strength $\leq 30$ kg Men & BMI $>28$ : 1=grip strength $\leq 32$ kg

**Supplementary Table 2.1. Items of the frailty phenotype in the UK Biobank.**



**Supplementary Table 2.2. Items of the frailty index in the UK Biobank.**

Type of deficit	No.	Item description	Categories
<i>Sensory</i>	1	Glaucoma	0: no; 1: yes
	2	Cataracts	0: no; 1: yes
	3	Hearing difficulty	0: no; 1: yes, completely deaf
<i>Cranial</i>	4	Migraine	0: no; 1: yes
	5	Dental problems	0: none; 1: any of ulcers, painful gums, bleeding gums, loose teeth, toothache, dentures
<i>Mental wellbeing</i>	6	Self-rated health	0: excellent; 0.25: good; 0.5: fair; 1: poor
	7	Fatigue: frequency of tiredness/lethargy in the last two weeks	0: not at all; 0.25: several days; 0.5: more than half; 1: nearly every day
	8	Sleep: experience of sleeplessness/insomnia	0: never/rarely; 0.5: sometimes; 1: usually
	9	Depressed feelings: frequency in last two weeks	0: not at all; 0.5: several days; 0.75: more than half, nearly every day
	10	Self-described nervous personality	0: no; 1: yes
	11	Severe anxiety/panic attacks	0: no; 1: yes
	12	Common to feel loneliness	0: no; 1: yes
	13	Sense of misery (ever/never)	0: no; 1: yes
<i>Infirmity</i>	14	Infirmity: long-standing illness or disability	0: no; 1: yes
	15	Falls in last year	0: no falls; 0.5: one fall; 1: more than one
	16	Fractures/broken bones in the last five years	0: no; 1: yes
<i>Cardiometabolic</i>	17	Diabetes	0: no; 1: yes
	18	Myocardial infarction	0: no; 1: yes
	19	Angina	0: no; 1: yes
	20	Stroke	0: no; 1: yes
	21	High blood pressure	0: no; 1: yes
	22	Hypothyroidism	0: no; 1: yes
	23	Deep-vein thrombosis	0: no; 1: yes
	24	High cholesterol	0: no; 1: yes
<i>Respiratory</i>	25	Breathing: wheeze in last year	0: no; 1: yes
	26	Pneumonia	0: no; 1: yes
	27	Chronic bronchitis/emphysema	0: no; 1: yes
	28	Asthma	0: no; 1: yes
<i>Musculoskeletal</i>	29	Rheumatoid arthritis	0: no; 1: yes
	30	Osteoarthritis	0: no; 1: yes
	31	Gout	0: no; 1: yes
	32	Osteoporosis	0: no; 1: yes
<i>Immunological</i>	33	Hayfever, allergic rhinitis, or eczema	0: no; 1: yes
	34	Psoriasis	0: no; 1: yes
<i>Cancer</i>	35	Any cancer diagnosis	0: no; 1: yes

	36	Multiple cancers diagnosed (number reported)	0: no cancer or single cancer; 1: multiple cancers
<i>Pain</i>	37	Chest pain	0: no; 1: yes
	38	Head and/or neck pain	0: no; 1: yes (combining responses to pain in head and neck/shoulders)
	39	Back pain	0: no; 1: yes
	40	Stomach/abdominal pain	0: no; 1: yes
	41	Hip pain	0: no; 1: yes
	42	Knee pain	0: no; 1: yes
	43	Whole-body pain	0: no; 1: yes
	44	Facial pain	0: no; 1: yes
	45	Sciatica	0: no; 1: yes
<i>Gastrointestinal</i>	46	Gastric reflux	0: no; 1: yes
	47	Hiatus hernia	0: no; 1: yes
	48	Gall stones	0: no; 1: yes
	49	Diverticulitis	0: no; 1: yes

**Supplementary Table 3.1. Codes used in the UK Biobank to define chronic diseases.**

<b>Diseases</b>	<b>Explanations</b>	<b>Field IDs &amp; ICD codes</b>
Diabetes mellitus	Diagnosis of DM at baseline (1: Yes, 0: No)	<b>Field 41270: DM--ICD10</b> (E10-E14) <b>Field 41271: ICD-9</b> (250) <b>Field 20002: Self report</b> (1220)
Cardiovascular disease	Diagnosis of CVD at baseline (1: Yes, 0: No)	<b>Field 41270: ICD-10</b> (I20.x, I21.x, I22.x, I23.x, I24.1, I25.x, I46, I60.x, I61.x, I63.x, I64.x) <b>Field 41271: ICD-9</b> (410.x, 411.x, 412.x, 413.x, 414.x, 429.79, 430.x, 431.x, 432.x, 433.x, 434.x, 435.x, 436.x, 437.x, 438.x) <b>Field 20002: Self report</b> (1066, 1074, 1075, 1081, 1086, 1491, 1583)
Cancer	Diagnosis of Overall cancer at baseline (1: Yes, 0: No)	<b>Field 40006: ICD-10</b> (C00-C96, except C44) <b>Field 40013: ICD-9</b> (140-208, except 173) <b>Field 20001: Self report</b> (1001-1088)
Chronic kidney disease	Diagnosis of Chronic Kidney Disease at baseline (1: Yes, 0: No)	<b>Field 41271: ICD-9</b> (7531, 585, 586) <b>Field 41270: ICD-10</b> (Q61, N18, N19) <b>Field 20002: Self report</b> (1427, 1192, 1193, 1194, 1519, 1520)
Hypertension	Diagnosis of Hypertension at baseline (1: Yes, 0: No)	<b>Field 41270: ICD-10</b> (I10.x - I13.x, I15.x) <b>Field 41271: ICD-9</b> (401.x - 405.x) <b>Field 20002: Self report</b> (1065, 1072, 1073)

Notes: DM, diabetes mellitus; CVD, cardiovascular disease.



**Supplementary Table 3.2. Define of metabolic syndrome.**

Measure	Metabolic syndrome
BP	SBP $\geq$ 130 or DBP $\geq$ 85 or using BP-lowing medication
Waist/Hip	Waist >102 cm for men and 88 cm for women
Glucose/Hemoglobin A1c/diabetes	Fasting glucose $\geq$ 110 mg/dL or prevalent diabetes
Triglycerides	$\geq$ 150mg/dL (1.7 mmol/mol)
High-Density Lipoprotein	<40mg/dL for men and 50 mg/dL for women

Notes: MS, metabolic syndrome; SBP, systolic blood pressure; DBP, diastolic blood pressure; BP, blood pressure. MS is identified if three or more of the five criteria are met.

**Supplementary Table 4. Basic characteristics of participants in analytic sample 2.**

	Total (N=26,270)	FP_Frailty		P value	FI_Frailty		P value
		No (N=25,648)	Yes (N=622)		No (N=24,526)	Yes (N=1,744)	
<b>Age, years</b>	57.7 (50.5, 62.9)	57.7 (50.4, 62.9)	58.5 (52.8, 63.3)	0.007	57.6 (50.3, 62.8)	59.5 (52.8, 63.8)	<0.001
<b>Sex</b>				0.001			0.031
Female	14,463 (55.1)	14,081 (54.9)	382 (61.4)		13,459 (54.9)	1,004 (57.6)	
Male	11,807 (44.9)	11,567 (45.1)	240 (38.6)		11,067 (45.1)	740 (42.4)	
<b>Ethnicity</b>				<0.001			0.347
Non-British White	784 (3.0)	744 (2.9)	40 (6.4)		725 (3.0)	59 (3.4)	
British White	25,486 (97.0)	24,904 (97.1)	582 (93.6)		23,801 (97.0)	1,685 (96.6)	
<b>Townsend Deprivation Index</b>	-2.4 (-3.8, -0.0)	-2.4 (-3.8, -0.1)	-1.1 (-3.2, 1.9)	<0.001	-2.4 (-3.8, -0.1)	-1.7 (-3.5, 1.1)	<0.001
<b>Education level</b>				<0.001			<0.001
Low	12,527 (47.7)	12,305 (48.0)	222 (35.7)		11,929 (48.6)	598 (34.3)	
Intermediate	8,460 (32.2)	8,243 (32.1)	217 (34.9)		7,834 (31.9)	626 (35.9)	
High	5,283 (20.1)	5,100 (19.9)	183 (29.4)		4,763 (19.4)	520 (29.8)	
<b>Smoking status</b>				0.001			<0.001
Never smoker	15,144 (57.6)	14,824 (57.8)	320 (51.4)		14,343 (58.5)	801 (45.9)	
Previous smoker	9,332 (35.5)	9,091 (35.4)	241 (38.7)		8,563 (34.9)	769 (44.1)	
Current smoker	1,794 (6.8)	1,733 (6.8)	61 (9.8)		1,620 (6.6)	174 (10.0)	
<b>Alcohol intake frequency</b>				<0.001			<0.001
Never or special occasions	3,901 (14.8)	3,661 (14.3)	240 (38.6)		3,408 (13.9)	493 (28.3)	
1 to 3 times per month	2,840 (10.8)	2,747 (10.7)	93 (15.0)		2,609 (10.6)	231 (13.2)	
1 to 4 times per week	13,277 (50.5)	13,080 (51.0)	197 (31.7)		12,598 (51.4)	679 (38.9)	
Daily or almost daily	6,252 (23.8)	6,160 (24.0)	92 (14.8)		5,911 (24.1)	341 (19.6)	
<b>Regular physical activity</b>				<0.001			<0.001
No	11,384 (43.3)	10,915 (42.6)	469 (75.4)		10,417 (42.5)	967 (55.4)	

Yes	14,886 (56.7)	14,733 (57.4)	153 (24.6)		14,109 (57.5)	777 (44.6)	
<b>BMI</b>	26.0 (23.6, 29.0)	26.0 (23.6, 28.9)	30.3 (26.4, 34.6)	<0.001	25.9 (23.5, 28.8)	28.9 (25.6, 32.8)	<0.001
<b>eGFR</b>	90.7 (12.7)	90.7 (12.7)	90.5 (15.3)	0.772	90.8 (12.6)	88.9 (14.3)	<0.001
<b>Anti-lipid drugs</b>				<0.001			<0.001
No	22,410 (85.3)	21,977 (85.7)	433 (69.6)		21,292 (86.8)	1,118 (64.1)	
Yes	3,860 (14.7)	3,671 (14.3)	189 (30.4)		3,234 (13.2)	626 (35.9)	
<b>Dietary pattern score</b> <b>(continuous)</b>							
aMED	3.6 (1.3)	3.6 (1.3)	3.2 (1.3)	<0.001	3.6 (1.3)	3.4 (1.3)	<0.001
RFS	8.3 (2.4)	8.3 (2.4)	7.5 (2.5)	<0.001	8.4 (2.4)	7.9 (2.7)	<0.001
DASH	20.1 (4.1)	20.1 (4.1)	19.3 (4.1)	<0.001	20.1 (4.1)	19.7 (4.3)	<0.001
MIND	37.5 (5.3)	37.6 (5.3)	36.4 (5.2)	<0.001	37.6 (5.3)	36.8 (5.5)	<0.001
<b>Dietary pattern score</b> <b>(categorical)</b>							
<b>aMED</b>				<0.001			<0.001
Tertile 1	10,366 (39.5)	10,036 (39.1)	330 (53.1)		9,547 (38.9)	819 (47.0)	
Tertile 2	7,877 (30.0)	7,695 (30.0)	182 (29.3)		7,405 (30.2)	472 (27.1)	
Tertile 3	8,027 (30.6)	7,917 (30.9)	110 (17.7)		7,574 (30.9)	453 (26.0)	
<b>RFS</b>				<0.001			<0.001
Tertile 1	8,970 (34.1)	8,676 (33.8)	294 (47.3)		8,215 (33.5)	755 (43.3)	
Tertile 2	8,160 (31.1)	7,985 (31.1)	175 (28.1)		7,691 (31.4)	469 (26.9)	
Tertile 3	9,140 (34.8)	8,987 (35.0)	153 (24.6)		8,620 (35.1)	520 (29.8)	
<b>DASH</b>				<0.001			<0.001
Tertile 1	8,835 (33.6)	8,571 (33.4)	264 (42.4)		8,154 (33.2)	681 (39.0)	
Tertile 2	8,839 (33.6)	8,649 (33.7)	190 (30.5)		8,306 (33.9)	533 (30.6)	
Tertile 3	8,596 (32.7)	8,429 (32.9)	168 (27.0)		8,066 (32.9)	530 (30.4)	

<b>MIND</b>				<0.001		<0.001
Tertile 1	9,040 (34.4)	8,760 (34.2)	280 (45.0)		8,295 (33.8)	745 (42.7)
Tertile 2	8,731 (33.2)	8,538 (33.3)	193 (31.0)		8,223 (33.5)	508 (29.1)
Tertile 3	8,499 (32.4)	8,350 (32.6)	149 (24.0)		8,008 (32.7)	491 (28.2)

Notes: Abbreviations: SD, standard deviation; IQR, Interquartile Range; BMI, body mass index; FP\_Frailty, frailty defined by the frailty phenotype; FI\_Frailty, frailty defined by the frailty index; aMED, alternate Mediterranean diet score; RFS, recommended food score; DASH, dietary approaches to stop hypertension; MIND, Mediterranean-DASH intervention for neurodegenerative delay.

- <sup>a</sup> Educational levels were defined as high (college or university degree), intermediate (A/AS levels or equivalent, O levels/GCSEs or equivalent), and low (none of the aforementioned).
- <sup>b</sup> Regular physical activity was defined as meeting the current global health recommendations for physical activity (150 minutes of moderate activity or 75 minutes of vigorous activity or an equivalent combination), which equated to  $\geq 500$  MET-minutes/week, or no regular physical activity ( $< 500$  MET-minutes/week).

**Supplementary Table 5.1. Associations of the metabolic signatures with frailty in analytic sample 2.**

Metabolic signature	Model 1		Model 2		Model 3	
	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
<b>FP_Frailty</b>						
aMED_MS	0.24 (0.20, 0.30)	<0.001	0.59 (0.47, 0.75)	<0.001	0.66 (0.52, 0.85)	<0.001
RFS_MS	0.49 (0.44, 0.56)	<0.001	0.77 (0.68, 0.88)	<0.001	0.82 (0.72, 0.93)	0.003
DASH_MS	0.68 (0.63, 0.72)	<0.001	0.87 (0.81, 0.93)	<0.001	0.88 (0.81, 0.94)	<0.001
MIND_MS	0.74 (0.71, 0.78)	<0.001	0.90 (0.85, 0.95)	<0.001	0.91 (0.86, 0.96)	<0.001
<b>FI_Frailty</b>						
aMED_MS	0.32 (0.28, 0.36)	<0.001	0.62 (0.54, 0.72)	<0.001	0.63 (0.55, 0.74)	<0.001
RFS_MS	0.55 (0.51, 0.59)	<0.001	0.77 (0.72, 0.84)	<0.001	0.79 (0.73, 0.86)	<0.001
DASH_MS	0.70 (0.67, 0.73)	<0.001	0.85 (0.81, 0.89)	<0.001	0.85 (0.81, 0.89)	<0.001
MIND_MS	0.78 (0.76, 0.81)	<0.001	0.90 (0.87, 0.93)	<0.001	0.91 (0.88, 0.94)	<0.001

Notes: OR, odds ratio; CI, confident interval; MS, metabolic signature; aMED, alternate Mediterranean diet score; RFS, recommended food score; DASH, dietary approaches to stop hypertension; MIND, Mediterranean-DASH intervention for neurodegenerative delay. The higher tertiles indicate better diet quality.

Model 1: adjusted for age and sex.

Model 2: further adjusted for ethnicity, educational level, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

Model 3: further adjusted for related dietary pattern based on Model 2 to examine association independence.

**Supplementary Table 5.2. Associations of the metabolic signatures with frailty in analytic sample 2.**

Metabolic signature	Model 4 (n=22,922)		Model 5 (n=26,270)	
	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
aMED_MS	0.67 (0.52, 0.86)	0.002	0.59 (0.47, 0.75)	<0.001
RFS_MS	0.81 (0.71, 0.93)	0.002	0.78 (0.68, 0.88)	<0.001
DASH_MS	0.9 (0.84, 0.97)	0.008	0.88 (0.82, 0.94)	<0.001
MIND_MS	0.93 (0.88, 0.98)	0.011	0.90 (0.85, 0.95)	<0.001
aMED_MS	0.69 (0.59, 0.81)	<0.001	0.60 (0.52, 0.69)	<0.001
RFS_MS	0.81 (0.75, 0.89)	<0.001	0.78 (0.72, 0.84)	<0.001
DASH_MS	0.89 (0.84, 0.93)	<0.001	0.86 (0.83, 0.90)	<0.001
MIND_MS	0.93 (0.89, 0.96)	<0.001	0.90 (0.87, 0.93)	<0.001

Notes: OR, odds ratio; CI, confident interval; MS, metabolic signature; aMED, alternate Mediterranean diet score; RFS, recommended food score; DASH, dietary approaches to stop hypertension; MIND, Mediterranean-DASH intervention for neurodegenerative delay.

Model 4: adjusted for age, sex, ethnicity, educational level, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), regular physical activity, and several chronic diseases at baseline (i.e., cardiovascular disease, cancer, diabetes, chronic kidney disease, hypertension, and metabolic syndrome).

Model 5: adjusted for age, sex, ethnicity, educational level, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), regular physical activity, and the use of medicine (i.e., lipid-lowering drugs, antihypertensive drugs and antidiabetic drugs).

**Supplementary Table 6. Associations of dietary patterns (in continuous variable) with frailty and the mediation effects attributed to metabolic signatures.**

Dietary Patterns	Model 1		Model 2		Model 3		Mediation proportion, % (95% CI) <sup>a</sup>	Mediation proportion, % (95% CI) <sup>b</sup>
	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value		
<b>FP_Frailty</b>								
aMED	0.73 (0.68, 0.78)	<0.001	0.85 (0.79, 0.91)	<0.001	0.87 (0.81, 0.94)	<0.001	36.19 (26.88, 46.00) ***	18.11 (6.61, 36.00) ***
RFS	0.84 (0.81, 0.87)	<0.001	0.91 (0.88, 0.94)	<0.001	0.92 (0.89, 0.96)	<0.001	26.52 (19.44, 35.00) ***	13.06 (5.01, 27.00) ***
DASH	0.93 (0.91, 0.95)	<0.001	0.97 (0.95, 0.99)	0.010	0.98 (0.96, 1.00)	0.079	44.68 (32.15, 62.00) ***	31.66 (13.08, 106.00) ***
MIND	0.95 (0.93, 0.96)	<0.001	0.98 (0.96, 0.99)	0.005	0.98 (0.97, 1.00)	0.055	45.83 (32.67, 63.00) ***	29.70 (9.34, 80.00) **
<b>FI_Frailty</b>								
aMED	0.84 (0.81, 0.88)	<0.001	0.95 (0.91, 0.99)	0.011	0.98 (0.94, 1.02)	0.313	59.89 (45.81, 77.00) ***	58.97 (27.79, 177.00) **
RFS	0.9 (0.88, 0.92)	<0.001	0.96 (0.94, 0.98)	<0.001	0.97 (0.95, 0.99)	0.015	40.95 (31.95, 52.00) ***	34.62 (19.42, 69.00) ***
DASH	0.96 (0.95, 0.97)	<0.001	0.99 (0.98, 1.00)	0.121	1.00 (0.99, 1.01)	0.959	72.66 (53.99, 97.00) ***	-
MIND	0.96 (0.95, 0.97)	<0.001	0.98 (0.97, 0.99)	<0.001	0.99 (0.98, 1.00)	0.057	54.94 (41.84, 70.00) ***	42.21 (21.33, 87.00) ***

Abbreviations: CI, confidence interval.

Notes: Model 1: adjusted for sex, age, and ethnicity.

Model 2: further adjusted for education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

Model 3: further adjusted for metabolomic diet score based on Model 2 to examine association independence.

<sup>a</sup> The model included sex, age, ethnicity, and metabolomic diet score.

<sup>b</sup> The model included variables in Model 3.

**Supplementary Table 7. Associations of diet patterns (in categorical variables) with frailty and the mediation effects attributed to metabolic signatures.**

Dietary pattern		No. of events/ No. of participants	Model 1		Model 2		Mediation proportion, % (95% CI) <sup>a</sup>	Mediation proportion, % (95% CI) <sup>b</sup>
			OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value		
<b>FP_Frailty</b>								
<b>aMED</b>	Tertile 1	330/ 10,366					Ref.	
	Tertile 2	182/ 7,877	0.57 (0.53, 0.62)	<0.001	0.85 (0.70, 1.03)	0.091	39.03 (24.46, 77.00) ***	-
	Tertile 3	110/ 8,027	0.39 (0.35, 0.43)	<0.001	0.57 (0.46, 0.72)	<0.001	33.71 (25.85, 46.00) ***	14.57 (5.45, 29.00) ***
	P for trend	-	<0.001		<0.001			
<b>RFS</b>	Tertile 1	294/ 8,970					Ref.	
	Tertile 2	175/ 8,160	0.60 (0.55, 0.65)	<0.001	0.81 (0.66, 0.99)	0.035	24.44 (16.63, 39.00) ***	13.97 (2.01, 75.00) *
	Tertile 3	153/ 9,140	0.40 (0.36, 0.44)	<0.001	0.64 (0.51, 0.79)	<0.001	30.51 (23.03, 42.00) ***	15.06 (5.65, 32.00) **
	P for trend	-	<0.001		<0.001			
<b>DASH</b>	Tertile 1	264/ 8,835					Ref.	
	Tertile 2	190/ 8,839	0.67 (0.62, 0.73)	<0.001	0.84 (0.69, 1.02)	0.080	36.17 (23.87, 65.00) ***	-
	Tertile 3	168/ 8,596	0.50 (0.46, 0.55)	<0.001	0.78 (0.63, 0.96)	0.019	49.09 (34.37, 78.00) ***	30.65 (8.94, 148.00) *
	P for trend	-	<0.001		<0.001			
<b>MIND</b>	Tertile 1	280/ 9,040					Ref.	
	Tertile 2	193/ 8,731	0.62 (0.57, 0.67)	<0.001	0.81 (0.67, 0.98)	0.030	33.34 (21.33, 61.00) ***	15.85 (3.62, 86.00) *
	Tertile 3	149/ 8,499	0.47 (0.43, 0.51)	<0.001	0.71 (0.57, 0.87)	0.001	41.45 (30.02, 61.00) ***	23.67 (7.77, 62.00) **
	P for trend	-	<0.001		<0.001			
<b>FI_Frailty</b>								
<b>aMED</b>	Tertile 1	819/ 10,366					Ref.	
	Tertile 2	472/ 7,877	0.69 (0.66, 0.73)	<0.001	0.83 (0.74, 0.94)	0.003	37.38 (26.28, 57.00) ***	20.90 (11.31, 68.00) ***
	Tertile 3	453/ 8,027	0.57 (0.54, 0.60)	<0.001	0.87 (0.77, 0.99)	0.029	61.78 (46.96, 87.00) ***	59.94 (24.15, 316.00) *
	P for trend	-	<0.001		<0.001			
<b>RFS</b>	Tertile 1	755/ 8,970					Ref.	

	Tertile 2	469/ 8,160	0.64 (0.61, 0.68)	<0.001	0.76 (0.67, 0.86)	<0.001	22.67 (16.97, 31.00) ***	12.11 (6.35, 23.00) ***
	Tertile 3	520/ 9,140	0.56 (0.53, 0.59)	<0.001	0.77 (0.68, 0.88)	<0.001	39.24 (30.84, 52.00) ***	27.76 (14.78, 54.00) ***
	P for trend	-	<0.001		<0.001			
	Tertile 1	681/ 8,835				Ref.		
<b>DASH</b>	Tertile 2	533/ 8,839	0.76 (0.72, 0.80)	<0.001	0.86 (0.76, 0.97)	0.014	43.03 (30.67, 66.00) ***	30.18 (14.73, 105.00) *
	Tertile 3	530/ 8,596	0.66 (0.63, 0.70)	<0.001	0.90 (0.79, 1.02)	0.100	74.53 (54.22, 112.00) ***	-
	P for trend	-	<0.001		<0.001			
	Tertile 1	745/ 9,040				Ref.		
<b>MIND</b>	Tertile 2	508/ 8,731	0.66 (0.62, 0.70)	<0.001	0.76 (0.67, 0.86)	<0.001	27.79 (20.61, 39.00) ***	13.24 (7.55, 25.00) ***
	Tertile 3	491/ 8,499	0.56 (0.53, 0.60)	<0.001	0.80 (0.71, 0.91)	<0.001	52.45 (39.77, 73.00) ***	38.09 (18.97, 85.00) **
	P for trend	-	<0.001		<0.001			

Notes: OR, odds ratio; CI, confident interval; aMED, alternate Mediterranean diet score; RFS, recommended food score; DASH, dietary approaches to stop hypertension; MIND, Mediterranean-DASH intervention for neurodegenerative delay. The higher tertiles indicate better diet quality.

Model 1: adjusted for age and sex.

Model 2 was further adjusted for ethnicity, educational level, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

a The model included sex, age, ethnicity, and metabolomic diet score.

b The model included variables in Model 2 and metabolomic diet score.



**Supplementary Table 8.1. Associations between dietary patterns and frailty among participants without chronic diseases. (N=99,267)**

Dietary pattern		No. of events/ No. of participants	Model 1		Model 2	
			OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
<b>FP_Frailty</b>						
<b>aMED</b>	Tertile 1	907/38,795			Ref.	
	Tertile 2	459/30,098	0.61 (0.54, 0.68)	<0.001	0.75 (0.66, 0.84)	<0.001
	Tertile 3	326/30,374	0.40 (0.36, 0.46)	<0.001	0.61 (0.53, 0.69)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>RFS</b>	Tertile 1	770/33,619			Ref.	
	Tertile 2	535/32,944	0.63 (0.56, 0.71)	<0.001	0.84 (0.75, 0.94)	0.003
	Tertile 3	387/32,704	0.42 (0.37, 0.48)	<0.001	0.64 (0.56, 0.73)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>DASH</b>	Tertile 1	703/33,083			Ref.	
	Tertile 2	552/33,535	0.69 (0.61, 0.77)	<0.001	0.86 (0.76, 0.96)	<0.001
	Tertile 3	437/32,649	0.51 (0.45, 0.58)	<0.001	0.73 (0.64, 0.83)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>MIND</b>	Tertile 1	726/33,105			Ref.	
	Tertile 2	529/33,548	0.65 (0.58, 0.72)	<0.001	0.79 (0.700, 0.89)	<0.001
	Tertile 3	437/32,614	0.50 (0.45, 0.57)	<0.001	0.72 (0.63, 0.81)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>FI_Frailty</b>						
<b>aMED</b>	Tertile 1	1,918/38,795			Ref.	
	Tertile 2	1,123/30,098	0.71 (0.66, 0.76)	<0.001	0.81 (0.75, 0.87)	<0.001
	Tertile 3	993/30,374	0.59 (0.54, 0.64)	<0.001	0.76 (0.70, 0.83)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>RFS</b>	Tertile 1	1,714/33,619			Ref.	
	Tertile 2	1,174/32,944	0.62 (0.58, 0.67)	<0.001	0.76 (0.71, 0.83)	<0.001
	Tertile 3	1,146/32,704	0.57 (0.53, 0.62)	<0.001	0.76 (0.70, 0.83)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>DASH</b>	Tertile 1	1,547/33,083			Ref.	
	Tertile 2	1,262/33,535	0.73 (0.67, 0.79)	<0.001	0.85 (0.78, 0.91)	<0.001
	Tertile 3	1,225/32,649	0.68 (0.63, 0.73)	<0.001	0.86 (0.79, 0.93)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>MIND</b>	Tertile 1	1,659/33,105			Ref.	
	Tertile 2	1,254/33,548	0.68 (0.63, 0.74)	<0.001	0.78 (0.72, 0.84)	<0.001
	Tertile 3	1,121/32,614	0.59 (0.54, 0.63)	<0.001	0.73 (0.67, 0.79)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001

Abbreviations: CI, confidence interval.

Notes: Model 1: adjusted for sex, age, and ethnicity.

Model 2: further adjusted for education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

**Supplementary Table 8.2. Associations between dietary patterns and frailty among participants older than 60 years. (N=50,635)**

Dietary pattern		No. of events/ No. of participants	Model 1		Model 2	
			OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
<b>FP_Frailty</b>						
<b>aMED</b>	Tertile 1	688/ 17,771			Ref.	
	Tertile 2	327/ 15,365	0.52 (0.46, 0.60)	<0.001	0.64 (0.55, 0.73)	<0.001
	Tertile 3	304/ 17,499	0.41 (0.36, 0.47)	<0.001	0.63 (0.54, 0.72)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>RFS</b>	Tertile 1	499/ 13,308			Ref.	
	Tertile 2	438/ 16,899	0.64 (0.56, 0.73)	<0.001	0.85 (0.74, 0.97)	0.003
	Tertile 3	382/ 20,428	0.44 (0.38, 0.50)	<0.001	0.66 (0.57, 0.77)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>DASH</b>	Tertile 1	478/ 14,128			Ref.	
	Tertile 2	461/ 17,526	0.72 (0.63, 0.82)	<0.001	0.90 (0.79, 1.03)	<0.001
	Tertile 3	380/ 18,981	0.50 (0.44, 0.58)	<0.001	0.72 (0.62, 0.83)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>MIND</b>	Tertile 1	553/ 15,462			Ref.	
	Tertile 2	408/ 16,901	0.62 (0.54, 0.71)	<0.001	0.76 (0.67, 0.87)	<0.001
	Tertile 3	358/ 18,272	0.47 (0.41, 0.54)	<0.001	0.68 (0.59, 0.79)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>FI_Frailty</b>						
<b>aMED</b>	Tertile 1	1,766/ 17,771			Ref.	
	Tertile 2	1,164/ 15,365	0.73 (0.67, 0.79)	<0.001	0.84 (0.77, 0.91)	<0.001
	Tertile 3	1,088/ 17,499	0.58 (0.54, 0.63)	<0.001	0.77 (0.71, 0.84)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>RFS</b>	Tertile 1	1,369/ 13,308			Ref.	
	Tertile 2	1,278/ 16,899	0.69 (0.63, 0.75)	<0.001	0.85 (0.78, 0.92)	<0.001
	Tertile 3	1,371/ 20,428	0.59 (0.54, 0.64)	<0.001	0.81 (0.74, 0.88)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>DASH</b>	Tertile 1	1,275/ 14,128			Ref.	
	Tertile 2	1,391/ 17,526	0.84 (0.77, 0.91)	<0.001	0.99 (0.91, 1.07)	0.722
	Tertile 3	1,352/ 18,981	0.72 (0.66, 0.78)	<0.001	0.92 (0.85, 1.00)	0.063
	<i>P</i> for trend	-		<0.001		<0.001
<b>MIND</b>	Tertile 1	1,568/ 15,462			Ref.	
	Tertile 2	1,252/ 16,901	0.68 (0.63, 0.74)	<0.001	0.79 (0.72, 0.85)	<0.001
	Tertile 3	1,198/ 18,272	0.58 (0.53, 0.62)	<0.001	0.74 (0.68, 0.80)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001

Abbreviations: CI, confidence interval.

Notes: Model 1: adjusted for sex, age, and ethnicity.

Model 2: further adjusted for education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

**Supplementary Table 8.3. Associations between dietary patterns and frailty after further adjusting for several chronic diseases. (N=101,405)**

Dietary pattern		No. of events/ No. of participants	Model 3	
			OR (95% CI)	P value
<b>FP_Frailty</b>				
<b>aMED</b>	Tertile 1	1,355/ 40,053	Ref.	
	Tertile 2	645/ 30,446	0.74 (0.67, 0.82)	<0.001
	Tertile 3	469/ 30,906	0.62 (0.56, 0.70)	<0.001
	<i>P</i> for trend	-	<0.001	
<b>RFS</b>	Tertile 1	1,161/ 34,733	Ref.	
	Tertile 2	752/ 33,407	0.81 (0.73, 0.89)	<0.001
	Tertile 3	556/ 33,265	0.63 (0.57, 0.71)	<0.001
	<i>P</i> for trend	-	<0.001	
<b>DASH</b>	Tertile 1	1,043/ 33,946	Ref.	
	Tertile 2	800/ 34,183	0.86 (0.78, 0.95)	0.003
	Tertile 3	626/ 33,276	0.74 (0.66, 0.83)	<0.001
	<i>P</i> for trend	-	<0.001	
<b>MIND</b>	Tertile 1	1,112/ 34,341	Ref.	
	Tertile 2	756/ 33,963	0.78 (0.71, 0.86)	<0.001
	Tertile 3	601/ 33,101	0.71 (0.64, 0.79)	<0.001
	<i>P</i> for trend	-	<0.001	
<b>FI_Frailty</b>				
<b>aMED</b>	Tertile 1	3,302/ 40,053	Ref.	
	Tertile 2	1,864/ 30,446	0.83 (0.78, 0.89)	<0.001
	Tertile 3	1,619/ 30,906	0.78 (0.73, 0.84)	<0.001
	<i>P</i> for trend	-	<0.001	
<b>RFS</b>	Tertile 1	2,914/ 34,733	Ref.	
	Tertile 2	2,011/ 33,407	0.80 (0.75, 0.85)	<0.001
	Tertile 3	1,860/ 33,265	0.78 (0.73, 0.83)	<0.001
	<i>P</i> for trend	-	<0.001	
<b>DASH</b>	Tertile 1	2,615/ 33,946	Ref.	
	Tertile 2	2,205/ 34,183	0.93 (0.87, 0.99)	0.028
	Tertile 3	1,965/ 33,276	0.88 (0.83, 0.95)	<0.001
	<i>P</i> for trend	-	<0.001	
<b>MIND</b>	Tertile 1	2,923/ 34,341	Ref.	
	Tertile 2	2,063/ 33,963	0.77 (0.73, 0.82)	<0.001
	Tertile 3	1,799/ 33,101	0.73 (0.68, 0.78)	<0.001
	<i>P</i> for trend	-	<0.001	

Abbreviations: CI, confidence interval.

Notes: Model 3: adjusted for sex, age, ethnicity, education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), regular physical activity, and several chronic diseases at baseline (i.e., cardiovascular disease, cancer, diabetes, chronic kidney disease, hypertension, and metabolic syndrome).

**Supplementary Table 8.4. Associations between dietary patterns and frailty after further adjusting for medicine use. (N=124,261)**

Dietary pattern		No. of events/ No. of participants	Model 4	
			OR (95% CI)	P value
<b>FP_Frailty</b>				
<b>aMED</b>	Tertile 1	1,672/48,939	Ref.	
	Tertile 2	786/37,464	0.73 (0.66, 0.79)	<0.001
	Tertile 3	576/37,858	0.62 (0.56, 0.68)	<0.001
	<i>P</i> for trend	-		<0.001
<b>RFS</b>	Tertile 1	1,429/42,368	Ref.	
	Tertile 2	930/40,969	0.81 (0.74, 0.89)	<0.001
	Tertile 3	675/40,924	0.62 (0.56, 0.68)	<0.001
	<i>P</i> for trend	-		<0.001
<b>DASH</b>	Tertile 1	1,286/41,460	Ref.	
	Tertile 2	976/41,872	0.86 (0.79, 0.94)	<0.001
	Tertile 3	772/40,929	0.74 (0.67, 0.82)	<0.001
	<i>P</i> for trend	-		<0.001
<b>MIND</b>	Tertile 1	1,367/41,864	Ref.	
	Tertile 2	927/41,751	0.77 (0.70, 0.84)	<0.001
	Tertile 3	740/40,646	0.7 (0.64, 0.77)	<0.001
	<i>P</i> for trend	-		<0.001
<b>FI_Frailty</b>				
<b>aMED</b>	Tertile 1	4,066/48,939	Ref.	
	Tertile 2	2,313/37,464	0.82 (0.78, 0.87)	<0.001
	Tertile 3	2,011/37,858	0.79 (0.74, 0.83)	<0.001
	<i>P</i> for trend	-		<0.001
<b>RFS</b>	Tertile 1	3,565/42,368	Ref.	
	Tertile 2	2,484/40,969	0.81 (0.77, 0.86)	<0.001
	Tertile 3	2,341/40,924	0.80 (0.75, 0.85)	<0.001
	<i>P</i> for trend	-		<0.001
<b>DASH</b>	Tertile 1	3,220/41,460	Ref.	
	Tertile 2	2,715/41,872	0.93 (0.88, 0.98)	0.008
	Tertile 3	2,455/40,929	0.90 (0.85, 0.96)	<0.001
	<i>P</i> for trend	-		<0.001
<b>MIND</b>	Tertile 1	3,572/41,864	Ref.	
	Tertile 2	2,555/41,751	0.77 (0.73, 0.82)	<0.001
	Tertile 3	2,263/40,646	0.75 (0.70, 0.79)	<0.001
	<i>P</i> for trend	-		<0.001

Abbreviations: CI, confidence interval.

Notes: Model 4: adjusted for sex, age, ethnicity, education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), regular physical activity, and the use of medicine (i.e., lipid-lowering drugs, antihypertensive drugs and antidiabetic drugs).

**Supplementary Table 8.5. Associations between dietary patterns and frailty after further adjusting for total energy intake (kcal/d; quintiles). (N=124,261)**

Dietary pattern		No. of events/ No. of participants	Model 5	
			OR (95% CI)	P value
<b>FP_Frailty</b>				
<b>aMED</b>	Tertile 1	1,672/48,939	Ref.	
	Tertile 2	786/37,464	0.73 (0.67, 0.80)	<0.001
	Tertile 3	576/37,858	0.63 (0.57, 0.70)	<0.001
	<i>P</i> for trend	-		<0.001
<b>RFS</b>	Tertile 1	1,429/42,368	Ref.	
	Tertile 2	930/40,969	0.82 (0.75, 0.90)	<0.001
	Tertile 3	675/40,924	0.64 (0.58, 0.71)	<0.001
	<i>P</i> for trend	-		<0.001
<b>DASH</b>	Tertile 1	1,286/41,460	Ref.	
	Tertile 2	976/41,872	0.86 (0.78, 0.93)	<0.001
	Tertile 3	772/40,929	0.74 (0.67, 0.82)	<0.001
	<i>P</i> for trend	-		<0.001
<b>MIND</b>	Tertile 1	1,367/41,864	Ref.	
	Tertile 2	927/41,751	0.75 (0.69, 0.82)	<0.001
	Tertile 3	740/40,646	0.68 (0.61, 0.74)	<0.001
	<i>P</i> for trend	-		<0.001
<b>FI_Frailty</b>				
<b>aMED</b>	Tertile 1	4,066/48,939	Ref.	
	Tertile 2	2,313/37,464	0.81 (0.77, 0.86)	<0.001
	Tertile 3	2,011/37,858	0.76 (0.71, 0.80)	<0.001
	<i>P</i> for trend	-		<0.001
<b>RFS</b>	Tertile 1	3,565/42,368	Ref.	
	Tertile 2	2,484/40,969	0.80 (0.76, 0.85)	<0.001
	Tertile 3	2,341/40,924	0.76 (0.72, 0.81)	<0.001
	<i>P</i> for trend	-		<0.001
<b>DASH</b>	Tertile 1	3,220/41,460	Ref.	
	Tertile 2	2,715/41,872	0.90 (0.86, 0.96)	<0.001
	Tertile 3	2,455/40,929	0.86 (0.81, 0.92)	<0.001
	<i>P</i> for trend	-		<0.001
<b>MIND</b>	Tertile 1	3,572/41,864	Ref.	
	Tertile 2	2,555/41,751	0.77 (0.73, 0.82)	<0.001
	Tertile 3	2,263/40,646	0.74 (0.70, 0.79)	<0.001
	<i>P</i> for trend	-		<0.001

Abbreviations: CI, confidence interval.

Notes: Model 5: adjusted for sex, age, ethnicity, education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), regular physical activity, and the total energy intake (kcal/d; quintiles).

**Supplementary Table 8.6. Associations between dietary patterns (based on at least three repeats) and frailty. (N=76,905)**

Dietary pattern		No. of events/ No. of participants	Model 1		Model 2	
			OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
<b>FP_Frailty</b>						
<b>aMED</b>	Tertile 1	967/ 28,342			Ref.	
	Tertile 2	494/ 24,509	0.55 (0.49, 0.62)	<0.001	0.71 (0.63, 0.79)	<0.001
	Tertile 3	343/ 24,054	0.37 (0.32, 0.42)	<0.001	0.59 (0.52, 0.67)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>RFS</b>	Tertile 1	907/ 27,426			Ref.	
	Tertile 2	525/ 24,944	0.57 (0.51, 0.63)	<0.001	0.76 (0.67, 0.85)	<0.001
	Tertile 3	372/ 24,535	0.37 (0.33, 0.42)	<0.001	0.58 (0.51, 0.66)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>DASH</b>	Tertile 1	808/ 26,458			Ref.	
	Tertile 2	552/ 25,169	0.64 (0.57, 0.72)	<0.001	0.82 (0.73, 0.92)	<0.001
	Tertile 3	444/ 25,278	0.47 (0.42, 0.53)	<0.001	0.69 (0.61, 0.79)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>MIND</b>	Tertile 1	838/ 26,462			Ref.	
	Tertile 2	521/ 25,469	0.58 (0.52, 0.65)	<0.001	0.74 (0.66, 0.83)	<0.001
	Tertile 3	445/ 24,974	0.47 (0.42, 0.53)	<0.001	0.70 (0.62, 0.80)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>FI_Frailty</b>						
<b>aMED</b>	Tertile 1	2,333/ 28,342			Ref.	
	Tertile 2	1,432/ 24,509	0.66 (0.62, 0.71)	<0.001	0.79 (0.74, 0.85)	<0.001
	Tertile 3	1,218/ 24,054	0.54 (0.51, 0.59)	<0.001	0.76 (0.71, 0.82)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>RFS</b>	Tertile 1	2,225/ 27,426			Ref.	
	Tertile 2	1,443/ 24,944	0.64 (0.59, 0.68)	<0.001	0.81 (0.75, 0.87)	<0.001
	Tertile 3	1,315/ 24,535	0.55 (0.51, 0.59)	<0.001	0.78 (0.72, 0.84)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>DASH</b>	Tertile 1	1,984/ 26,458			Ref.	
	Tertile 2	1,560/ 25,169	0.75 (0.70, 0.81)	<0.001	0.91 (0.85, 0.98)	0.015
	Tertile 3	1,439/ 25,278	0.66 (0.61, 0.70)	<0.001	0.88 (0.81, 0.95)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>MIND</b>	Tertile 1	2,207/ 26,462			Ref.	
	Tertile 2	1,475/ 25,469	0.64 (0.60, 0.68)	<0.001	0.75 (0.70, 0.81)	<0.001
	Tertile 3	1,301/ 24,974	0.54 (0.50, 0.58)	<0.001	0.71 (0.66, 0.77)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001

Abbreviations: CI, confidence interval.

Notes: Model 1: adjusted for sex, age, and ethnicity.

Model 2: further adjusted for education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

**Supplementary Table 8.7. Associations between dietary patterns and frailty using a sample with complete data on all frailty components (or items). (N=107,709)**

Dietary pattern		No. of events/ No. of participants	Model 1		Model 2	
			OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
<b>FP_Frailty</b>						
<b>aMED</b>	Tertile 1	1,351/ 42,174			Ref.	
	Tertile 2	628/ 32,575	0.56 (0.51, 0.62)	<0.001	0.71 (0.64, 0.78)	<0.001
	Tertile 3	472/ 32,960	0.39 (0.35, 0.44)	<0.001	0.62 (0.55, 0.69)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>RFS</b>	Tertile 1	1,162/ 36,571			Ref.	
	Tertile 2	751/ 35,557	0.59 (0.53, 0.65)	<0.001	0.79 (0.72, 0.88)	0.003
	Tertile 3	538/ 35,581	0.39 (0.35, 0.43)	<0.001	0.60 (0.54, 0.67)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>DASH</b>	Tertile 1	1,055/ 35,967			Ref.	
	Tertile 2	788/ 36,307	0.66 (0.600, 0.72)	<0.001	0.83 (0.75, 0.91)	<0.001
	Tertile 3	608/ 35,435	0.47 (0.43, 0.53)	<0.001	0.70 (0.63, 0.78)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>MIND</b>	Tertile 1	1,102/ 36,025			Ref.	
	Tertile 2	747/ 36,264	0.61 (0.55, 0.67)	<0.001	0.76 (0.69, 0.83)	<0.001
	Tertile 3	602/ 35,420	0.46 (0.42, 0.51)	<0.001	0.68 (0.61, 0.76)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>FI_Frailty</b>						
<b>aMED</b>	Tertile 1	3,325/ 42,174			Ref.	
	Tertile 2	1,909/ 32,575	0.69 (0.65, 0.74)	<0.001	0.82 (0.77, 0.87)	<0.001
	Tertile 3	1,673/ 32,960	0.57 (0.54, 0.61)	<0.001	0.78 (0.73, 0.83)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>RFS</b>	Tertile 1	2,906/ 36,571			Ref.	
	Tertile 2	2,064/ 35,557	0.65 (0.61, 0.69)	<0.001	0.83 (0.78, 0.88)	<0.001
	Tertile 3	1,937/ 35,581	0.57 (0.53, 0.60)	<0.001	0.80 (0.75, 0.85)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>DASH</b>	Tertile 1	2,671/ 35,967			Ref.	
	Tertile 2	2,226/ 36,307	0.75 (0.71, 0.80)	<0.001	0.89 (0.84, 0.95)	<0.001
	Tertile 3	2,010/ 35,435	0.66 (0.62, 0.70)	<0.001	0.86 (0.81, 0.92)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001
<b>MIND</b>	Tertile 1	2,926/ 36,025			Ref.	
	Tertile 2	2,113/ 36,264	0.66 (0.62, 0.70)	<0.001	0.77 (0.72, 0.82)	<0.001
	Tertile 3	1,868/ 35,420	0.56 (0.53, 0.60)	<0.001	0.73 (0.69, 0.78)	<0.001
	<i>P</i> for trend	-		<0.001		<0.001

Abbreviations: CI, confidence interval.

Notes: Model 1: adjusted for sex, age, and ethnicity.

Model 2: further adjusted for education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

**Supplementary Table 8.8. Associations between dietary patterns and FP\_Frailty in the model without adjustment for regular exercise. (N=124,261)**

Dietary pattern		No. of events/ No. of participants	Model 6	
			OR (95% CI)	P value
<b>aMED</b>	Tertile 1	1,672/48,939		Ref.
	Tertile 2	786/37,464	0.69 (0.63, 0.75)	<0.001
	Tertile 3	576/37,858	0.55 (0.49, 0.60)	<0.001
	<i>P</i> for trend	-		<0.001
<b>RFS</b>	Tertile 1	1,429/42,368		Ref.
	Tertile 2	930/40,969	0.77 (0.70, 0.84)	<0.001
	Tertile 3	675/40,924	0.55 (0.50, 0.61)	<0.001
	<i>P</i> for trend	-		<0.001
<b>DASH</b>	Tertile 1	1,286/41,460		Ref.
	Tertile 2	976/41,872	0.81 (0.74, 0.89)	<0.001
	Tertile 3	772/40,929	0.65 (0.59, 0.72)	<0.001
	<i>P</i> for trend	-		<0.001
<b>MIND</b>	Tertile 1	1,367/41,864		Ref.
	Tertile 2	927/41,751	0.73 (0.67, 0.80)	<0.001
	Tertile 3	740/40,646	0.62 (0.56, 0.68)	<0.001
	<i>P</i> for trend	-		<0.001

Abbreviations: CI, confidence interval.

Notes: Model 6: adjusted for sex, age, ethnicity, education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH).



**Supplementary Table 9.1. Comparison of socio-demographic characteristics between included participants and those excluded from analytic sample 1.**

	<b>Total</b> (N=124,261)	<b>Included</b> (N=26,270)	<b>Excluded</b> (N=97,991)	<b>P value</b>
<b>Age, years, median (IQR)</b>	57.7 (50.5, 62.9)	57.7 (50.5, 62.9)	57.8 (52.5, 62.9)	0.385
<b>Sex</b>				
Female, <i>n</i> (%)	69,323 (55.8)	14,463 (55.1)	54,860 (56.0)	0.007
Male, <i>n</i> (%)	54,938 (44.2)	11,807 (44.9)	43,131 (44.0)	
<b>Ethnicity</b>				
Non-British White, <i>n</i> (%)	3,832 (3.1)	784 (3.0)	3,048 (3.1)	0.303
British White, <i>n</i> (%)	120,429 (96.9)	25,486 (97.0)	94,943 (96.9)	
<b>Educational level<sup>a</sup></b>				
High, <i>n</i> (%)	59,094 (47.6)	12,527 (47.7)	46,567 (47.5)	0.137
Intermediate, <i>n</i> (%)	40,580 (32.7)	8,460 (32.2)	32,120 (32.8)	
Low, <i>n</i> (%)	24,587 (19.8)	5,283 (20.1)	19,304 (19.7)	
<b>Townsend Deprivation Index, median (IQR)</b>	-2.4 (-3.8, -0.0)	-2.4 (-3.8, -0.0)	-2.4 (-3.8, -0.0)	0.516
<b>BMI, kg/m<sup>2</sup>, median (IQR)</b>	26.0 (23.6, 29.0)	26.0 (23.6, 29.0)	26.0 (23.6, 29.0)	0.316
<b>Smoking status</b>				
Never smoker, <i>n</i> (%)	71,203 (57.3)	15,144 (57.6)	56,059 (57.2)	0.432
Previous smoker, <i>n</i> (%)	44,537 (35.8)	9,332 (35.5)	35,205 (35.9)	
Current smoker, <i>n</i> (%)	8,521 (6.9)	1,794 (6.8)	6,727 (6.9)	
<b>Alcohol intake frequency</b>				
Never or special occasions, <i>n</i> (%)	18,537 (14.9)	3,901 (14.8)	14,636 (14.9)	0.924
1 to 3 times per month, <i>n</i> (%)	13,379 (10.8)	2,840 (10.8)	10,539 (10.8)	
1 to 4 times per week, <i>n</i> (%)	62,629 (50.4)	13,277 (50.5)	49,352 (50.4)	
Daily or almost daily, <i>n</i> (%)	29,716 (23.9)	6,252 (23.8)	23,464 (23.9)	
<b>Regular physical activity<sup>b</sup></b>				
No, <i>n</i> (%)	53,979 (43.4)	11,384 (43.3)	42,595 (43.5)	0.703
Yes, <i>n</i> (%)	70,282 (56.6)	14,886 (56.7)	55,396 (56.5)	
<b>FP_Frailty</b>				
No, <i>n</i> (%)	121,227 (97.6)	25,648 (97.6)	95,579 (97.5)	0.394
Yes, <i>n</i> (%)	3,034 (2.4)	622 (2.4)	2,412 (2.5)	
<b>FI_Frailty</b>				
No, <i>n</i> (%)	115,871 (93.2)	24,526 (93.4)	91,345 (93.2)	0.418
Yes, <i>n</i> (%)	8,390 (6.8)	1,744 (6.6)	6,646 (6.8)	
<b>Dietary pattern score (continuous)</b>				
aMED, mean ± SD	3.6 (1.3)	3.6 (1.3)	3.6 (1.3)	0.991
RFS, mean ± SD	8.3 (2.4)	8.3 (2.4)	8.3 (2.4)	0.844
DASH, mean ± SD	20.1 (4.1)	20.1 (4.1)	20.1 (4.1)	0.312
MIND, mean ± SD	37.6 (5.3)	37.5 (5.3)	37.6 (5.3)	0.023
<b>Dietary pattern score (categorical)</b>				
aMED				
Tertile 1, <i>n</i> (%)	48,939 (39.4)	10,366 (39.5)	38,573 (39.4)	0.805
Tertile 2, <i>n</i> (%)	37,464 (30.1)	7,877 (30.0)	29,587 (30.2)	

Tertile 3, <i>n</i> (%)	37,858 (30.5)	8,027 (30.6)	29,831 (30.4)	
RFS				
Tertile 1, <i>n</i> (%)	42,368 (34.1)	8,970 (34.1)	33,398 (34.1)	
Tertile 2, <i>n</i> (%)	40,969 (33.0)	8,576 (32.6)	32,393 (33.1)	0.396
Tertile 3, <i>n</i> (%)	40,924 (32.9)	8,724 (33.2)	32,200 (32.9)	
DASH				
Tertile 1, <i>n</i> (%)	41,460 (33.4)	8,835 (33.6)	32,625 (33.3)	
Tertile 2, <i>n</i> (%)	41,872 (33.7)	8,820 (33.6)	33,052 (33.7)	0.587
Tertile 3, <i>n</i> (%)	40,929 (32.9)	8,615 (32.8)	32,314 (33.0)	
MIND				
Tertile 1, <i>n</i> (%)	41,864 (33.7)	9,040 (34.4)	32,824 (33.5)	
Tertile 2, <i>n</i> (%)	41,751 (33.6)	8,731 (33.2)	33,020 (33.7)	0.021
Tertile 3, <i>n</i> (%)	40,646 (32.7)	8,499 (32.4)	32,147 (32.8)	

Notes: Abbreviations: SD, standard deviation; IQR, Interquartile Range; BMI, body mass index; FP\_Frailty, frailty defined by the frailty phenotype; FI\_Frailty, frailty defined by the frailty index; aMED, alternate Mediterranean diet score; RFS, recommended food score; DASH, dietary approaches to stop hypertension; MIND, Mediterranean-DASH intervention for neurodegenerative delay.

<sup>a</sup> Educational levels were defined as high (college or university degree), intermediate (A/AS levels or equivalent, O levels/GCSEs or equivalent), and low (none of the aforementioned).

<sup>b</sup> Regular physical activity was defined as meeting the current global health recommendations for physical activity (150 minutes of moderate activity or 75 minutes of vigorous activity or an equivalent combination), which equated to  $\geq 500$  MET-minutes/week, or no regular physical activity ( $< 500$  MET-minutes/week).

**Supplementary Table 9.2. Associations between dietary patterns and frailty in analytic sample 2 after further adjusting for several chronic diseases. (N=26,270)**

Dietary pattern		No. of events/ No. of participants	Model 3		Mediation proportion, % (95% CI) <sup>a</sup>
			OR (95% CI)	P value	
<b>FP_Frailty</b>					
<b>aMED</b>	Tertile 1	330/ 10,366	Ref.		
	Tertile 2	182/ 7,877	0.85 (0.70, 1.03)	0.088	-
	Tertile 3	110/ 8,027	0.57 (0.45, 0.71)	<0.001	13.03 (5.02, 29.000) ***
	<i>P</i> for trend	-	<0.001		
<b>RFS</b>	Tertile 1	294/ 8,970	Ref.		
	Tertile 2	175/ 8,160	0.83 (0.67, 1.01)	0.062	-
	Tertile 3	153/ 9,140	0.63 (0.51, 0.79)	<0.001	13.82 (4.94, 31.000) **
	<i>P</i> for trend	-	<0.001		
<b>DASH</b>	Tertile 1	264/ 8,835	Ref.		
	Tertile 2	190/ 8,839	0.84 (0.69, 1.03)	0.099	-
	Tertile 3	168/ 8,596	0.76 (0.61, 0.94)	<0.001	25.24 (8.57, 95.000) **
	<i>P</i> for trend	-	<0.001		
<b>MIND</b>	Tertile 1	280/ 9,040	Ref.		
	Tertile 2	193/ 8,731	0.83 (0.68, 1.01)	0.057	-
	Tertile 3	149/ 8,499	0.71 (0.57, 0.88)	0.002	21.67 (6.51, 68.000) ***
	<i>P</i> for trend	-	<0.001		
<b>FI_Frailty</b>					
<b>aMED</b>	Tertile 1	819/ 10,366	Ref.		
	Tertile 2	472/ 7,877	0.84 (0.74, 0.96)	0.008	18.90 (8.79, 83.000) **
	Tertile 3	453/ 8,027	0.87 (0.76, 0.99)	0.036	-
	<i>P</i> for trend	-	<0.001		
<b>RFS</b>	Tertile 1	755/ 8,970	Ref.		
	Tertile 2	469/ 8,160	0.78 (0.68, 0.89)	<0.001	11.28 (5.63, 26.000) ***
	Tertile 3	520/ 9,140	0.80 (0.70, 0.91)	<0.001	26.92 (14.67, 63.000) ***
	<i>P</i> for trend	-	<0.001		
<b>DASH</b>	Tertile 1	681/ 8,835	Ref.		
	Tertile 2	533/ 8,839	0.86 (0.75, 0.97)	0.018	24.55 (11.60, 129.000) *
	Tertile 3	530/ 8,596	0.91 (0.79, 1.03)	0.145	-
	<i>P</i> for trend	-	<0.001		
<b>MIND</b>	Tertile 1	745/ 9,040	Ref.		
	Tertile 2	508/ 8,731	0.78 (0.69, 0.89)	<0.001	12.13 (5.84, 25.000) ***
	Tertile 3	491/ 8,499	0.82 (0.72, 0.93)	0.003	35.30 (16.92, 125.000) ***
	<i>P</i> for trend	-	<0.001		

Abbreviations: CI, confidence interval.

Notes: Model 3: adjusted for sex, age, ethnicity, education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), regular physical activity, and several chronic diseases.

**Supplementary Table 9.3. Associations between dietary patterns and frailty in analytic sample 2 after further adjusting for medicine use. (N=26,270)**

Dietary pattern		No. of events/ No. of participants	Model 4		Mediation proportion, % (95% CI) <sup>a</sup>
			OR (95% CI)	P value	
<b>FP_Frailty</b>					
<b>aMED</b>	Tertile 1	330/ 10,366	Ref.		
	Tertile 2	182/ 7,877	0.84 (0.70, 1.02)	0.083	-
	Tertile 3	110/ 8,027	0.57 (0.45, 0.72)	<0.001	14.73 (5.97, 28.00) ***
	<i>P</i> for trend	-		<0.001	
<b>RFS</b>	Tertile 1	294/ 8,970	Ref.		
	Tertile 2	175/ 8,160	0.80 (0.66, 0.98)	0.030	13.48 (4.67, 82.00) **
	Tertile 3	153/ 9,140	0.63 (0.51, 0.78)	<0.001	14.33 (5.63, 30.00) ***
	<i>P</i> for trend	-		<0.001	
<b>DASH</b>	Tertile 1	264/ 8,835	Ref.		
	Tertile 2	190/ 8,839	0.85 (0.69, 1.03)	0.102	-
	Tertile 3	168/ 8,596	0.78 (0.63, 0.96)	0.019	28.07 (7.59, 99.00) *
	<i>P</i> for trend	-		<0.001	
<b>MIND</b>	Tertile 1	280/ 9,040	Ref.		
	Tertile 2	193/ 8,731	0.81 (0.67, 0.98)	0.034	16.79 (2.81, 93.00) *
	Tertile 3	149/ 8,499	0.71 (0.58, 0.88)	0.002	24.15 (8.31, 65.00) **
	<i>P</i> for trend	-		<0.001	
<b>FI_Frailty</b>					
<b>aMED</b>	Tertile 1	819/ 10,366	Ref.		
	Tertile 2	472/ 7,877	0.82 (0.73, 0.93)	0.002	21.99 (11.28, 55.00) **
	Tertile 3	453/ 8,027	0.87 (0.76, 0.98)	0.027	61.05 (26.81, 288.00) *
	<i>P</i> for trend	-		<0.001	
<b>RFS</b>	Tertile 1	755/ 8,970	Ref.		
	Tertile 2	469/ 8,160	0.75 (0.66, 0.85)	<0.001	11.42 (6.79, 21.00) ***
	Tertile 3	520/ 9,140	0.77 (0.68, 0.87)	<0.001	26.99 (15.10, 53.00) ***
	<i>P</i> for trend	-		<0.001	
<b>DASH</b>	Tertile 1	681/ 8,835	Ref.		
	Tertile 2	533/ 8,839	0.88 (0.77, 0.99)	0.036	31.20 (14.17, 205.00) *
	Tertile 3	530/ 8,596	0.91 (0.80, 1.04)	0.157	-
	<i>P</i> for trend	-		<0.001	
<b>MIND</b>	Tertile 1	745/ 9,040	Ref.		
	Tertile 2	508/ 8,731	0.76 (0.67, 0.86)	<0.001	14.28 (8.01, 26.00) ***
	Tertile 3	491/ 8,499	0.81 (0.71, 0.91)	<0.001	41.07 (21.46, 95.00) ***
	<i>P</i> for trend	-		<0.001	

Abbreviations: CI, confidence interval.

Notes: Model 4: adjusted for sex, age, ethnicity, education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), regular physical activity, and the use of medicine (i.e., lipid-lowering drugs, antihypertensive drugs and antidiabetic drugs).

**Supplementary Table 9.4. Associations between dietary patterns and frailty in analytic sample 2 after further adjusting for total energy intake (kcal/d; quintiles). (N=26,270)**

Dietary pattern		No. of events/ No. of participants	Model 5		Mediation proportion, % (95% CI) <sup>a</sup>
			OR (95% CI)	P value	
<b>FP_Frailty</b>					
<b>aMED</b>	Tertile 1	330/ 10,366	Ref.		
	Tertile 2	182/ 7,877	0.87 (0.72, 1.05)	0.140	-
	Tertile 3	110/ 8,027	0.60 (0.47, 0.75)	<0.001	16.59 (7.26, 39.00) ***
	<i>P</i> for trend	-		<0.001	
<b>RFS</b>	Tertile 1	294/ 8,970	Ref.		
	Tertile 2	175/ 8,160	0.83 (0.68, 1.01)	0.063	-
	Tertile 3	153/ 9,140	0.66 (0.53, 0.82)	<0.001	16.17 (6.26, 39.00) **
	<i>P</i> for trend	-		<0.001	
<b>DASH</b>	Tertile 1	264/ 8,835	Ref.		
	Tertile 2	190/ 8,839	0.85 (0.70, 1.04)	0.107	-
	Tertile 3	168/ 8,596	0.79 (0.64, 0.98)	0.029	31.13 (8.61, 159.00) *
	<i>P</i> for trend	-		<0.001	
<b>MIND</b>	Tertile 1	280/ 9,040	Ref.		
	Tertile 2	193/ 8,731	0.79 (0.65, 0.96)	0.019	15.11 (4.33, 70.00) *
	Tertile 3	149/ 8,499	0.69 (0.56, 0.85)	<0.001	22.75 (8.75, 62.00) ***
	<i>P</i> for trend	-		<0.001	
<b>FI_Frailty</b>					
<b>aMED</b>	Tertile 1	819/ 10,366	Ref.		
	Tertile 2	472/ 7,877	0.83 (0.73, 0.94)	0.002	20.89 (10.89, 68.00) ***
	Tertile 3	453/ 8,027	0.86 (0.75, 0.97)	0.017	57.26 (25.54, 275.00) *
	<i>P</i> for trend	-		<0.001	
<b>RFS</b>	Tertile 1	755/ 8,970	Ref.		
	Tertile 2	469/ 8,160	0.75 (0.66, 0.85)	0.004	11.35 (6.17, 23.00) ***
	Tertile 3	520/ 9,140	0.75 (0.66, 0.85)	<0.001	25.07 (14.99, 50.00) ***
	<i>P</i> for trend	-		<0.001	
<b>DASH</b>	Tertile 1	681/ 8,835	Ref.		
	Tertile 2	533/ 8,839	0.85 (0.75, 0.97)	0.012	28.02 (14.69, 131.00) **
	Tertile 3	530/ 8,596	0.89 (0.78, 1.01)	0.073	-
	<i>P</i> for trend	-		<0.001	
<b>MIND</b>	Tertile 1	745/ 9,040	Ref.		
	Tertile 2	508/ 8,731	0.76 (0.67, 0.86)	<0.001	13.57 (7.51, 25.00) ***
	Tertile 3	491/ 8,499	0.80 (0.71, 0.91)	<0.001	39.26 (21.90, 100.00) ***
	<i>P</i> for trend	-		<0.001	

Abbreviations: CI, confidence interval.

Notes: Model 5: adjusted for sex, age, ethnicity, education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), regular physical activity, and the total energy intake (kcal/d; quintiles) .

**Supplementary Table 9.5. Associations between dietary patterns (based on at least three repeats) and frailty. (N=16,302)**

Dietary pattern		No. of events/ No. of participants	Model 1		Model 2	
			OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
<b>FP_Frailty</b>						
<b>aMED</b>	Tertile 1	176/ 6,019			Ref.	
	Tertile 2	117/ 5,180	0.74 (0.58, 0.93)	0.012	0.91 (0.71, 1.17)	0.477
	Tertile 3	66/ 5,103	0.40 (0.30, 0.54)	<0.001	0.61 (0.45, 0.82)	0.001
	<i>P</i> for trend	-	<0.001		<0.001	
<b>RFS</b>	Tertile 1	173/ 5,822			Ref.	
	Tertile 2	105/ 5,235	0.62 (0.48, 0.79)	<0.001	0.84 (0.65, 1.08)	0.174
	Tertile 3	81/ 5,245	0.45 (0.34, 0.59)	<0.001	0.64 (0.48, 0.86)	0.003
	<i>P</i> for trend	-	<0.001		<0.001	
<b>DASH</b>	Tertile 1	157/ 5,673			Ref.	
	Tertile 2	101/ 5,200	0.64 (0.50, 0.83)	<0.001	0.80 (0.62, 1.04)	0.101
	Tertile 3	101/ 5,429	0.58 (0.45, 0.76)	<0.001	0.78 (0.59, 1.03)	0.075
	<i>P</i> for trend	-	<0.001		<0.001	
<b>MIND</b>	Tertile 1	168/ 5,445			Ref.	
	Tertile 2	103/ 5,496	0.56 (0.44, 0.72)	<0.001	0.69 (0.53, 0.89)	0.004
	Tertile 3	88/ 5,361	0.46 (0.35, 0.60)	<0.001	0.67 (0.50, 0.88)	0.004
	<i>P</i> for trend	-	<0.001		<0.001	
<b>FI_Frailty</b>						
<b>aMED</b>	Tertile 1	459/ 6,019			Ref.	
	Tertile 2	292/ 5,180	0.69 (0.59, 0.80)	<0.001	0.80 (0.69, 0.94)	0.007
	Tertile 3	283/ 5,103	0.65 (0.56, 0.76)	<0.001	0.89 (0.76, 1.05)	0.156
	<i>P</i> for trend	-	<0.001		<0.001	
<b>RFS</b>	Tertile 1	449/ 5,822			Ref.	
	Tertile 2	294/ 5,235	0.65 (0.56, 0.76)	<0.001	0.82 (0.70, 0.96)	0.013
	Tertile 3	291/ 5,245	0.60 (0.52, 0.71)	<0.001	0.82 (0.70, 0.97)	0.020
	<i>P</i> for trend	-	<0.001		<0.001	
<b>DASH</b>	Tertile 1	411/ 5,673			Ref.	
	Tertile 2	303/ 5,200	0.73 (0.63, 0.86)	<0.001	0.88 (0.75, 1.03)	0.106
	Tertile 3	320/ 5,429	0.71 (0.61, 0.83)	<0.001	0.91 (0.77, 1.07)	0.263
	<i>P</i> for trend	-	<0.001		<0.001	
<b>MIND</b>	Tertile 1	449/ 5,445			Ref.	
	Tertile 2	296/ 5,496	0.60 (0.52, 0.70)	<0.001	0.70 (0.59, 0.81)	<0.001
	Tertile 3	289/ 5,361	0.57 (0.49, 0.67)	<0.001	0.74 (0.63, 0.87)	<0.001
	<i>P</i> for trend	-	<0.001		<0.001	

Abbreviations: CI, confidence interval.

Notes: Model 1: adjusted for sex, age, and ethnicity.

Model 2: further adjusted for education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

**Supplementary Table 9.6. Associations between dietary patterns and frailty using a sample with complete data on all frailty components (or items). (N=22,804)**

Dietary pattern		No. of events/ No. of participants	Model 1		Model 2	
			OR (95% CI)	<i>P</i> value	OR (95% CI)	<i>P</i> value
<b>FP_Frailty</b>						
<b>aMED</b>	Tertile 1	271/ 8,935			Ref.	
	Tertile 2	151/ 6,834	0.69 (0.56, 0.84)	<0.001	0.86 (0.70, 1.06)	0.155
	Tertile 3	90/ 7,035	0.38 (0.30, 0.48)	<0.001	0.56 (0.44, 0.73)	<0.001
	<i>P</i> for trend	-	<0.001		<0.001	
<b>RFS</b>	Tertile 1	245/ 7,732			Ref.	
	Tertile 2	141/ 7,115	0.56 (0.45, 0.70)	<0.001	0.76 (0.61, 0.95)	0.017
	Tertile 3	126/ 7,957	0.42 (0.34, 0.53)	<0.001	0.62 (0.49, 0.78)	<0.001
	<i>P</i> for trend	-	<0.001		<0.001	
<b>DASH</b>	Tertile 1	217/ 7,645			Ref.	
	Tertile 2	158/ 7,691	0.66 (0.53, 0.81)	<0.001	0.83 (0.67, 1.04)	0.103
	Tertile 3	137/ 7,468	0.55 (0.44, 0.69)	<0.001	0.76 (0.60, 0.96)	0.024
	<i>P</i> for trend	-	<0.001		<0.001	
<b>MIND</b>	Tertile 1	232/ 7,772			Ref.	
	Tertile 2	160/ 7,605	0.61 (0.55, 0.67)	<0.001	0.80 (0.64, 0.98)	0.034
	Tertile 3	120/ 7,427	0.47 (0.37, 0.59)	<0.001	0.66 (0.53, 0.84)	<0.001
	<i>P</i> for trend	-	<0.001		<0.001	
<b>FI_Frailty</b>						
<b>aMED</b>	Tertile 1	681/ 8,935			Ref.	
	Tertile 2	403/ 6,834	0.69 (0.56, 0.84)	<0.001	0.85 (0.75, 0.97)	0.019
	Tertile 3	384/ 7,035	0.38 (0.30, 0.48)	<0.001	0.87 (0.76, 1.00)	0.047
	<i>P</i> for trend	-	<0.001		<0.001	
<b>RFS</b>	Tertile 1	630/ 7,732			Ref.	
	Tertile 2	395/ 7,115	0.56 (0.45, 0.70)	<0.001	0.76 (0.66, 0.87)	<0.001
	Tertile 3	443/ 7,957	0.42 (0.34, 0.53)	<0.001	0.78 (0.68, 0.90)	<0.001
	<i>P</i> for trend	-	<0.001		<0.001	
<b>DASH</b>	Tertile 1	578/ 7,645			Ref.	
	Tertile 2	447/ 7,691	0.66 (0.53, 0.81)	<0.001	0.84 (0.73, 0.96)	0.009
	Tertile 3	443/ 7,468	0.55 (0.44, 0.69)	<0.001	0.88 (0.76, 1.01)	0.067
	<i>P</i> for trend	-	<0.001		<0.001	
<b>MIND</b>	Tertile 1	626/ 7,772			Ref.	
	Tertile 2	429/ 7,605	0.65 (0.53, 0.80)	<0.001	0.75 (0.65, 0.85)	<0.001
	Tertile 3	413/ 7,427	0.47 (0.37, 0.59)	<0.001	0.78 (0.68, 0.89)	<0.001
	<i>P</i> for trend	-	<0.001		<0.001	

Abbreviations: CI, confidence interval.

Notes: Model 1: adjusted for sex, age, and ethnicity.

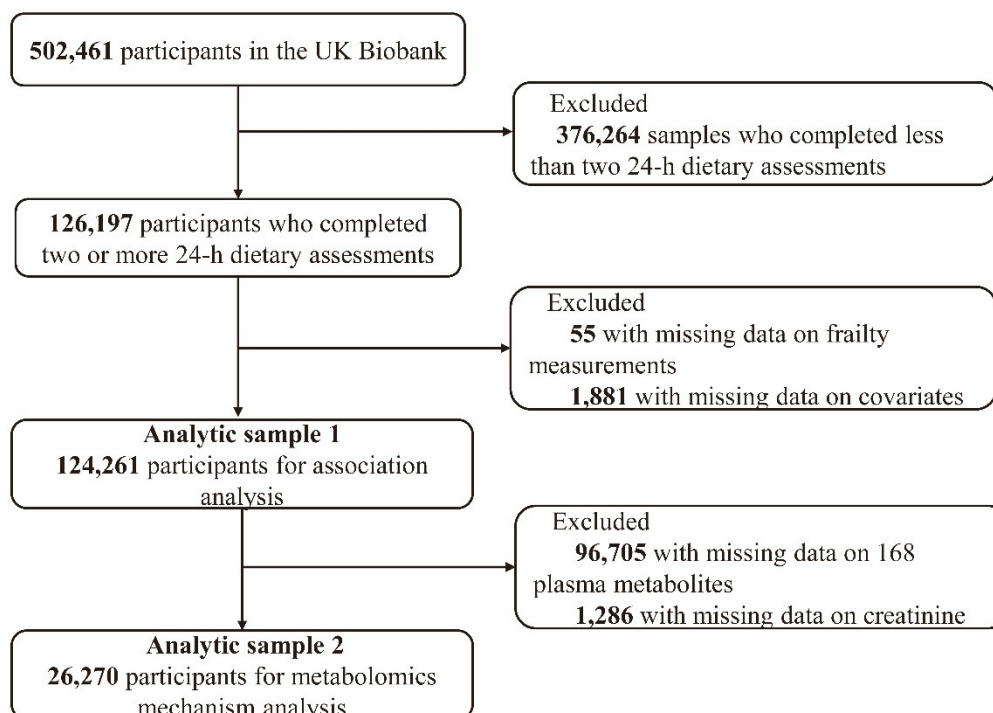
Model 2: further adjusted for education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH), and regular physical activity based on Model 1.

**Supplementary Table 9.7. Associations between dietary patterns and FP\_Frailty in analytic sample 2 in the model without adjustment for regular exercise. (N=26,270)**

Dietary pattern	No. of events/ No. of participants	Model 6		
		OR (95% CI)	P value	
<b>aMED</b>	Tertile 1	330/ 10,366	Ref.	
	Tertile 2	182/ 7,877	0.81 (0.67, 0.98)	0.030
	Tertile 3	110/ 8,027	0.52 (0.41, 0.65)	<0.001
	<i>P</i> for trend	-		<0.001
<b>RFS</b>	Tertile 1	294/ 8,970	Ref.	
	Tertile 2	175/ 8,160	0.77 (0.63, 0.93)	0.009
	Tertile 3	153/ 9,140	0.57 (0.46, 0.71)	<0.001
	<i>P</i> for trend	-		<0.001
<b>DASH</b>	Tertile 1	264/ 8,835	Ref.	
	Tertile 2	190/ 8,839	0.79 (0.65, 0.96)	0.020
	Tertile 3	168/ 8,596	0.69 (0.56, 0.85)	<0.001
	<i>P</i> for trend	-		<0.001
<b>MIND</b>	Tertile 1	280/ 9,040	Ref.	
	Tertile 2	193/ 8,731	0.77 (0.64, 0.93)	0.008
	Tertile 3	149/ 8,499	0.63 (0.51, 0.78)	<0.001
	<i>P</i> for trend	-		<0.001

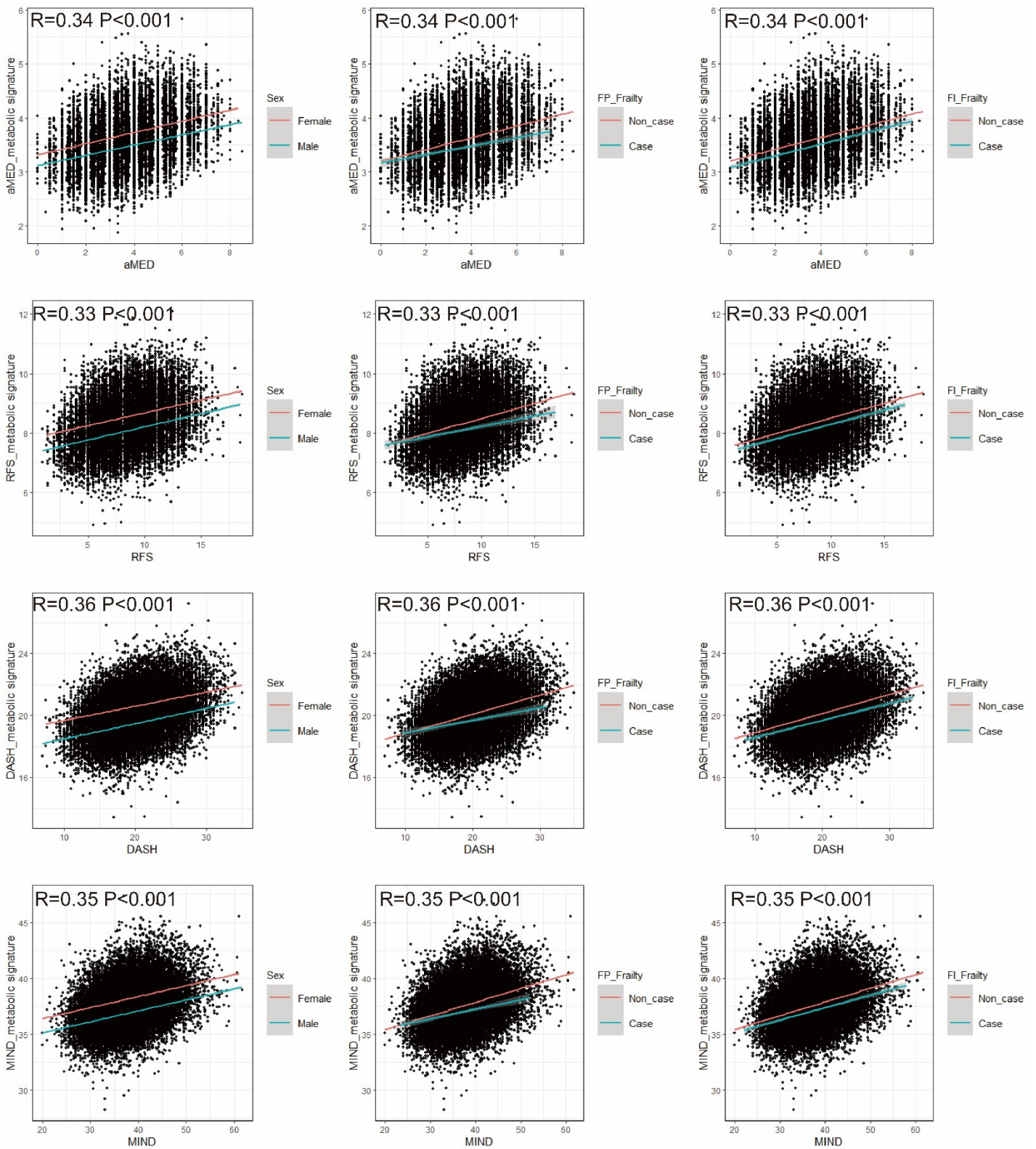
Abbreviations: CI, confidence interval.

Notes: Model 6: adjusted for sex, age, ethnicity, education levels, Townsend deprivation index, body mass index, smoking status, alcohol intake frequency (RFS and DASH).





**Figure S1. The flow chart for the analytic sample.**



**Figure S2. Correlations between four dietary patterns and its metabolic signature in analytic sample 2 stratified by study characteristics (sex and case-control status).**