

## **Supplementary Information**

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**Supplementary Table 1 Diseases and corresponding ICD-8 codes for the outcomes**

Outcome	Diseases
Major cardiovascular disease	Coronary heart disease and stroke.
Coronary heart disease	Fatal coronary heart disease and nonfatal myocardial infarction (ICD-8 codes 410, 412).
Stroke	Fatal and nonfatal strokes (ICD-8 codes 430–438).
Type 2 diabetes	Diabetes mellitus (ICD-8 code 250).
Total cancer	All cancer types (ICD-8 codes 140–209) except non-melanoma skin cancer and nonfatal prostate cancer.
Obesity-related cancer	Cancer types that have been related to excessive body fatness with sufficient evidence, including esophagus cancer (ICD-8 code 150), gastric cancer (ICD-8 code 151), colorectal cancer (ICD-8 codes 153, 154), liver cancer (ICD-8 code 155), gallbladder cancer (ICD-8 code 156), pancreatic cancer (ICD-8 code 157), postmenopausal breast cancer (ICD-8 code 174), endometrial cancer (ICD-8 code 182), ovarian cancer (ICD-8 code 183), kidney cancer (ICD-8 code 189), thyroid cancer (ICD-8 code 193), and multiple myeloma (ICD-8 code 203).
Smoking-related cancer	Cancer types that have been related to tobacco smoking with sufficient evidence, including oral cancer (ICD-8 codes 140–149), esophageal cancer (ICD-8 code 150), stomach cancer (ICD-8 code 151), colorectal cancer (ICD-8 codes 153, 154), liver cancer (ICD-8 code 155), pancreatic cancer (ICD-8 code 157), nasopharyngeal cancer (ICD-8 code 147), lung cancer (ICD-8 code 162), cervical cancer (ICD-8 code 180), ovarian cancer (ICD-8 code 183), bladder cancer (ICD-8 code 188), kidney cancer (ICD-8 code 189), and myeloid leukemia (ICD-8 code 205).
Alternative major chronic disease	Incidence of major chronic disease and non-traumatic death. Non-traumatic death included all causes of death except those from injury (ICD-8 codes E800–E949, E960–E999) or suicides (ICD-8 codes E950–E959).

**Supplementary Table 2 Associations between cumulative average dietary patterns (comparing the 90<sup>th</sup> to 10<sup>th</sup> percentile) and major chronic disease in each cohort and random-effects meta-analysis**

Cohort		HPFS <sup>a</sup>	NHS <sup>a</sup>	NHSII <sup>a</sup>	Random-effects meta-analysis	
Cases		14,427	21,003	9,545	44,975	
Person-year		879,987	1,769,776	2,203,131	4,852,894	
Pattern	Model	HR (95% CI)	HR (95% CI)	HR (95% CI)	HR (95% CI)	<i>P</i> <sub>Heterogeneity</sub> <sup>b</sup>
AHEI-2010	Age	0.74 (0.71, 0.77)	0.64 (0.62, 0.66)	0.51 (0.49, 0.54)	0.62 (0.52, 0.75)	<0.0001
	MV	0.84 (0.81, 0.88)	0.77 (0.74, 0.80)	0.63 (0.59, 0.67)	0.74 (0.64, 0.86)	<0.0001
AMED	Age	0.72 (0.69, 0.76)	0.67 (0.64, 0.69)	0.54 (0.51, 0.56)	0.64 (0.55, 0.75)	<0.0001
	MV	0.83 (0.79, 0.87)	0.83 (0.80, 0.87)	0.67 (0.63, 0.71)	0.77 (0.68, 0.88)	<0.0001
hPDI	Age	0.79 (0.75, 0.82)	0.71 (0.68, 0.73)	0.58 (0.55, 0.62)	0.69 (0.59, 0.80)	<0.0001
	MV	0.86 (0.82, 0.90)	0.81 (0.78, 0.84)	0.70 (0.67, 0.75)	0.79 (0.71, 0.88)	<0.0001
DASH	Age	0.71 (0.68, 0.75)	0.64 (0.62, 0.67)	0.48 (0.46, 0.51)	0.61 (0.50, 0.74)	<0.0001
	MV	0.83 (0.79, 0.87)	0.84 (0.81, 0.88)	0.64 (0.60, 0.67)	0.76 (0.65, 0.90)	<0.0001
DRRD	Age	0.74 (0.71, 0.77)	0.60 (0.58, 0.63)	0.46 (0.44, 0.49)	0.59 (0.46, 0.75)	<0.0001
	MV	0.82 (0.78, 0.85)	0.71 (0.68, 0.73)	0.58 (0.55, 0.62)	0.70 (0.59, 0.83)	<0.0001
WCRF/AICR	Age	0.82 (0.79, 0.86)	0.83 (0.80, 0.86)	0.87 (0.83, 0.92)	0.84 (0.81, 0.87)	0.19
	MV	0.95 (0.91, 0.99)	1.02 (0.98, 1.06)	1.06 (1.00, 1.12)	1.01 (0.95, 1.07)	0.005
rEDIH	Age	0.68 (0.66, 0.71)	0.54 (0.52, 0.56)	0.35 (0.33, 0.37)	0.51 (0.36, 0.71)	<0.0001
	MV	0.74 (0.70, 0.77)	0.60 (0.58, 0.62)	0.41 (0.39, 0.43)	0.56 (0.42, 0.76)	<0.0001
rEDIP	Age	0.77 (0.74, 0.80)	0.57 (0.55, 0.59)	0.40 (0.38, 0.42)	0.56 (0.40, 0.78)	<0.0001
	MV	0.77 (0.74, 0.80)	0.60 (0.58, 0.62)	0.45 (0.43, 0.47)	0.59 (0.45, 0.78)	<0.0001

AHEI-2010, Alternative Healthy Eating Index-2010; AMED, Alternate Mediterranean Diet score; CI, Confidence interval; DASH, Dietary Approaches to Stop Hypertension score; DRRD, Diabetes Risk Reduction Diet; hPDI, Healthful plant-based diet index; HR, Hazard ratio; rEDIH, reversed Empirical dietary index for hyperinsulinemia; MV, multivariable rEDIP, reversed Empirical dietary inflammation pattern; WCRF/AICR, World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) dietary score.

MV model: adjusted for family history of diabetes (yes or no), family history of cancer (yes or no), family history of cardiovascular disease (yes or no), physical activity (<3.0, 3.0-8.9, 9.0-17.9, 18.0-26.9, 27.0-41.9, or ≥42 MET-h/week), cigarette smoking status (never, former quitting ≥10 y, former quitting <10 y, current), cigarette smoking pack-years (0, 1-4, 5-14, 15-24, or ≥25 pack-years), multivitamin use (yes or no), regular aspirin use (yes or no), regular non-steroidal anti-inflammatory drugs use (yes or no), postmenopausal hormone use (premenopausal, never, former, or current use) for women, and total energy intake (quintiles). For DASH, hPDI, and DRRD, alcohol consumption (<5.0, 5.0-14.9, or ≥15.0 g/d) was additionally adjusted for. We reported unadjusted *P* values based on two-sided statistical tests.

<sup>a</sup>Cohort-specific analyses were stratified by age (in month) and calendar year.

<sup>b</sup>*P*-value for the heterogeneity test based on *Q* statistic.

**Supplementary Table 3 HRs (95% CI) for the associations between cumulative average dietary patterns in quintiles and major chronic disease in the pooled data**

Pattern <sup>a</sup>	Quintile	Q1 (Ref.)	Q2	Q3	Q4	Q5	Continuous <sup>b</sup>
AHEI-2010	Cases	9,630	9,724	9,266	8,695	7,660	44,975
	Person-year	972,731	971,991	971,203	969,728	967,242	4,852,894
	Age	1	0.91 (0.88, 0.94)	0.82 (0.80, 0.85)	0.74 (0.72, 0.76)	0.63 (0.61, 0.65)	0.64 (0.62, 0.66)
	MV	1	0.96 (0.93, 0.99)	0.90 (0.87, 0.93)	0.85 (0.82, 0.87)	0.76 (0.73, 0.78)	0.76 (0.74, 0.78)
AMED	Cases	9,826	9,575	9,297	8,652	7,625	44,975
	Person-year	968,590	969,696	970,851	971,348	972,409	4,852,894
	Age	1	0.88 (0.86, 0.91)	0.82 (0.80, 0.84)	0.74 (0.71, 0.76)	0.63 (0.62, 0.65)	0.65 (0.64, 0.67)
	MV	1	0.94 (0.92, 0.97)	0.91 (0.89, 0.94)	0.85 (0.83, 0.88)	0.78 (0.75, 0.80)	0.79 (0.77, 0.81)
hPDI	Cases	9,369	9,428	9,268	8,847	8,063	44,975
	Person-year	968,809	969,693	970,720	971,596	972,078	4,852,894
	Age	1	0.91 (0.89, 0.94)	0.85 (0.83, 0.88)	0.78 (0.76, 0.80)	0.68 (0.66, 0.71)	0.70 (0.69, 0.72)
	MV	1	0.95 (0.92, 0.97)	0.91 (0.88, 0.94)	0.86 (0.83, 0.88)	0.79 (0.76, 0.81)	0.80 (0.78, 0.82)
DASH	Cases	9,906	9,406	9,168	8,638	7,857	44,975
	Person-year	969,139	969,686	970,499	971,429	972,141	4,852,894
	Age	1	0.85 (0.83, 0.88)	0.78 (0.76, 0.80)	0.70 (0.68, 0.72)	0.61 (0.59, 0.62)	0.63 (0.61, 0.64)
	MV	1	0.93 (0.90, 0.95)	0.89 (0.86, 0.92)	0.83 (0.81, 0.86)	0.76 (0.74, 0.79)	0.78 (0.76, 0.80)
DRRD	Cases	10,206	9,691	9,052	8,563	7,463	44,975
	Person-year	969,186	969,360	970,592	970,937	972,819	4,852,894
	Age	1	0.85 (0.83, 0.88)	0.76 (0.74, 0.79)	0.69 (0.67, 0.71)	0.58 (0.56, 0.60)	0.61 (0.59, 0.62)
	MV	1	0.89 (0.86, 0.91)	0.82 (0.80, 0.85)	0.78 (0.75, 0.80)	0.68 (0.66, 0.70)	0.70 (0.69, 0.72)
WCRF/AICR	Cases	8,240	9,137	9,237	9,520	8,841	44,975
	Person-year	971,959	970,728	970,471	969,576	970,161	4,852,894
	Age	1	1.00 (0.97, 1.03)	0.95 (0.92, 0.98)	0.94 (0.91, 0.96)	0.83 (0.80, 0.85)	0.84 (0.82, 0.86)
	MV	1	1.05 (1.01, 1.08)	1.04 (1.01, 1.07)	1.06 (1.03, 1.10)	1.00 (0.97, 1.04)	1.00 (0.98, 1.03)
rEDIH	Cases	11,033	9,907	8,946	7,979	7,110	44,975
	Person-year	970,153	970,728	971,201	970,746	970,067	4,852,894
	Age	1	0.78 (0.76, 0.80)	0.66 (0.64, 0.67)	0.56 (0.54, 0.57)	0.49 (0.48, 0.51)	0.53 (0.52, 0.54)
	MV	1	0.82 (0.80, 0.84)	0.70 (0.68, 0.72)	0.61 (0.59, 0.63)	0.55 (0.53, 0.56)	0.58 (0.57, 0.60)
rEDIP	Cases	11,739	9,995	8,766	7,785	6,690	44,975
	Person-year	969,472	970,510	970,829	970,901	971,184	4,852,894
	Age	1	0.78 (0.76, 0.81)	0.68 (0.66, 0.70)	0.60 (0.58, 0.62)	0.54 (0.52, 0.55)	0.59 (0.57, 0.60)
	MV	1	0.82 (0.80, 0.84)	0.71 (0.69, 0.73)	0.63 (0.61, 0.65)	0.56 (0.54, 0.58)	0.61 (0.60, 0.63)

AHEI-2010, Alternative Healthy Eating Index-2010; AMED, Alternate Mediterranean Diet score; CI, Confidence interval; DASH, Dietary Approaches to Stop Hypertension score; DRRD, Diabetes Risk Reduction Diet; hPDI, Healthful plant-based diet index; HR, Hazard ratio; MV, multivariable; rEDIH, reversed Empirical dietary index for hyperinsulinemia; rEDIP, reversed Empirical dietary inflammation pattern; Ref, reference; WCRF/AICR, World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) dietary score.

Analyses were stratified by age (in month), calendar year, and cohort. MV model: adjusted for family history of diabetes (yes or no), family history of cancer (yes or no), family history of cardiovascular disease (yes or no), physical activity (<3.0, 3.0-8.9, 9.0-17.9, 18.0-26.9, 27.0-41.9, or >=42 MET-h/week), cigarette smoking status (never, former quitting >=10 y, former quitting <10 y, current), cigarette smoking pack-years (0, 1-4, 5-14, 15-24, or >=25 pack-years), multivitamin use (yes or no), regular aspirin use (yes or no), regular non-steroidal anti-inflammatory drugs use (yes or no), postmenopausal hormone use (premenopausal, never, former, or current use) for women, and total energy intake (quintiles). For DASH, hPDI, and DRRD, alcohol consumption (<5.0, 5.0-14.9, or >=15.0 g/d) was additionally adjusted for.

<sup>a</sup>Linear trend was tested using the median score of each quintile as a continuous variable. *P* values based on the two-sided test for all patterns were <0.0001 except WCRF/AICR in the MV model (*P* = 0.81) (not adjusted for multiple comparisons). <sup>b</sup>Comparing the 90<sup>th</sup> to 10<sup>th</sup> percentile.

**Supplementary Table 4 Associations between cumulative average dietary patterns (comparing the 90<sup>th</sup> to 10<sup>th</sup> percentile) and risk of major chronic disease in sensitivity analyses**

Cases		Censoring loss to follow-up		Stop updating when intermediate endpoints occurred	
Person-year		37,148		44,975	
4,482,907				4,852,894	
Pattern	Model	HR (95% CI)	P <sup>a</sup>	HR (95% CI)	P <sup>a</sup>
AHEI-2010	Age	0.63 (0.61, 0.64)	<0.0001	0.64 (0.62, 0.66)	<0.0001
	MV	0.74 (0.72, 0.76)	<0.0001	0.75 (0.73, 0.77)	<0.0001
AMED	Age	0.66 (0.64, 0.67)	<0.0001	0.71 (0.69, 0.73)	<0.0001
	MV	0.79 (0.77, 0.81)	<0.0001	0.85 (0.83, 0.87)	<0.0001
hPDI	Age	0.70 (0.68, 0.72)	<0.0001	0.75 (0.73, 0.77)	<0.0001
	MV	0.79 (0.77, 0.81)	<0.0001	0.84 (0.82, 0.86)	<0.0001
DASH	Age	0.62 (0.61, 0.64)	<0.0001	0.65 (0.64, 0.67)	<0.0001
	MV	0.76 (0.74, 0.79)	<0.0001	0.81 (0.79, 0.83)	<0.0001
DRRD	Age	0.60 (0.58, 0.61)	<0.0001	0.67 (0.65, 0.68)	<0.0001
	MV	0.69 (0.67, 0.71)	<0.0001	0.77 (0.75, 0.79)	<0.0001
WCRF/AICR	Age	0.85 (0.83, 0.88)	<0.0001	0.83 (0.81, 0.85)	<0.0001
	MV	1.01 (0.98, 1.04)	0.53	0.97 (0.95, 0.99)	0.02
rEDIH	Age	0.49 (0.47, 0.50)	<0.0001	0.56 (0.55, 0.58)	<0.0001
	MV	0.54 (0.53, 0.56)	<0.0001	0.62 (0.60, 0.63)	<0.0001
rEDIP	Age	0.55 (0.53, 0.56)	<0.0001	0.67 (0.66, 0.69)	<0.0001
	MV	0.58 (0.56, 0.59)	<0.0001	0.69 (0.68, 0.71)	<0.0001

AHEI-2010, Alternative Healthy Eating Index-2010; AMED, Alternate Mediterranean Diet score; BMI, body mass index; CI, Confidence interval; DASH, Dietary Approaches to Stop Hypertension score; DRRD, Diabetes Risk Reduction Diet; hPDI, Healthful plant-based diet index; HR, Hazard ratio; MV, multivariable; rEDIH, reversed Empirical dietary index for hyperinsulinemia; rEDIP, reversed Empirical dietary inflammation pattern; WCRF/AICR, World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) dietary score.

Analyses were stratified by age (in month), calendar year, and cohort. MV model: adjusted for family history of diabetes (yes or no), family history of cancer (yes or no), family history of cardiovascular disease (yes or no), physical activity (<3.0, 3.0-8.9, 9.0-17.9, 18.0-26.9, 27.0-41.9, or ≥42 MET-h/week), cigarette smoking status (never, former quitting ≥10 y, former quitting <10 y, current), cigarette smoking pack-years (0, 1-4, 5-14, 15-24, or ≥25 pack-years), multivitamin use (yes or no), regular aspirin use (yes or no), regular non-steroidal anti-inflammatory drugs use (yes or no), postmenopausal hormone use (premenopausal, never, former, or current use) for women, and total energy intake (quintiles). For DASH, hPDI, and DRRD, alcohol consumption (<5.0, 5.0-14.9, or ≥15.0 g/d) was additionally adjusted for.

<sup>a</sup>P-value for the two-sided Wald test (not adjusted for multiple comparisons).