Supplementary Table S1. Cutoff values and components used to classify participants according to MetS definitions.

Components	WHO [1]	NCEP: ATPIII [2,3]	IDF [4]
Mandatory component(s)	GI, IGT or DM, and/or IR together with two or more of the following components:	Three or more of the following components:	Central obesity as defined by ethnic/racial, specific WC, and two of the following components:
Blood pressure	≥ 140/90 mmHg	≥130/85 mmHg	≥ 130/85 mmHg
Triglycerides	≥ 150 mg/dl and/or low HDL-c: Men < 35 mg/dl; Female < 39 mg/dl	≥150 mg/dl	≥ 150 mg/dl
Central obesity	Men: WHR > 90 cm; Women: WHR > 85 cm And/or BMI > 30 kg/m^2	Men: WC > 101 cm; Women: > 88.9 cm	-
FBG	-	≥ 110 mg/dl	FBG ≥100 mg/dl
HDL-c	-	Men: < 40 mg/dl; Female: < 50 mg/dl	Men: <40 mg/dl; Women: <50 mg/dl

MetS: metabolic syndrome; GI: glucose intolerance; IGT: impaired glucose tolerance; DM: diabetes mellitus; IR: insulin resistance; WHR: waist to hip ratio; WC: waist circumference; HT: hypertension; FBG: fasting blood glucose; HDL: High-density lipoprotein, WHO: World Health Organization, NCEP: ATPIII: National Cholesterol Education Program's Adult Treatment Panel III, IDF: International Diabetes Federation.

Supplementary Table S2. Global daily mean intake of food parameters (± SD) and their corresponding Westernized Diet Index (WDI) coefficients.

Food parameter	Global daily mean intake (unit/day) ± SD*	WDI Coefficients [5]	Fractional Rank of the WDI Coefficients
Energy (kcal)	2056 ± 338	-0.2395	24.14
Carbohydrate (g)	272.2 ± 40.0	0.0584	48.28
Protein (g)	79.4 ± 13.9	0.0829	51.72
Total fat (g)	71.4 ± 19.4	-0.0507	44.83
Healthy fatty acids			
MUFA[$] (g)	27.0 ± 6.1		
PUFA[$$] (g)	13.88 ± 3.76	0.2405	75.86
n-3 Fatty acids (g)	1.06 ± 1.06		
n-6 Fatty acids (g)	10.80 ± 7.50		
Unhealthy fatty acids			
Trans fat (g)	3.15 ± 3.75	-0.0767	41.38
Saturated fat (g)	28.6 ± 8.0		
Cholesterol (mg)	279.4 ± 51.2		
Dietary fiber (g)	18.8 ± 4.9	0.4062	100.00
Whole grains (g)	62.74 ± 61.82	0.1007	58.62
Refined grains (g)	96.33 ± 82.90	-0.1998	27.59
Legumes (g)	51.15 ± 53.8	0.1888	68.97
Nuts and Seeds (g)	1.57 ± 2.07	0.2652	89.66
Oils (L)	0.43 ± 0.23	0.0893	55.17
Refined fats (g)	4.57 ± 2.20	-0.2734	17.24
Soft drinks (L)	0.37 ± 0.07	-0.3693	3.45
Salt (g)	3.6 ± 1.2	-0.2784	13.79
Coffee/tea/waters (L)	1.33 ± 0.52	0.1662	65.52
Processed foods (g)	186.67 ± 100	-0.3083	6.9
Sugars (g)	97.85 ± 40	-0.1782	31.03
Fruits (g)	183.4 ± 118.2	0.2491	82.76
Vegetables (g)	175.3 ± 86.1	0.2469	79.31
Red meat (g)	43.83 ± 23.29	-0.2954	10.34
Processed meat (g)	17.00 ± 11.65	-0.2448	20.69
White meat (g)	35 ± 25	0.1283	62.07
Fish (g)	92.43 ± 85.86	0.2497	86.21
Dairy (g)	113.5 ± 50.29	0.2081	72.41
Diet drinks (mL)	56.3 ± 46.2	-0.1343	37.93
Alcoholic drinks (L)	0.38 ± 0.07	-0.1618	34.48
Vitamins and minerals			
Vitamin B_{12} (μg)	5.15 ± 2.70		
Vitamin B_6 (mg)	1.47 ± 0.74		
Folic acid (μg)	273.0 ± 70.7		
Thiamin (mg)	1.70 ± 0.66		
Riboflavin (mg)	1.70 ± 0.79		
Niacin (mg)	25.90 ± 11.77		
Pantothenic acid (mg)	5 ± 2		
Vitamin C (mg)	118.2 ± 43.46		
Vitamin A (RE)	983.9 ± 518.6	0.2776	93.10
Vitamin D (μg)	6.26 ± 2.21		
Vitamin E (mg)	8.73 ± 1.49		
Vitamin K (μg)	125 ± 50		

Calcium (mg)	684 ± 211		
Se (µg)	67.0 ± 25.1		
Zn (mg)	9.84 ± 2.19		
Fe (mg)	13.35 ± 3.71		
Mg (mg)	310.1 ± 139.4		
Copper (mg)	1.6 ± 0.4		
Manganese (mg)	3.0 ± 1.0		
Secondary plant metabolites			
B-carotene (µg)	3718 ± 1720		
A-carotene (µg)	350 ± 200		
B-cryptoxanthin (µg)	250 ± 150	0.34235	96.55
Lycopene (µg)	4433 ± 2267		
Lutein/zeaxanthin (µg)	900 ± 296		
Caffeine (mg)	805 ± 667		

* From the world food consumption database, Whole Grain Consumption Worldwide | The Whole Grains Council, Whole grain intake across European countries | Knowledge for policy, Hydrogenated Fat Market Size, Share, Trends, Forecast To 2032, Soda Consumption by Country 2025, Salt Consumption by Country 2025, RF_SDMEST, Estimated intake of sodium in adults aged 25 and older (g/day), International Coffee Organization |, Statistics | FAO | Food and Agriculture Organization of the United Nations, Annual soft drink consumption volume EU 2013-2023 | Statista, Per capita alcohol consumption worldwide 2024, by country | Statista, EFSA: Food consumption data and Global Dietary Database (GDD) [6-21]. $Multi-unsaturated fatty acids, $$Poly-unsaturated fatty acids.

Supplementary Table S3. Association (ORs and 95%CIs) between different WDI estimation methods and various MetS definitions in crude logistic regression models.

Calculation methods*	WHO	p-value	ATPIII	p-value	IDF	p-value
WDI-G	0.234 (0.167, 0.330)	< 0.001	0.342 (0.267, 0.439)	< 0.001	0.323 (0.251, 0.415)	< 0.001
WDI-GC	0.484 (0.408, 0.574)	< 0.001	0.585 (0.517, 0.622)	< 0.001	0.568 (0.501, 0.644)	< 0.001
WDI-GS	0.747 (0.697, 0.800)	< 0.001	0.806 (0.767, 0.847)	< 0.001	0.797 (0.757, 0.838)	< 0.001
WDI-P	0.002 (0.000421, 0.007)	< 0.001	0.010 (0.004, 0.028)	< 0.001	0.010 (0.004, 0.029)	< 0.001
WDI-PC	0.041 (0.021, 0.082)	< 0.001	0.101 (0.061, 0.169)	< 0.001	0.102 (0.061, 0.171)	< 0.001
WDI-PS	0.733 (0.685, 0.784)	< 0.001	0.800 (0.761, 0.841)	< 0.001	0.801 (0.726, 0.742)	< 0.001
WDI-I	0.952 (0.774, 1.173)	0.646	0.995 (0.861, 1.150)	0.945	1.038 (0.896, 1.203)	0.618
WDI-FG	0.266 (0.202, 0.350)	< 0.001	0.393 (0.322, 0.479)	< 0.001	0.388 (0.318, 0.474)	< 0.001

* For the detailed calculation methods, please see the methods and materials section (in all methods, higher scores indicate lower adherence to WDPs).

WDI: Westernized diet index, WDI-G: WDI global, WDI-GC: WDI global centralized, WDI-GS: WDI global standardized, WDI-P: WDI population, WDI-PC: WDI population centralized, WDI-PS: WDI population standardized, WDI-I: WDI individuald, WDI-FG: WDI food groups, OR: odds ratio, CI: confidence interval, MetS: metabolic syndrome, WHO: World Health Organization, ATPIII: Adult Treatment Panel III, IDF: international diabetes federation.

Supplementary Table S4. Association (ORs and 95%CIs) between different WDI estimation methods and various MetS definitions in logistic regression models adjusted for age and sex.

Calculation methods*	WHO	p-value	ATPIII	p-value	IDF	p-value
WDI-G	0.201 (0.140, 0.290)	< 0.001	0.304 (0.234, 0.395)	< 0.001	0.268 (0.204, 0.351)	< 0.001
WDI-GC	0.449 (0.374, 0.538)	< 0.001	0.551 (0.483, 0.628)	< 0.001	0.517 (0.452, 0.592)	< 0.001
WDI-GS	0.724 (0.673, 0.779)	< 0.001	0.787 (0.746, 0.829)	< 0.001	0.767 (0.726, 0.810)	< 0.001
WDI-P	0.0012 (0.0003, 0.0055)	< 0.001	0.008 (0.003, 0.025)	< 0.001	0.006 (0.002, 0.020)	< 0.001
WDI-PC	0.035 (0.017, 0.075)	< 0.001	0.092 (0.053, 0.159)	< 0.001	0.080 (0.045, 0.142)	< 0.001
WDI-PS	0.722 (0.672, 0.777)	< 0.001	0.793 (0.751, 0.836)	< 0.001	0.782 (0.740, 0.827)	< 0.001
WDI-I	0.634 (0.513, 0.783)	< 0.001	0.630 (0.541, 0.733)	< 0.001	0.579 (0.494, 0.678)	< 0.001
WDI-FG	0.276 (0.204, 0.371)	< 0.001	0.428 (0.345, 0.531)	< 0.001	0.412 (0.329, 0.516)	< 0.001

* For the detailed calculation methods, please see the methods and materials section (in all methods, higher scores indicate lower adherence to WDPs).

WDI: Westernized diet index, WDI-G: WDI global, WDI-GC: WDI global centralized, WDI-GS: WDI global standardized, WDI-P: WDI population, WDI-PC: WDI population centralized, WDI-PS: WDI population standardized, WDI-I: WDI individual, WDI-FG: WDI food groups, OR: odds ratio, CI: confidence interval, MetS: metabolic syndrome, WHO: World Health Organization, ATPIII: Adult Treatment Panel III, IDF: International Diabetes Federation.

Supplementary Table S5. Association (β and 95%CIs) between different WDI estimation methods* and various metabolic (bio)markers in crude linear regression models.

Bio(marker)	WDI-G	p-value	WDI-GC	p-value	WDI-GS	p-value	WDI-P	p-value	WDI-PC	p-value	WDI-PS	p-value	WDI-I	p-value	WDI-FG	p-value
WC (cm)	-8.869 (-10.035, -7.702)	< 0.001	-4.434 (-5.017, -3.851)	< 0.001	-1.785 (-2.020, -1.550)	< 0.001	-35.410 (-40.238, -30.582)	< 0.001	-17.705 (-20.119, -15.291)	< 0.001	-1.723 (-1.958, -14.88)	< 0.001	-1.776 (-2.446, -1.106)	< 0.001	-6.258 (-7.166, -5.350)	< 0.001
HC (cm)	-6.282 (-7.162, -5.402)	< 0.001	-3.141 (-3.581, -2.701)	< 0.001	-1.264 (-1.441, -1.087)	< 0.001	-23.317 (-26.965, -19.669)	< 0.001	-11.658 (-13.482, -9.834)	< 0.001	-1.135, -1.312, -0.957)	< 0.001	-2.068 (-2.572, -1.564)	< 0.001	-3.868 (-4.554, -3.182)	< 0.001
WHR	-0.031 (-0.037, -0.025)	< 0.001	-0.016 (-0.019, -0.012)	< 0.001	-0.006 (-0.008, -0.005)	< 0.001	-0.140 (-0.167, -0.114)	< 0.001	-0.070 (-0.083, -0.057)	< 0.001	-0.007 (-0.008, -0.006)	< 0.001	0.002 (-0.002, 0.005)	0.808	-0.027 (-0.032, -0.022)	< 0.001
BMI (kg/m²)	-3.658 (-4.135, -3.181)	< 0.001	-1.829 (-2.068, -1.590)	< 0.001	-0.736 (-0.832, -0.640)	< 0.001	-13.863 (-15.841, -11.885)	< 0.001	-6.931 (-7.920, -5.942)	< 0.001	-0.675 (-0.771, -0.578)	< 0.001	-0.829 (-1.103, -0.555)	< 0.001	-2.441 (-2.813, -2.069)	< 0.001
DBP (mmHg)	-4.222 (-5.418, -3.026)	< 0.001	-2.111 (-2.709, -1.513)	< 0.001	-0.850 (-1.090, -0.609)	< 0.001	-22.646 (-27.585, -17.706)	< 0.001	-11.232 (-13.792, -8.853)	< 0.001	-1.102 (-1.342, -0.862)	< 0.001	-2.129 (-2.809, -1.448)	< 0.001	-3.616 (-4.545, -2.687)	< 0.001
SBP (mmHg)	-5.902 (-7.757, -4.047)	< 0.001	-2.951 (-3.879, -2.024)	< 0.001	-1.188 (-1.561, -0.814)	< 0.001	-32.389 (-40.049, -24.729)	< 0.001	-16.194 (-20.024, -12.364)	< 0.001	-1.576 (-1.949, -1.203)	< 0.001	-1.579 (-2.635, -0.523)	0.003	-5.416 (-6.855, -3.976)	< 0.001
PR (bpm)	-2.221 (-3.295, -1.147)	< 0.001	-1.111 (-1.648, -0.573)	< 0.001	-0.447 (-0.663, -0.231)	< 0.001	-7.298 (-11.743, -2.854)	< 0.001	-3.649 (-5.871, -1.427)	< 0.001	-0.355 (-0.571, -0.139)	< 0.001	0.527 (-0.084, 1.138)	0.091	-1.356 (-2.191, -0.521)	0.001
MAP (mmHg)	-4.782 (-6.130, -3.434)	< 0.001	-2.391 (-3.065, -1.717)	< 0.001	-0.962 (-1.234, -0.691)	< 0.001	-25.893 (-31.457, -20.329)	< 0.001	-12.947 (-15.729, -10.165)	< 0.001	-1.260 (-1.531, -0.989)	< 0.001	-1.946 (-2.713, -1.179)	< 0.001	-4.216 (-5.262, -3.170)	< 0.001
FBG (mg/dL)	-10.675 (-13.626, -7.723)	< 0.001	-5.337 (-6.813, -3.862)	< 0.001	-2.148 (-2.742, -1.554)	< 0.001	-59.095 (-68.282, -43.907)	< 0.001	-28.047 (-34.141, -21.954)	< 0.001	-2.730 (-3.232, -2.137)	< 0.001	-0.891 (-2.573, 0.791)	0.299	-10.521 (-12.810, -8.232)	< 0.001
TG (mg/dL)	-39.385 (-47.601, -31.169)	< 0.001	-19.693 (-23.801, -15.584)	< 0.001	-7.926 (-9.580, -6.273)	< 0.001	-125.403 (-159.447, -91.358)	< 0.001	-62.701 (-79.724, -45.679)	< 0.001	-6.102 (-7.759, -4.445)	< 0.001	-15.764 (-20.445, -11.083)	< 0.001	-17.738 (-24.139, -11.337)	< 0.001
Cholesterol (mg/dL)	-5.951 (-9.854, -2.048)	< 0.001	-2.976 (-4.927, -1.024)	< 0.001	-1.198 (-1.983, -0.412)	< 0.001	-20.220 (-36.365, -4.076)	< 0.001	-10.110 (-18.182, -2.038)	< 0.001	-0.984 (-1.770, -0.198)	< 0.001	0.380 (-1.839, 2.599)	0.737	-3.569 (-6.601, -0.0537)	0.021
LDL-c (mg/dL)	1.316 (-0.89, 2.920)	0.108	0.658 (-0.144, 1.460)	0.108	0.265 (-0.058, 0.588)	0.108	-5.726 (-12.362, 0.910)	0.091	-2.863 (-6.181, 0.455)	0.091	-0.279 (-0.602, 0.044)	0.091	-0.843 (-1.755, 0.069)	0.070	-0.102 (-1.349, 1.144)	0.872
HDL-c (mg/dL)	0.594 (-2.692, 3.880)	0.723	0.297 (-1.346, 1.940)	0.723	0.120 (-0.542, 0.781)	0.723	10.501 (-3.088, 24.090)	0.130	5.250 (-1.544, 12.045)	0.130	0.511 (-0.150, 1.172)	0.130	4.409 (2.544, 6.275)	< 0.001	0.055 (-2.498, 2.607)	0.967

* For the detailed calculation methods, please see the methods and materials section (in all methods, higher scores indicate lower adherence to WDPs).

WDI: Westernized diet index, WDI-G: WDI global, WDI-GC: WDI global centralized, WDI-GS: WDI global standardized, WDI-P: WDI population, WDI-PC: WDI population centralized, WDI-PS: WDI population standardized, WDI-I: WDI individuald, WDI-FG: WDI food groups, β: beta, CI: confidence interval, MetS: metabolic syndrome, DBP: diastolic blood pressure, SBP: systolic blood pressure, PR: pulse rate, bpm: beats per minute, FBG: fasting blood glucose, TG: triglycerides, LDL-c: low-density lipoprotein cholesterol, HDL-c: high-density lipoprotein cholesterol.

Supplementary Table S6. Association (β and 95%CIs) between different WDI estimation methods* and various metabolic (bio)markers in linear regression models adjusted for age and sex.

Bio(marker)	WDI-G	R/ARS	p-value	WDI-GC	R/ARS	p-value	WDI-GS	R/ARS	p-value	WDI-P	R/ARS	p-value	WDI-PS	R/ARS	p-value	WDI-PS	R/ARS	p-value	WDI-I	R/ARS	p-value	WDI-FG	R/ARS	p-value
WC (cm)	-8.973 (-10.088, -7.857)	0.327/0.106	< 0.001	-4.486 (-5.044, -3.928)	0.327/0.106	< 0.001	-1.806 (-2.030, -1.581)	0.327/0.106	< 0.001	-33.748 (-38.390, -29.106)	0.320/0.102	< 0.001	-16.874 (-19.195, -14.553)	0.320/0.102	< 0.001	-1.642 (-1.868, -1.416)	0.320/0.102	< 0.001	-4.312 (-4.967, -3.656)	0.315/0.099	< 0.001	-5.237 (-6.115, -4.359)	0.310/0.096	< 0.001
HC (cm)	-6.507 (-7.361, -5.653)	0.280/0.078	< 0.001	-3.253 (-3.680, -2.826)	0.280/0.078	< 0.001	-1.309 (-1.481, -1.138)	0.280/0.078	< 0.001	-25.185 (-28.735, -21.635)	0.275/0.075	< 0.001	-12.593 (-14.368, -10.818)	0.275/0.075	< 0.001	-1.226 (-1.398, -1.053)	0.275/0.075	< 0.001	-3.333 (-3.834, -2.832)	0.271/0.073	< 0.001	-3.952 (-4.623, -3.280)	0.264/0.070	< 0.001
WHR	-0.030 (-0.036, -0.024)	0.401/0.160	< 0.001	-0.015 (-0.018, -0.012)	0.401/0.160	< 0.001	-0.006 (-0.007, -0.005)	0.401/0.160	< 0.001	-0.106 (-0.130, -0.081)	0.398/0.158	< 0.001	-0.053 (-0.065, -0.041)	0.398/0.158	< 0.001	-0.005 (-0.006, -0.004)	0.398/0.158	< 0.001	-0.013 (-0.016, -0.009)	0.395/0.156	< 0.001	-0.016 (-0.020, -0.011)	0.395/0.156	< 0.001
BMI (kg/m²)	-3.757 (-4.216, -3.299)	0.316/0.099	< 0.001	-1.879 (-2.108, -1.650)	0.316/0.099	< 0.001	-0.756 (-0.848, -0.664)	0.316/0.099	< 0.001	-14.170 (-16.078, -12.263)	0.309/0.095	< 0.001	-7.085 (-8.039, -6.131)	0.309/0.095	< 0.001	-0.690 (-0.782, -0.597)	0.309/0.095	< 0.001	-1.769 (-2.038, -1.499)	0.0302/0.091	< 0.001	-2.261 (-2.622, -1.900)	0.300/0.089	< 0.001
DBP (mmHg)	-3.990 (-5.162, -2.817)	0.211/0.044	< 0.001	-1.995 (-2.281, -1.408)	0.211/0.044	< 0.001	-0.803 (-1.039, -0.567)	0.211/0.044	< 0.001	-18.491 (-23.355, -13.626)	0.214/0.045	< 0.001	-9.245 (-11.678, -6.813)	0.214/0.045	< 0.001	-0.900 (-1.136, -0.663)	0.214/0.045	< 0.001	-2.852 (-3.538, -2.167)	0.216/0.046	< 0.001	-2.584 (-3.502, -1.666)	0.208/0.043	< 0.001
SBP (mmHg)	-5.239 (-6.970, -3.508)	0.365/0.133	< 0.001	-2.620 (-3.485, -1.754)	0.365/0.133	< 0.001	-1.054 (-1.403, -0.706)	0.365/0.133	< 0.001	-20.529 (-27.716, -13.343)	0.365/0.133	< 0.001	-10.265 (-13.858, -6.971)	0.365/0.133	< 0.001	-0.999 (-1.349, -0.649)	0.365/0.133	< 0.001	-3.242 (-4.255, -2.229)	0.366/0.133	< 0.001	-2.485 (-3.841, -1.129)	0.362/0.131	< 0.001
PR (bpm)	-2.363 (-3.407, -1.320)	0.244/0.059	< 0.001	-1.182 (-1.703, -0.663)	0.244/0.059	< 0.001	-0.476 (-0.686, -0.266)	0.244/0.059	< 0.001	-6.905 (-11.273, -2.573)	0.242/0.058	< 0.001	-3.453 (-5.619, -1.287)	0.242/0.058	< 0.001	-0.336 (-0.547, -0.125)	0.242/0.058	< 0.001	-1.258 (-1.868, -0.647)	0.243/0.059	< 0.001	-0.752 (-1.569, 0.065)	0.241/0.058	0.071
MAP (mmHg)	-4.406 (-5.699, -3.113)	0.291/0.085	< 0.001	-2.203 (-2.850, -1.557)	0.291/0.085	< 0.001	-0.887 (-1.147, -0.627)	0.291/0.085	< 0.001	-19.170 (-24.536, -13.804)	0.292/0.085	< 0.001	-9.585 (-12.268, -6.902)	0.292/0.085	< 0.001	-0.933 (-1.194, -0.672)	0.292/0.085	< 0.001	-2.982 (-3.738, -2.226)	0.294/0.086	< 0.001	-2.551 (-3.564, -1.538)	0.288/0.083	< 0.001
FBG (mg/dL)	-10.192 (-13.080, -7.303)	0.219/0.048	< 0.001	-5.096 (-6.540, -3.651)	0.219/0.048	< 0.001	-2.051 (-2.632, -1.470)	0.219/0.048	< 0.001	-45.919 (-57.904, -33.935)	0.221/0.049	< 0.001	-22.960 (-28.952, -16.967)	0.221/0.049	< 0.001	-2.234 (-2.818, -1.651)	0.221/0.049	< 0.001	-3.317 (-5.011, -1.624)	0.211/0.044	< 0.001	-7.750 (-10.011, -5.490)	0.218/0.047	< 0.001
TG (mg/dL)	-39.055 (-47.265, -30.844)	0.107/0.011	< 0.001	-19.527 (-23.633, -15.422)	0.107/0.011	< 0.001	-7.860 (-9.512, -6.207)	0.107/0.011	< 0.001	-124.614 (-158.755, -90.473)	0.088/0.007	< 0.001	-62.307 (-79.377, -45.237)	0.088/0.007	< 0.001	-6.064 (-7.725, -4.402)	0.088/0.007	< 0.001	-14.207 (-19.025, -9.390)	0.077/0.006	< 0.001	-18.369 (-24.811, -11.927)	0.075/0.005	< 0.001
Cholesterol (mg/dL)	-5.889 (-9.734, -2.045)	0.177/0.031	0.003	-2.945 (-4.867, -1.022)	0.177/0.031	0.003	-1.185 (-1.959, -0.411)	0.177/0.031	0.003	-13.055 (-29.017, 2.908)	0.175/0.030	0.109	-6.527 (-14.509, 1.454)	0.175/0.030	0.109	-0.635 (-1.412, 0.141)	0.175/0.030	0.109	-4.127 (-6.376, -1.878)	0.178/0.031	< 0.001	-0.758 (-3.767, 2.251)	0.174/0.030	0.622
LDL-c (mg/dL)	1.216 (-0.351, 2.783)	0.217/0.047	0.128	0.608 (-0.176, 1.391)	0.217/0.047	0.128	0.245 (-0.071, 0.560)	0.217/0.047	0.128	-3.796 (-10.301, 2.709)	0.217/0.047	0.253	-1.898 (-5.150, 1.355)	0.217/0.047	0.253	-0.185 (-0.501, 0.132)	0.217/0.047	0.253	-3.371 (-4.286, -2.456)	0.228/0.052	< 0.001	1.850)-0.702, 4.402)	0.124/0.015	0.155
HDL-c (mg/dL)	0.689 (-2.573, 3.951)	0.123/0.015	0.679	0.345 (-1.278, 1.976)	0.123/0.015	0.679	0.139 (-0.581, 0.795)	0.123/0.015	0.679	15.561 (2.024, 29.098)	0.125/0.015	0.024	7.780 (1.012, 14.549)	0.125/0.015	0.024	0.757 (0.098, 1.416)	0.125/0.015	0.024	2.126 (0.217, 4.034)	0.125/0.015	0.029	1.035 (-0.191, 2.261)	0.217/0.047	0.098

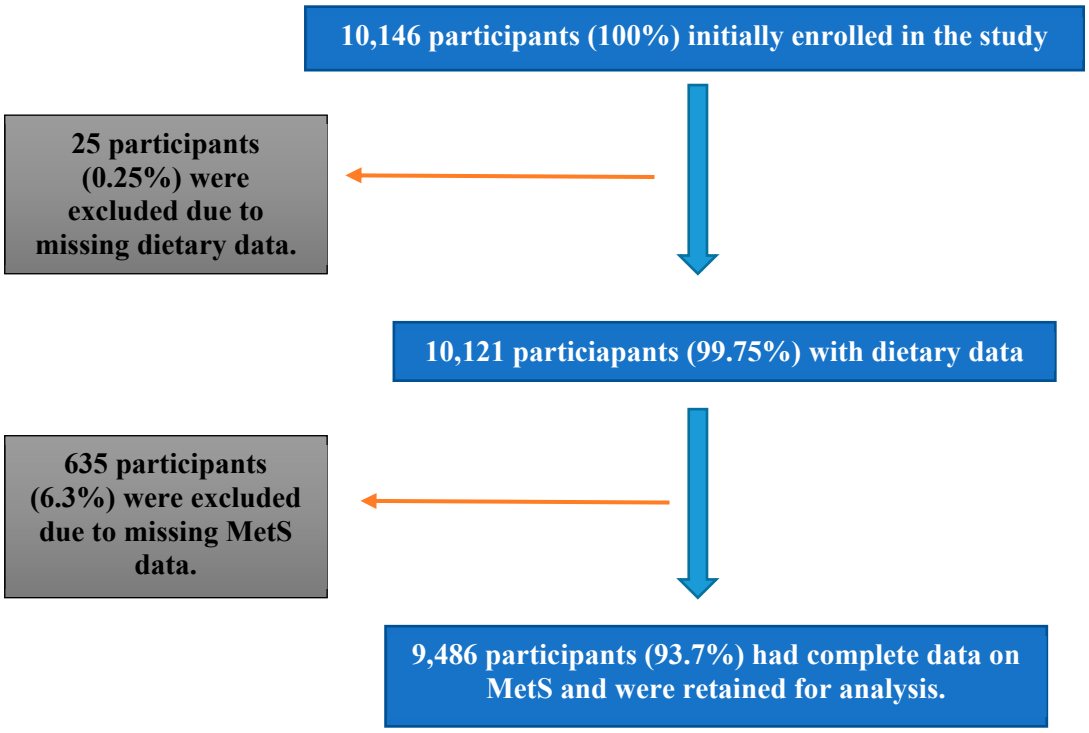
* For the detailed calculation methods, please see the methods and materials section (in all methods, higher scores indicate lower adherence to WDPs).
WDI: Westernized diet index, WDI-G: WDI global, WDI-GC: WDI global centralized, WDI-GS: WDI global standardized, WDI-P: WDI population, WDI-PC: WDI population centralized, WDI-PS: WDI population standardized, WDI-I: WDI individuald, WDI-FG: WDI food groups, β: beta, CI: confidence interval, MetS: metabolic syndrome, DBP: diastolic blood pressure, SBP: systolic blood pressure, PR: pulse rate, bpm: beats per minute, FBG: fasting blood glucose, TG: triglycerides, LDL-c: low-density lipoprotein cholesterol, HDL-c: high-density lipoprotein cholesterol, R: R-squared, ARS: adjusted R-squared.

Supplementary Table S7. Final cluster centers for health indicators and WDI, showing distinct patterns in healthy and unhealthy clusters.

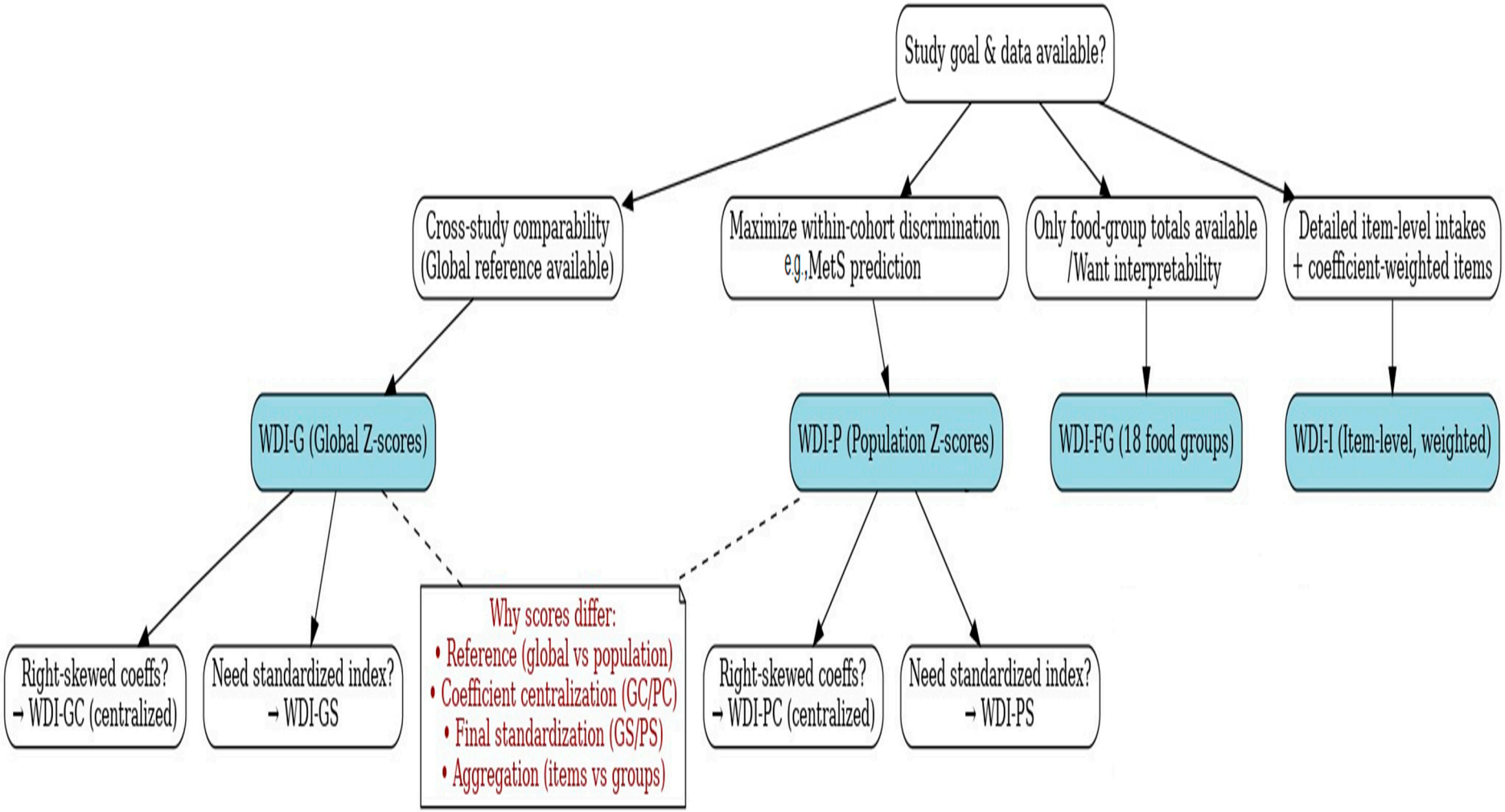
Health indicators (biomarkers)	Cluster	
	1 (Healthy)	2 (Unhealthy)
WC (cm)	92.53	98.14
HC (cm)	99.24	101.89
WHR	0.93	0.96
BMI (kg/m^2)	25.42	27.56
DPB (mmHg)	74	78
SPB (mmHg)	111	116
PR (bpm)	74	76
MAP (mmHg)	86.28	90.36
FBG (mg/dL)	91.71	101.51
TG (mg/dL)	109.21	290.84
Cholesterol (mg/dL)	181.24	217.32
LDL-c (mg/dL)	52.31	45.51
HDL-c (mg/dL)	107.06	113.63
WDI-G*	-0.13	-0.18
WDI-P*	-0.01	-0.02
WDI-FG*	0.00	-0.03

* were entered separately in the K-means analysis.

DBP: diastolic blood pressure, SBP: systolic blood pressure, PR: pulse rate, bpm: beats per minute, FBG: fasting blood glucose, TG: triglycerides, LDL-c: low-density lipoprotein cholesterol, HDL-c: high-density lipoprotein cholesterol, WDI: Westernized diet index, WDI-G: WDI global, WDI-P: WDI population, WDI-FG: WDI food groups.



Supplementary Figure S1. Flow diagram of participants through the study.



Supplementary Figure S2. Decision Guide for WDI: Illustrating When and Why to Select Different WDI Calculation Methods.
WDI: Westernized diet index, WDI-G: WDI global, WDI-GC: WDI global centralized, WDI-GS: WDI global standardized, WDI-P: WDI population, WDI-PC: WDI population centralized, WDI-PS: WDI population standardized, WDI-I: WDI individuald, WDI-FG: WDI food groups.

References

1. Alberti, K.G.M.M.; Zimmet, P.Z. Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus. Provisional report of a WHO consultation. *Diabetic medicine* **1998**, *15*, 539-553.
2. Grundy, S.M.; Cleeman, J.I.; Merz, C.N.B.; Brewer Jr, H.B.; Clark, L.T.; Hunninghake, D.B.; Pasternak, R.C.; Smith Jr, S.C.; Stone, N.J. Implications of recent clinical trials for the national cholesterol education program adult treatment panel III guidelines. *Circulation* **2004**, *110*, 227-239.
3. Detection, N.C.E.P.E.P.o.; Adults, T.o.H.B.C.i. *Third report of the National Cholesterol Education Program (NCEP) Expert Panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III)*; The Program: 2002.
4. Alberti, K.G.; Zimmet, P.; Shaw, J. Metabolic syndrome--a new world-wide definition. A Consensus Statement from the International Diabetes Federation. *Diabet Med* **2006**, *23*, 469-480, doi:10.1111/j.1464-5491.2006.01858.x.
5. Cifuentes, M.; Hejazi, Z.; Vahid, F.; Bohn, T. Designing and Developing a Population/Literature-Based Westernized Diet Index (WDI) and Its Relevance for Cardiometabolic Health. In *Nutrients*, 2025; Vol. 17.
6. Micha, R.; Khatibzadeh, S.; Shi, P.; Andrews, K.G.; Engell, R.E.; Mozaffarian, D. Global, regional and national consumption of major food groups in 1990 and 2010: a systematic analysis including 266 country-specific nutrition surveys worldwide. *BMJ Open* **2015**, *5*, e008705, doi:10.1136/bmjopen-2015-008705.
7. Skórska, K.B.; Grajeta, H.; Zabłocka-Słowińska, K.A. Frequency of legume consumption related to sociodemographic factors, health status and health-related variables among surveyed adults from Poland. *Public Health Nutr* **2021**, *24*, 1895-1905, doi:10.1017/s1368980020002116.
8. Hughes, J.; Pearson, E.; Grafenauer, S. Legumes-A Comprehensive Exploration of Global Food-Based Dietary Guidelines and Consumption. *Nutrients* **2022**, *14*, doi:10.3390/nu14153080.
9. Jenab, M.; Sabaté, J.; Slimani, N.; Ferrari, P.; Mazuir, M.; Casagrande, C.; Deharveng, G.; Tjønneland, A.; Olsen, A.; Overvad, K. Consumption and portion sizes of tree nuts, peanuts and seeds in the European Prospective Investigation into Cancer and Nutrition (EPIC) cohorts from 10 European countries. *British Journal of Nutrition* **2006**, *96*, S12-S23.
10. Canton, H. Food and agriculture organization of the United Nations—FAO. In *The Europa directory of international organizations 2021*, Routledge: 2021; pp. 297-305.
11. Silva, T.J.; Barrera-Arellano, D.; Ribeiro, A.P.B. Margarines: Historical approach, technological aspects, nutritional profile, and global trends. *Food Res Int* **2021**, *147*, 110486, doi:10.1016/j.foodres.2021.110486.
12. Górska-Warsewicz, H.; Rejman, K.; Laskowski, W.; Czeczotko, M. Butter, Margarine, Vegetable Oils, and Olive Oil in the Average Polish Diet. In *Nutrients*, 2019; Vol. 11.
13. Cormick, G.; Belizán, J.M. Calcium Intake and Health. In *Nutrients*, 2019; Vol. 11.
14. EFSA Panel on Dietetic Products, N.; Allergies. Scientific opinion on dietary reference values for copper. *EFSA Journal* **2015**, *13*, 4253.
15. Sadhra, S.S.; Wheatley, A.D.; Cross, H.J. Dietary exposure to copper in the European Union and its assessment for EU regulatory risk assessment. *Sci Total Environ* **2007**,

374, 223-234, doi:10.1016/j.scitotenv.2006.12.041.
16. EFSA Panel on Dietetic Products, N.; Allergies; Turck, D.; Bresson, J.L.; Burlingame, B.; Dean, T.; Fairweather-Tait, S.; Heinonen, M.; Hirsch-Ernst, K.I.; Mangelsdorf, I., et al. Dietary reference values for vitamin K. *EFSA Journal* **2017**, *15*, e04780.
17. Booth, S.L. Vitamin K: food composition and dietary intakes. *Food Nutr Res* **2012**, *56*, doi:10.3402/fnr.v56i0.5505.
18. Huang, Y.; Chen, Z.; Chen, B.; Li, J.; Yuan, X.; Li, J.; Wang, W.; Dai, T.; Chen, H.; Wang, Y., et al. Dietary sugar consumption and health: umbrella review. *Bmj* **2023**, *381*, e071609, doi:10.1136/bmj-2022-071609.
19. Kalmpourtzidou, A.; Eilander, A.; Talsma, E.F. Global Vegetable Intake and Supply Compared to Recommendations: A Systematic Review. *Nutrients* **2020**, *12*, doi:10.3390/nu12061558.
20. Cancer, I.A.f.R.o. Working Group on the Evaluation of Carcinogenic Risks to Humans Red Meat and Processed Meat. *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans* **2018**, *114*.
21. Shivappa, N.; Steck, S.E.; Hurley, T.G.; Hussey, J.R.; Hébert, J.R. Designing and developing a literature-derived, population-based dietary inflammatory index. *Public Health Nutr* **2014**, *17*, 1689-1696, doi:10.1017/s1368980013002115.