Supplement Content:

Table S1: Example of food items and scoring for plant-based diet indices in 17 food groups

Food groups	Food items	Scoring for overall PDI	Scoring for hPDI	Scoring for uPDI
Healthy plant foods				
Whole grains	Porridge, muesli, plain cereal, bran cereal, whole-wheat cereal, oatcakes, whole meal bread (flour type: whole meal), whole meal pasta, brown rice, couscous, other cooked grains (such as bulgur)	Positive	Positive	Reverse
Fruits	Stewed fruit, prune, dried fruit, mixed fruit, apple, banana, berries, cherries, grapefruit, grapes, mango, melon, orange, orange-like small fruits, peach/nectarine, pear, pineapple, plum, other fruits, olives	Positive	Positive	Reverse
Vegetables	Mixed vegetables, vegetable pieces, coleslaw, side salad, avocado, beetroot, broccoli, butternut squash, cabbage/kale, carrots, cauliflower, celery, courgetti, cucumber, garlic, leeks, lettuce, mushrooms, onion, parsnip, sweet peppers, spinach	Positive	Positive	Reverse
	sprouts, sweetcorn, fresh tomatoes, cooked or tinned tomatoes, turnip/swede, watercress, other vegetable intake			
Nuts	Salted peanuts, unsalted peanuts, salted nuts, unsalted nuts, seeds	Positive	Positive	Reverse
Legumes	Vegetarian sausages/burgers, tofu, quorn, other vegetarian alternative, baked	Positive	Positive	Reverse

	beans, pulse, broad beans, green beans, peas			
Tea and coffee	Instant coffee, filtered coffee, cappuccino, latte, espresso, other coffee drinks, standard tea, rooibos tea, green tea, herbal tea, other tea, low calorie hot chocolate, hot chocolate	Positive	Positive	Reverse
Less healthy plant foods				
Refined grains	Oat crunch, sweetened cereal, other cereal, white bread (flour types: white, mix, and others), naan bread, garlic bread, crispbread, other bread, white pasta, white rice, snackpot, couscous, pancake, scotch pancake, croissant, scone, savoury biscuits, cheesy biscuits, sweet potato, other savoury snack	Positive	Reverse	Positive
Potatoes	Fried potatoes, boiled/baked potatoes, mashed potatoes, crisps (e.g., potato chips)	Positive	Reverse	Positive
Sugary drinks	Low calorie or diet drinks (e.g. fizzy, squash), carbonated (fizzy) drinks, squash or cordial	Positive	Reverse	Positive
Fruit juices	Orange juice, grapefruit juice, other fruit/vegetable juice, fruit smoothie	Positive	Reverse	Positive
Sweets and desserts	Double crust pie, single crust pie/flan, crumble topping, Yorkshire pudding, Danish pastry, fruitcake, cake, doughnuts, sponge pudding, other dessert, chocolate bar, white chocolate, milk chocolate, dark chocolate, chocolate-covered raisin, chocolate sweet, diet sweets, chocolate-covered biscuits, chocolate biscuits, sweet biscuits, other sweets	Positive	Reverse	Positive

Animal-based food groups				
Animal fat	Butter on bread/crackers (spreadable, low fat, normal fat, or unknown type), dairy spread on bread/crackers (very low fat, low fat, normal fat, unknown type)	Reverse	Reverse	Reverse
Dairy	Milk, dairy smoothie, flavored milk, yogurt, ice-cream, cheesecake, milk-based pudding, other milk-based pudding, low fat hard cheese, hard cheese, soft cheese, blue cheese, low fat cheese spread, cheese spread, cottage cheese, feta cheese, mozzarella cheese, goat's cheese, other cheese	Reverse	Reverse	Reverse
Animal-based food groups				
Eggs	Whole eggs, omelettes or scrambled egg, eggs in sandwiches, scotch egg, other egg dishes	Reverse	Reverse	Reverse
Fish or seafood	Tinned tuna, oily fish, breaded fish, battered fish, white fish, prawns, lobster/crab, shellfish, other fish intake	Reverse	Reverse	Reverse
Meat	Sausage, beef, pork, lamb, crumbed or deep-fried poultry, poultry, bacon, ham, liver, other meat intake	Reverse	Reverse	Reverse
Miscellaneous animal-based foods	Pizza, Indian snacks	Reverse	Reverse	Reverse

Abbreviations: PDI, plant-based diet index; hPDI, healthful plant-based diet index; uPDI, unhealthful plant-based diet index.

Table S2. Participant characteristics by thyroid dysfunction at baseline in UK Biobank (n = 199,382)

Characteristics	Non thyroid dysfunction	Thyroid dysfunction
Age (years)	56 (50, 62) [a]	58 (52, 64)
Male, n (%)	91,639 (47.0)	1,245 (29.1)
Education, n (%)		
College or university	28,819 (14.8)	566 (13.2)
Vocational	45,596 (23.4）	1,009 (23.6)
Upper secondary	11,855 (6.08）	279 (6.51)
Lower secondary	26,374 (13.5）	551 (12.9)
Others	65,344 (33.5）	1,331 (31.1)
Unknown	17,111 (8.77)	547 (12.8)
TDI	-2.32 (-3.73, 0.08)	-2.15 (-3.60, 0.32)
Household income, n (%)		
≥31,000	68,719 (39.2)	1,871 (50.1)
<31,000	106,489 (60.8)	1,867 (50.0)
$PM_{2.5}$ (micro-g/m^3)	9.87 (9.23, 10.5)	9.91 (9.28, 10.5)
Total energy intake (kJ/d)	8,360.9 (6,770.7, 10,233.1)	8,014 (6,491.9, 9,830.7)
BMI (kg/m^2)	26.2 (23.7, 29.2)	27.1 (24.3, 30.8)
Current smoker, n (%)	15,388 (7.89)	392 (9.15)
Current drinker, n (%)	183,094 (93.9)	3,849 (89.9)
PA (MET × hour/week)	1,733.0 (817.0, 3,324.0)	1,638.0 (712.5, 3,135.0)
Individual history of diseases, n (%)		
Hypertension	125,906 (64.5)	2,197 (51.3)
Diabetes	65,975 (33.8)	2,002 (46.7)

Table S2. Participant characteristics by thyroid dysfunction at baseline in UK Biobank (n = 199,382) (continued form)

Characteristics	Non thyroid dysfunction	Thyroid dysfunction
Hyperlipemia	3,218 (1.65)	84.0 (1.96)
Iodine intake	183.7 (136.2, 246.1)	179 (133.9, 242.5)
Plant-based diet index, n (%)		
PDI	51 (47, 54)	51 (47, 55)
hPDI	55 (50, 59)	55 (51, 59)
uPDI	55 (51, 59)	55 (51, 59)

Abbreviation: BMI, body mass index; hPDI, healthful plant-based diet index; MET, metabolic equivalent of task; PA, physical activity; PDI, overall plant-based diet index; TDI, Townsend deprivation index; uPDI, unhealthful plant-based diet index.

[a] Continuous variables are expressed as medians (P25, P75) and categorical variables are expressed as n (%).

Table S3. Participant characteristics by hypothyroidism at baseline in UK Biobank (n = 200,446)

Characteristics	Non hypothyroidism	Hypothyroidism
Age (years)	57 (50, 62) [a]	59 (53, 64)
Male, n (%)	91,919 (46.8)	1,158 (28.3)
Education, n (%)		
College or university	28,986 (14.8)	537 (13.1)
Vocational	45,898 (23.4)	939 (23.0)
Upper secondary	11,940 (6.08)	259 (6.34)
Lower secondary	26,528 (13.5)	536 (13.1)
Others	65,765 (33.5)	1,282 (31.4)
Unknown	17,243 (8.78)	533 (13.0)
TDI	-2.32 (-3.73, 0.08)	-2.15 (-3.60, 0.30)
Household income, n (%)		
$\geq$31,000	69,204 (39.3)	1,808 (51.0)
<31,000	107,133 (60.8)	1,735 (49.0)
$PM_{2.5}$ (micro-g/m^3)	9.87 (9.23, 10.5)	9.92 (9.27, 10.5)
Total energy intake (kJ/d)	8,359.6 (6,769.8, 10,230.5)	8,002.7 (6,453.3, 9,807.3)
BMI (kg/m^2)	26.2 (23.7, 29.2)	27.2 (24.3, 30.9)
Current smoker, n (%)	15,388 (7.89)	392 (9.15)
Current drinker, n (%)	183,094 (93.9)	3,849 (89.9)
PA (MET × hour/week)	1,732.5 (817.0, 3,324.0)	1,687.5 (720.0, 3,252.0)
Individual history of diseases, n (%)		
Hypertension	126,570 (64.5)	2,007 (49.1)

Table S3. Participant characteristics by hypothyroidism at baseline in UK Biobank (n = 200,446) (continued form)

Characteristics	Non hypothyroidism	Hypothyroidism
Diabetes	66,544 (33.9)	1,998 (48.9)
Hyperlipemia	3,246 (1.65)	81.0 (1.98)
Iodine intake	183.7 (136.1, 246.0)	179.6 (134.0, 243.1)
Plant-based diet index		
PDI	51 (47, 54)	51 (47, 55)
hPDI	55 (50, 59)	55 (51, 59)
uPDI	55 (51, 59)	55 (51, 59)

Abbreviation: BMI, body mass index; hPDI, healthful plant-based diet index; MET, metabolic equivalent of task; PA, physical activity; PDI, overall plant-based diet index; TDI, Townsend deprivation index; uPDI, unhealthful plant-based diet index.

[a] Continuous variables are expressed as medians (P25, P75) and categorical variables are expressed as n (%).

Table S4. Participant characteristics by hyperthyroidism at baseline in UK Biobank (n = 200,166)

Characteristics	Non hyperthyroidism	Hyperthyroidism
Age (years)	57 (50, 63) [a]	59 (52, 64)
Male, n (%)	94,189 (45.2)	233 (24.9)
Education, n (%)		
College or university	30,456 (14.6)	104 (11.1)
Vocational	48,671 (23.4)	224 (24.0)
Upper secondary	12,633 (6.07)	68 (7.27)
Lower secondary	27,946 (13.4)	112 (12.0)
Others	69,725 (33.5)	294 (31.4)
Unknown	18,800 (9.03)	133 (14.2)
TDI	-2.32 (-3.73, 0.08)	-2.07 (-3.51, 0.75)
Household income, n (%)		
≥31,000	74,362 (39.9)	461 (55.1)
<31,000	112,215 (60.1)	375 (44.9)
$PM_{2.5}$ (micro-g/m^3)	9.87 (9.23, 10.5)	9.93 (9.33, 10.5)
Total energy intake (kJ/d)	8,331.1 (6,745.9, 10,198.8)	8,099 (6,565.9, 9,831.8)
BMI (kg/m^2)	26.3 (23.8, 29.3)	26.9 (24.0, 30.7)
Current smoker, n (%)	16,293 (7.82)	107 (11.4)
Current drinker, n (%)	194,956 (93.6)	854 (91.3)
PA (MET × hour/week)	1,727 (813, 3,318)	1,455 (648, 2,817)
Individual history of diseases, n (%)		
Hypertension	131,358 (63.1)	440 (47.1)
Diabetes	73,353 (35.2)	469 (50.2)

Table S4. Participant characteristics by hyperthyroidism at baseline in UK Biobank (n = 200,166) (continued form)

Characteristics	Non hyperthyroidism	Hyperthyroidism
Hyperlipemia	3,520 (1.69)	26 (2.78)
Iodine	184.0 (136.0, 245.9)	176.4 (129.2, 240.0)
Plant-based diet incides		
PDI	51 (47, 54)	51 (47, 54)
hPDI	55 (50, 59)	55 (50, 59)
uPDI	55 (51, 59)	55 (51, 59)

Abbreviation: BMI, body mass index; hPDI, healthful plant-based diet index; MET, metabolic equivalent of task; PA, physical activity; PDI, overall plant-based diet index; TDI, Townsend deprivation index; uPDI, unhealthful plant-based diet index.

[a] Continuous variables are expressed as medians (P25, P75) and categorical variables are expressed as n (%).

Table S5 Sensitivity analyses of the associations of plant-based diet indices with the risk of thyroid dysfunction

	Cases/Participants			Hazard ratio (95% confidence interval) [a]				
	Tertile 1	Tertile 2	Tertile 3	Tertile 1	Tertile 2	Tertile 3	*P* for trend	Per SD increase
1) excluding participants with less than 2 years of follow-up								
PDI								
TD	69,555/1,359	56,204/1,105	73,062/1,561	1.00 (ref.)	0.96 (0.89, 1.04)	1.01 (0.94, 1.09)	0.389	1.00 (0.97, 1.04)
Hypothyroidism	69,901/1,276	56,506/1,047	73,475/1,505	1.00 (ref.)	0.97 (0.90, 1.06)	1.05 (0.97, 1.14)	0.193	1.01 (0.98, 1.05)
Hyperthyroidism	72,712/301	59,088/259	76,971/301	1.00 (ref.)	1.02 (0.86, 1.21)	0.88 (0.75, 1.04)	0.127	0.96 (0.89, 1.03)
hPDI								
TD	73,309/1,444	51681/993	73,831/1,588	1.00 (ref.)	0.89 (0.82, 0.96)	0.93 (0.87, 1.01)	0.136	0.98 (0.94, 1.01)
Hypothyroidism	73,675/1,356	51,962/948	74,245/1524	1.00 (ref.)	0.90 (0.82, 0.98)	0.96 (0.89, 1.04)	0.326	0.98 (0.95, 1.02)
Hyperthyroidism	76,543/322	54,262/222	77,966/317	1.00 (ref.)	0.92 (0.77, 1.09)	0.82 (0.70, 0.97)	0.018	0.91 (0.85, 0.98)
uPDI								
TD	76,841/1,562	52,604/1,071	69,376/1,392	1.00 (ref.)	1.05 (0.97, 1.14)	1.09 (1.01, 1.18)	0.047	1.04 (1.01, 1.08)
Hypothyroidism	77,255/1,481	52,893/1,011	69,734/1,336	1.00 (ref.)	1.05 (0.97, 1.14)	1.10 (1.02, 1.19)	0.016	1.05 (1.01, 1.09)
Hyperthyroidism	80,915/323	55,250/257	72,606/281	1.00 (ref.)	1.20 (1.01, 1.42)	1.04 (0.88, 1.23)	0.606	1.05 (0.98, 1.13)
2) excluding participants with <2 dietary assessment								
PDI								
TD	37,253/728	35,400/706	47,349/1,062	1.00 (ref.)	0.96 (0.86, 1.06)	1.02 (0.92, 1.12)	0.160	1.01 (0.97, 1.05)
Hypothyroidism	37,430/677	35,589/674	47,623/1,037	1.00 (ref.)	0.99 (0.89, 1.10)	1.09 (0.99, 1.21)	0.028	1.04 (0.99, 1.08)
Hyperthyroidism	72,712/301	59,088/259	76,971/301	1.00 (ref.)	1.02 (0.86, 1.21)	0.88 (0.75, 1.04)	0.127	0.96 (0.89, 1.03)
hPDI								
TD	47,652/961	31,926/634	40,424/901	1.00 (ref.)	0.87 (0.78, 0.96)	0.90 (0.82, 0.99)	0.321	0.96 (0.92, 1.01)
Hypothyroidism	47,898/915	32,101/601	40,643/871	1.00 (ref.)	0.87 (0.79, 0.97)	0.95 (0.86, 1.05)	0.413	0.99 (0.95, 1.04)
Hyperthyroidism	76,543/322	54,262/222	77,966/317	1.00 (ref.)	0.92 (0.77, 1.09)	0.82 (0.70, 0.97)	0.018	0.91 (0.85, 0.98)
uPDI								
TD	49,045/1,038	32,842/648	38,115/810	1.00 (ref.)	0.98 (0.88, 1.08)	1.11 (1.01, 1.23)	0.134	1.04 (1.00, 1.08)
Hypothyroidism	49,294/988	33,037/625	38,311/775	1.00 (ref.)	0.99 (0.90, 1.10)	1.11 (1.01, 1.23)	0.076	1.04 (1.00, 1.09)

Table S5 Sensitivity analyses of the associations of plant-based diet indices with the risk of thyroid dysfunction (continued form)

	Cases/Participants			Hazard ratio (95% confidence interval) [a]				
	Tertile 1	Tertile 2	Tertile 3	Tertile 1	Tertile 2	Tertile 3	*P* for trend	Per SD increase
Hyperthyroidism	80,915/323	55,250/257	72,606/281	1.00 (ref.)	1.20 (1.01, 1.42)	1.04 (0.88, 1.23)	0.606	1.05 (0.98, 1.13)
3) excluding participants with cancer								
PDI								
TD	64,424/1,263	51,678/1,046	66,970/1,440	1.00 (ref.)	0.98 (0.91, 1.07)	1.02 (0.94, 1.10)	0.378	1.00 (0.97, 1.04)
Hypothyroidism	64,738/1,185	51,943/989	67,338/1,392	1.00 (ref.)	1.00 (0.92, 1.09)	1.06 (0.98, 1.15)	0.156	1.01 (0.98, 1.05)
Hyperthyroidism	38,848/170	37,124/163	49,771/208	1.00 (ref.)	0.95 (0.76, 1.18)	0.85 (0.68, 1.04)	0.166	0.94 (0.86, 1.03)
hPDI								
TD	67,879/1355	47,679/923	67,514/1,471	1.00 (ref.)	0.88 (0.81, 0.96)	0.94 (0.87, 1.01)	0.195	0.98 (0.95, 1.02)
Hypothyroidism	68,212/1,274	47,930/883	67,877/1409	1.00 (ref.)	0.90 (0.82, 0.98)	0.96 (0.89, 1.04)	0.414	0.99 (0.95, 1.02)
Hyperthyroidism	49,655/217	33,458/148	42,630/176	1.00 (ref.)	0.94 (0.76, 1.16)	0.79 (0.64, 0.97)	0.035	0.89 (0.81, 0.98)
uPDI								
TD	70,292/1,434	48357/1008	64,423/1,307	1.00 (ref.)	1.07 (0.99, 1.16)	1.10 (1.01, 1.19)	0.055	1.04 (1.01, 1.08)
Hypothyroidism	70,647/1,347	48,621/959	64,751/1,260	1.00 (ref.)	1.09 (1.00, 1.18)	1.11 (1.03, 1.21)	0.009	1.06 (1.02, 1.09)
Hyperthyroidism	51,553/219	34,435/163	39,755/159	1.00 (ref.)	1.14 (0.93, 1.41)	1.04 (0.84, 1.29)	0.743	1.05 (0.96, 1.15)
4) further implemented adjustments for NCDs (Hypertension, Diabetes, Hyperlipemia, CVD)								
PDI								
TD	69,787/1440	56,358/1186	73,237/1,657	1.00 (ref.)	0.97 (0.90, 1.05)	1.02 (0.94, 1.09)	0.355	1.00 (0.97, 1.04)
Hypothyroidism	70,134/1357	56,658/1,125	73,654/1,604	1.00 (ref.)	0.97 (0.90, 1.06)	1.04 (0.96, 1.12)	0.149	1.01 (0.98, 1.04)
Hyperthyroidism	72,899/327	59,182/276	77,085/332	1.00 (ref.)	0.99 (0.84, 1.17)	0.87 (0.74, 1.02)	0.156	0.95 (0.88, 1.01)
hPDI								
TD	73,507/1539	51,827/1054	74,048/1,690	1.00 (ref.)	0.88 (0.82, 0.96)	0.93 (0.87, 1.00)	0.108	0.97 (0.94, 1.01)
Hypothyroidism	73,877/1,453	52,108/1,008	74,461/1,625	1.00 (ref.)	0.89 (0.82, 0.97)	0.95 (0.88, 1.02)	0.260	0.98 (0.94, 1.01)
Hyperthyroidism	76,680/347	54,365/237	78,121/351	1.00 (ref.)	0.90 (0.76, 1.07)	0.84 (0.72, 0.98)	0.041	0.93 (0.88, 1.00)
uPDI								
TD	69,787/1440	56,358/1,186	73,237/1,657	1.00 (ref.)	1.05 (0.97, 1.14)	1.11 (1.03, 1.20)	0.014	1.05 (1.02, 1.08)

Table S5 Sensitivity analyses of the associations of plant-based diet indices with the risk of thyroid dysfunction (continued form)

	Cases/Participants			Hazard ratio (95% confidence interval) [a]				
	Tertile 1	Tertile 2	Tertile 3	Tertile 1	Tertile 2	Tertile 3	*P* for trend	Per SD increase
Hypothyroidism	77,439/1,559	53,027/1,079	69,980/1,448	1.00 (ref.)	1.06 (0.98, 1.15)	1.14 (1.06, 1.23)	0.002	1.06 (1.03, 1.10)
Hyperthyroidism	81,064/361	55,336/274	72,766/300	1.00 (ref.)	1.14 (0.97, 1.34)	1.00 (0.85, 1.18)	0.980	1.04 (0.97, 1.12)

Abbreviations: BMI, body mass index; CVD, Cardiovascular Disease; hPDI, healthful plant-based diet index; PA, physical activity; PDI, plant-based diet index; TD, thyroid dysfunction; TDI, Townsend deprivation index; uPDI, unhealthful plant-based diet index.

[a] Multivariable Cox proportional regression model was adjusted for age, sex, BMI, TDI, ethnic background, education levels, smoking status, drinking status, $PM_{2.5}$, total energy intake, PA, household income, and iodine intake.
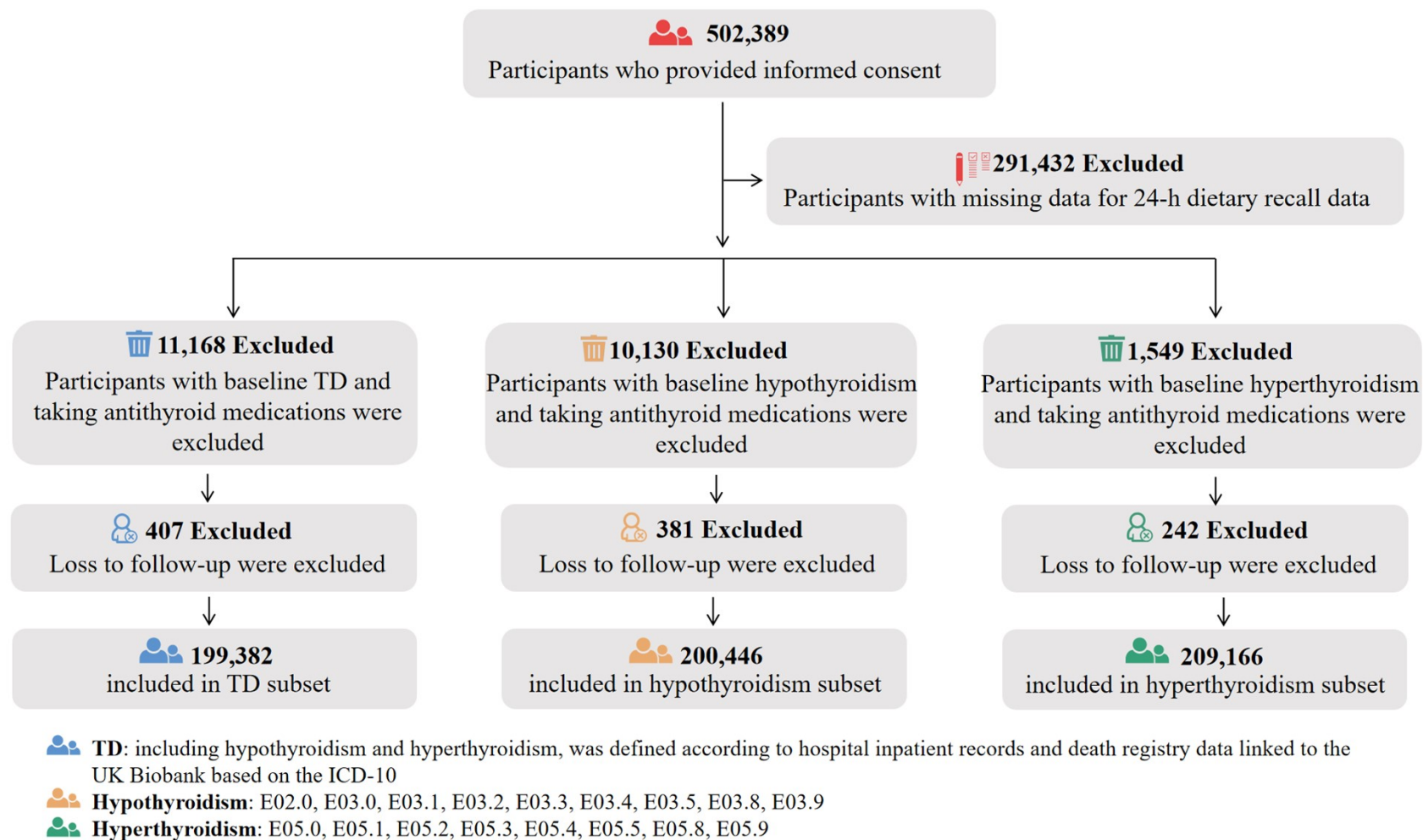
Figure legends

Figure S1. Flow chart of participants included in the present UK Biobank study.

Abbreviations: TD, thyroid dysfunction.

Figure S2. Restrict cubic spline for the associations of the three plant-based diet indices with the risk of hypothyroidism and hyperthyroidism.

Linear association between PDIs and the risk of TD, hypothyroidism, and hyperthyroidism using restricted cubic splines with 3 knots in the UK Biobank cohort. The lowest value of PDIs was used as the reference value. Adjusted for age, sex, PA, BMI, ethnic, and iodine consumption.

Abbreviations: BMI, body mass index; CI, confidence interval; hPDI, healthful plant-based diet index; HR, hazard ratio; PA, physical activity; TD, thyroid dysfunction; uPDI, unhealthful plant-based diet index.
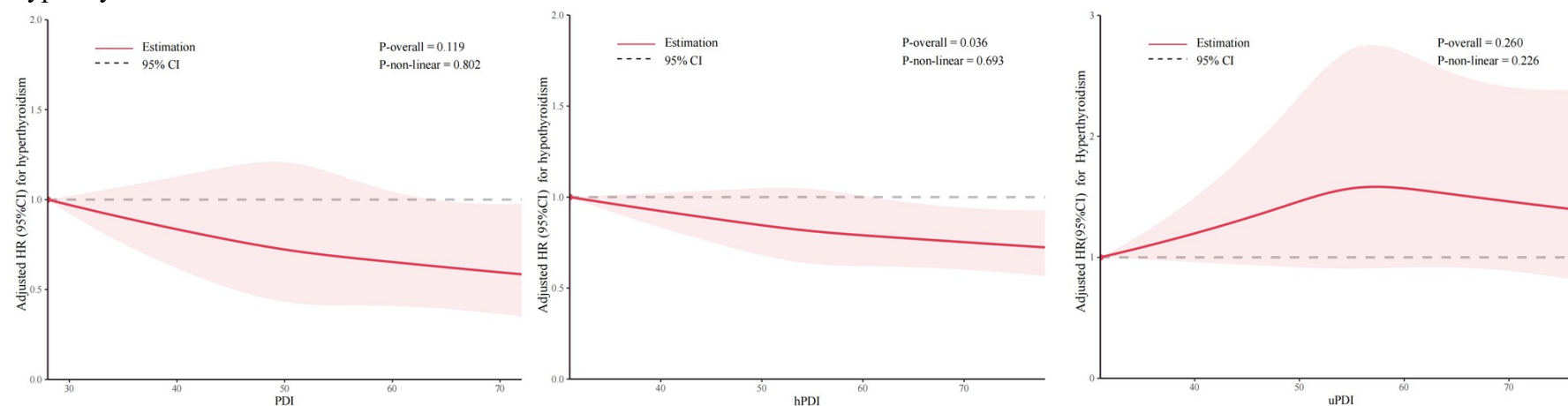
Figure S1. Flow chart of participants included in the present UK Biobank study

A. Hypothyroidism
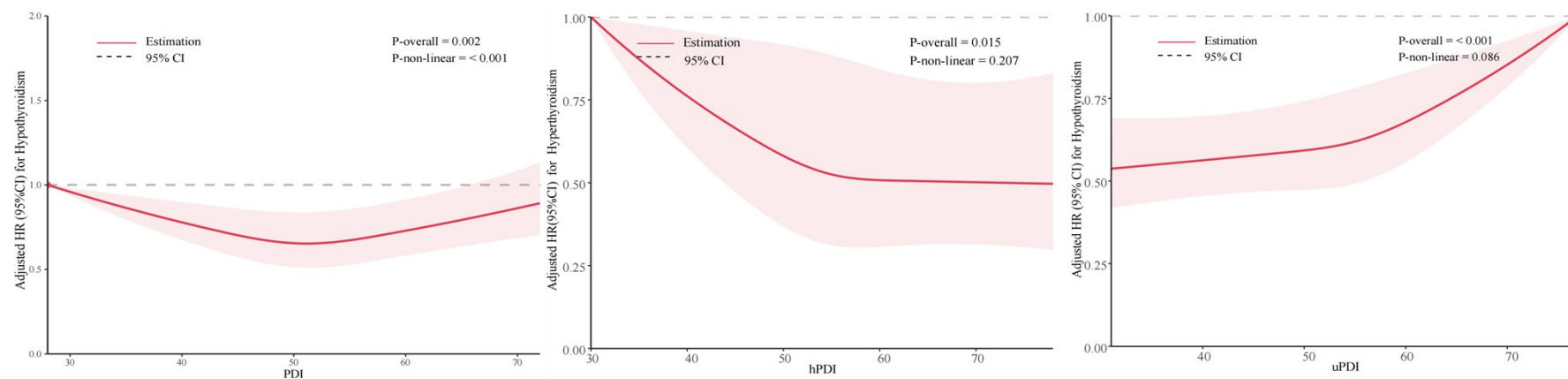
B. Hyperthyroidism

Figure S2. Restrict cubic spline for the associations of the three plant-based diet indices with the risk of hypothyroidism and hyperthyroidism