Supplementary Information (SI) for Food & Function.
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Supplementary Methods

Assessment of assumptions

Mendelian randomization (MR) analysis requires meeting restrict assumptions: strong relevance, independence, and exclusivity.[1] We set genome-wide significance at $P < 5*10^{-8}$, and we calculated individual instrument F-statistic to avoid a violation of strong relevance. Our samples were sourced from individuals of European ancestry, which largely satisfied the independence assumption to avoid population stratification. Concerning the exclusivity assumption, we used MR-Egger to detect directional pleiotropy. Sensitive analysis was also conducted to exclude SNPs with potential pleiotropy.

Sensitivity analysis of Mendelian randomization

In order to obtain reliable assessment of association, we also utilized different methods: 1) The weighted median method (WM) can provide robust assessment, as long as a minimum of 50% of the information is from valid instruments.[2] 2) The MR-Egger can provide unbiased results, even in the presence of pleiotropy.[3] The intercept of MR-Egger helps to detect pleiotropy, with significance at $P < 0.05$ indicates its existence. 3) MR pleiotropy residual sum and outlier (MRPRESSO) can identify pleiotropy and outliers. We calculated the empirical P for the MRPRESSO global test via 5,000 simulations, and corrected estimates were used if outliers were identified.[4] Additional searches were performed on Phenoscanner to exclude SNPs displaying pleiotropy [5]. Subsequent reanalysis was conducted to assess the reliability of results as another sensitivity analysis.

Table S1. Summary information for studies about the associations of tea intake with anemia (from Mar 1995 to Aug 2023).

	Author (year)	Study type	Including papers	Tea intake assessment	Anemia assessment	Main results	Factors controlled for in the analysis
1	Jing Zhang [6] (2022)	Meta-analysis	9 studies reviewed (inception to June 27, 2022)	Tea/coffee after meals	Hemoglobin (Hgb) ≤ 11 g/dL	The results showed that tea/coffee after meals was a risk factor for anemia in pregnancy.	/
2	M. Nelson [7] (2004)	Review	35 studies (published 1980–2002)	/	Iron absorption and iron status	From the available evidence there is no need to advise any restriction on tea drinking in healthy people with no risk of iron deficiency.	/
3	EHM Temme [8] (2002)		16 studies reviewed (published 1980–2001)	Tea consumption was calculated as mL/day, cups/day, times/week, g/day	Iron status	This overview shows that tea consumption does not influence iron status in Western populations in which most people have adequate iron stores as determined by serum ferritin concentrations.	/
4	EJ Gardner [9] (2007)		Combined previous two reviews 2 and 3	Black tea consumption	Iron status	There was no evidence that iron status could be harmed by tea drinking unless populations were already at risk from anemia.	/
			Populations				
5	Kenneth J Mukamal [10] (2007)	Randomized controlled trial	Israel, 31 adults aged 55 years and older	Participants were randomized to drink 3 glasses daily of either a standardized black tea preparation or water for 6 months	Hemoglobin was measured at the beginning and conclusion of the study	They did not find major changes in hemoglobin levels through the trial (P = 0.59).	/
6	Salma F Ahmad Fuzi [11] (2017)	Controlled trial	UK, 12 premenopausal women aged 19–40 years	The test meal (TM) was administered with water (TM-1), with tea administered simultaneously (TM-2), and with tea	The effect of tea consumption on nonheme iron absorption with the use of ^{57}Fe as a stable isotope	There were also no changes observed in subjects' hemoglobin between baseline and postintervention. Despite the lower plasma ferritin concentration postintervention, it was within the range of replete iron stores (15 mg/L).	/

				administered 1 h postmeal (TM-3)			
7	E. TYMPA-PSIRROPOULOU [12] (2005)	Case-control study	Greece, 938 children aged 12–24 months	A specific questionnaire concerning tea drinking frequency: every day every 2–3 weeks every week rarely	World Health Organization (WHO) as a diagnostic limit of anemia	The cases were breastfed less, were drinking fresh cow's milk and tea, were eating meat, vegetables and fruit less often, had a bad appetite and were more likely to get sick.	/
8	Melese Sinaga Teshome [13] (2020)		Ethiopia, 344 pregnant women	Tea/coffee consumption (yes/no)	WHO cut off point	The probabilities of developing anemia among pregnant women's who were drinking tea/coffee instantly after food were 3.6 times more likely to develop anemia as compared to than those mothers who did not drink tea/coffee (AOR = 3.6; 95% CI: 1.72–7.42).	Age of mother, residence, menstrual blood flow rate, food taboo, tea/coffee consumption, Dietary Diversity Score (DDS), stool examination
9	K Imai [14] (1995)	Cross-sectional study	Yoshimi, Japan, 1371 men aged over 40 years	Information on consumption of green tea (categorized as ≤ 3, 4–9, or ≥10 cups a day) from the questionnaire	Hemoglobin (g/L)	The proportion of subjects with abnormally low hemoglobin concentrations (< 120 g/L) was not related, however, to consumption of green tea.	Age, cigarette smoking, and alcohol consumption
10	L Mennen [15] (2007)		French, 954 men aged 52–68 years, and 1639 women aged 42–68 years	Three 1-day food records were used to estimate the intake of other dietary enhancing or inhibiting factors of iron absorption	Serum-ferritin was measured, and iron depletion was defined as a serum ferritin concentration < 16 μg/L	The mean serum-ferritin concentration was not related to black, green and herbal tea consumption in men, pre- or postmenopausal women. Also the risk of iron depletion was in the multivariate model not related to any kind of tea drinking or to the strength of tea, the infusion time or the time of tea drinking.	Age, smoking and intakes of coffee, iron, calcium, animal protein and vitamin C
11	P S Hogenkamp [16] (2008)		South Africa, 1,605 adults aged	FFQ was used to collect information on dietary	Hgb and serum ferritin	Logistic regression showed that tea consumption did not significantly increase risk for iron deficiency (men: OR: 1.36;	Age, BMI, smoking status, and alcohol and iron intake

		15–65 years	intake	concentrations	95% CI: 0.99, 1.87; women: OR: 0.98; 95% CI: 0.84, 1.13) nor for iron deficiency anemia (men: OR: 1.28; 95% CI: 0.84, 1.96; women: OR: 0.93; 95% CI: 0.78, 1.11).	
12	Naila Baig-Ansari [17] (2008)	Pakistan, 1,369 pregnant women	A 24-hour dietary recall	Anemia was classified according to the WHO classification for pregnant women.	Tea consumption before pregnancy (adjusted prevalence odds ratio (APOR) = 3.2, 95% CI: 1.3 to 8.0) was associated with anemia.	Education, pregnancy history, and height
13	Ilse Pynaert [18] (2009)	Belgium, 788 women aged 18–39 years	Nutritional variables were assessed using a 2d food record and non-nutritional variables by a general questionnaire	Fe status parameters were determined on a fasting venous blood sample.	The tea intake was negatively associated with serum ferritin (P = 0.007).	Contraceptive use, time since last blood donation, time since last pregnancy
14	Eun Suk Sung [19] (2018)	Korean, 27,071 adults aged 19 years and over	Food frequency questionnaire (FFQ) or 24-hour dietary	Serum ferritin level (by an immunoradiometric assay using a 1,470 Wizard Gamma Counter)	Green tea intake was not related to serum ferritin levels.	Age, body mass index (BMI), education level, smoking status, alcohol consumption, physical activity, hypertension, diabetes mellitus, and calorie-adjusted daily iron intake
15	Dyness Kejo [20] (2018)	Arusha, Tanzania, 436 children aged 6–59 months	Standard questionnaire at baseline during face-to-face interviews with the parents/guardians (tea with sugar: drink/not drink)	Anemia cut-off points were defined according to WHO standards for children aged 6-59 months.	Ultivariable logistic regression identified the following predictors of anemia: drinking tea (AOR: 4.5, 95% CI: 1.5–13.7).	Gender, age
16	Nyasiro S Gibore [21] (2021)	Tanzania, 338 pregnant women	consuming excess tea (yes/no)	WHO cut off point	Pregnant women who were not drinking tea or coffee with meals were less likely to be anemic than those who consumed tea or coffee with meals (AOR = 0.06; 95% CI = 0.03–0.13, P <	Parity, gravidity, birth interval, higher education level and multigravida

					0.001).	
17	Kashish Grover [22] (2020)	Haryana, India, 408 pregnant women	A semi-structured, predesigned, pretested, interviewer-administered questionnaire	Anemia was defined as a hemoglobin concentration < 11 g/dL.	The association of tea consumption was statistically significant with the severity of anemia (P < 0.05).	/
18	MAHA AWADH ALRESHIDI [23] (2021)	Hailcity, Saudi Arabia 390 pregnant women	FFQ format with four options in the category for frequency of intake	The hemoglobin level of < 11 g/dL was considered as anemia.	The habit of drinking tea just after meals was found to be significantly associated with anemia (AOR = 1.91, 95% CI: 1.2–13.03, P = 0.019).	Sociodemographic factors; dietary and nutrition factors; obstetric and menstrual factors; and medical factors
19	Dagyeong Lee [24] (2023)	Korea, 4322 premenopausal women who were not pregnant or nursing a baby	11 consumption frequency categories in the FFQ of the fifth KNHANES (2010–2011)	Serum hemoglobin level (g/dL) and ferritin levels (ng/mL)	No significant association was observed between green tea intake and the biochemical markers of iron status.	Adjusted for BMI, education, alcohol consumption, current smoking, hypertension, diabetes mellitus, physical activity, total energy intake, and daily iron intake
20	Hinako Nanri [25] (2023)	Saga, Japan, 4,263 men and 6,172 women aged 40–69 years	Validated Japanese FFQ, the frequencies of green tea consumption were as follows: almost none, 1–3 times/month, 1–2 times/week, 3–4 times/week, 5–6 times/week, 1 time/day, 2 times/day, and ≥ 3 times/day.	Serum ferritin concentrations, and iron deficiency was defined as a serum ferritin concentration < 12 μg/L.	They observed that higher green tea and coffee consumption was associated with lower ferritin levels in men and postmenopausal women, even after adjusting for covariates (all P for trends < 0.05). Among premenopausal women, they found an inverse association between green tea consumption and serum ferritin levels, while no significant association was observed for coffee consumption after adjusting for covariates (green tea, P for trend < 0.05; coffee, P for trend = 0.08).	Adjusted for age, BMI, total energy intake, alcohol consumption, smoking, physical activity level, iron intake, vitamin C intake, and coffee or green tea consumption, dietary iron intake, vitamin C intake

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Table S2. The characteristics relevant to tea intake on the questionnaire of GBCS at baseline (2003–2008).

Items	Questions	Answers
Tea intake	Which of the following situations best reflects your tea-drinking habits in the past year?	"Never or almost never", "occasionally", "used to drink tea regularly, but not anymore" and "currently drink tea regularly (at least once a week)"
Frequency of tea drinking (days/week)	On average, how many days did you drink tea per week in the past 12 months?	"1–2 days per week", "3–4 days per week", "5–6 days per week", "every day or almost every day"
Amount of tea intake/occasion	When you drink tea on a given day, how many cups of tea do you typically drink in a day? (Measured in cups with a capacity of 150 mL; please select the type of tea you most commonly drink)	"Green tea/Jasmine tea/Dragon Well/White tea, □□ cups/day", "Oolong tea (Tieguanyin, Narcissus, and others), □□ cups/day", "black tea (include brick tea, Pu-erh), □□ cups/day", "other (please specify, such as herbal tea, and others), ____ □□ cups/day"
Tea drinking duration (years)	At what age did you start habitually drinking tea?	"□□ years old"
Tea concentration	What is your preferred tea concentration when you drink tea?	"Mild", "moderate", "strong", "very strong"

GBCS: Guangzhou Biobank Cohort Study.

Table S3. The details of data source in Mendelian randomization.

Type	**Phenotype**	**Consortium**	**Definition**	**Unit**	**GWAS ID/PMID**	**Age, years**	**Population**	**Sample size (case/control)**
Exposure	Tea intake	UK Biobank	"How many cups of tea do you drink each day (include black and green tea)?"	cups/day	ukb-b-6066	40–69	European	447,485
	Green tea intake	UK Biobank	"How many cups of green tea did you drink yesterday (0 cups, 1 cup, 2 cups, 3 cups, 4 cups, 5 cups and ≥ 6 cups).?"	cups/day	ukb-b-4078	40-69	European	64,949
	Herbal tea intake	UK Biobank	"How many cups of herbal tea did you drink yesterday (0 cups, 1 cup, 2 cups, 3 cups, 4 cups, 5 cups and ≥ 6 cups).?"	cups/day	ukb-b-13344	40-69	European	64,949
	Green tea consumption	Biobank Japan	Participants were asked to determine the frequency of consumption on a four-point scale (1, almost daily; 2, 3–4 days a week; 3, 1–2 days per week; and 4, very rarely).	/	31959922	20–89	East Asian	152,653
Outcome	Anemia	FinnGen	A reduction in the number of circulating erythrocytes or in the quantity of hemoglobin	/	finngen_R9_D3_ANAEMIA	Median age was 63	European	27,371/88,536
	Iron deficiency anemia	The China Kadoorie Biobank	ICD 10 code D50: iron deficiency anemia	/	37601966	30-79	East Asian	128/75,752
	Hemoglobin	INTERVAL, UK Biobank, UK BiLEVE	Hemoglobin	g/dL	27863252	≥ 18	European	172,925
	Hematocrit	INTERVAL, UK Biobank, UK BiLEVE	Hematocrit	%	27863252	≥ 18	European	173,039

Hemoglobin	The UK Household Longitudinal Study	Hemoglobin	g/L	28887542	16–99	European	9,667
Hematocrit	BioVU	Hematocrit (volume fraction) of blood by automated count)	%	33441150	Average median age was 52	European	65,907
Hemoglobin	Korean Genome and Epidemiology Study	Hemoglobin	g/dL	36777999	Mean age was 54.15	East Asian	70,643
Hematocrit	Korean Genome and Epidemiology Study	Hematocrit	%	36777999	Mean age was 54.15	East Asian	54,365

BioVU: the Vanderbilt University biobank; GWAS: genome-wide association study.

Table S4. Baseline characteristics by participants who with (N = 17,898) and without re-assessments (12,187) during the first follow-up (2008–2012).

	With (N=17,898)	**Without (N=12,187)**	**Cohen's effect size***
Sex, men, N (%)	4,867 (27.2)	3,466 (28.4)	0.028
Age, years, mean (SD)	60.7 (6.9)	62.8 (7.4)	0.290
Self-reported health, good/very good, N (%)	14,543 (83.3)	9,485 (80.6)	0.072
Hemoglobin, g/L, mean (SD)	136.5 (13.4)	136.4 (13.9)	0.011
Hematocrit, %, (SD)	40.5 (4.2)	40.4 (3.8)	0.019
Socioeconomic position			
Education, N (%)			
≤ Primary	6,964 (38.9)	5,921 (48.6)	0.162
Middle school	9,289 (51.9)	5,213 (42.8)	
≥ College	1,641 (9.2)	1,046 (8.6)	
Occupation, N (%)			
Manual	10,701 (60.2)	7,597 (62.6)	0.019
Non-manual	4,378 (24.6)	2,745 (22.6)	
Other	2,713 (15.3)	1,797 (14.8)	
Family income, CNY/year, N (%)			
≤ 30,000	6,611 (37.0)	4,811 (39.5)	0.012
> 30,000	7,263 (40.6)	4,206 (34.6)	
Don't know	4,007 (22.4)	3,149 (25.9)	
Behavioral factors			
Smoking status, N (%)			
Never	14,698 (82.2)	9,572 (78.6)	0.083
Former	1,512 (8.5)	1,248 (10.3)	
Current	1,675 (9.4)	1,354 (11.1)	
Alcohol use, N (%)			
Never	12,712 (71.4)	8,954 (73.9)	0.062
Former	611 (3.4)	451 (3.7)	
Current	4,491 (25.2)	2,716 (22.4)	
Physical activity, N (%)			
Inactive	1,447 (8.1)	990 (8.1)	0.049
Minimally active	7,140 (40.0)	5,233 (42.9)	
Active	9,311 (52.0)	5,964 (48.9)	
Tea intake, N (%)			
Never-drinkers	1,960 (11.0)	1,457 (12.0)	0.006
Occasional drinkers	5,946 (33.2)	3,882 (31.9)	
Former drinkers	103 (0.6)	114 (0.9)	
Regular drinkers	9,889 (55.3)	6,734 (55.3)	

CNY = Chinese Yuan Renminbi (US$1 = 7 CNY); SD = standard deviation.

[*] Cohen classified effect sizes as small ($d = 0.2$), medium ($d = 0.5$), and large ($d \geq 0.8$).

Table S5. Baseline characteristics by participants who with (N = 10,241) and without re-assessments (7,657) during the second follow-up (2013–2019).

	With (N=10,241)	Without (N=7,657)	Cohen's effect size*
Sex, men, N (%)	2,728 (26.6)	2,139 (27.9)	0.029
Age, years, mean (SD)	63.4 (6.6)	66.6 (7.2)	0.470
Self-reported health, good/very good, N (%)	8,366(84.1)	6,177 (82.3)	0.049
Hemoglobin, g/L, mean (SD)	134.7 (13.3)	135.4 (12.8)	0.051
Hematocrit, %, (SD)	40.5 (3.2)	40.3 (3.4)	0.048
Socioeconomic position			
Education, N (%)			
≤ Primary	3,372 (32.9)	3,592 (46.9)	0..257
Middle school	5,840(57.0)	3,449 (45.1)	
≥ College	1,027 (10.0)	614 (8.0)	
Occupation, N (%)			
Manual	5,915 (58.2)	4,786 (62.8)	0.083
Non-manual	2,587 (25.4)	1,791 (23.5)	
Other	1,669 (16.4)	1,044 (13.7)	
Family income, CNY/year, N (%)			
≤ 30,000	3,543 (34.6)	3,068 (40.1)	0.003
> 30,000	4,647 (45.4)	2,616 (34.2)	
Don't know	2,042 (20.0)	1,965 (25.7)	
Behavioral factors			
Smoking status, N (%)			
Never	8,548 (83.5)	6,150 (80.4)	0.069
Former	775 (7.6)	737 (9.6)	
Current	909 (8.9)	766 (10.0)	
Alcohol use, N (%)			
Never	7,041 (69.1)	5,671 (74.4)	0.123
Former	342 (3.4)	269 (3.5)	
Current	2,805 (27.5)	1,686 (22.1)	
Physical activity, N (%)			
Inactive	878 (8.6)	569 (7.4)	0.008
Minimally active	3,964 (38.7)	3,176 (41.5)	
Active	5,399 (52.7)	3,912 (51.1)	
Tea intake, N (%)			
Never-drinkers	1,040 (10.2)	920 (12.0)	0.007
Occasional drinkers	3,505 (34.2)	2,441 (31.9)	
Former drinkers	63 (0.6)	40 (0.5)	
Regular drinkers	5,633 (55.0)	4,256 (55.6)	

CNY = Chinese Yuan Renminbi (US$1 = 7 CNY); SD = standard deviation.

* Cohen classified effect sizes as small ($d = 0.2$), medium ($d = 0.5$), and large ($d \geq 0.8$).

Table S6. Baseline characteristics by participants who with (N = 5,303) and without re-assessments (5,132) during the third follow-up (2016–2019).

	With (N= 5,303)	Without (N=5,132)	Cohen's effect size*
Sex, men, N (%)	1,381 (26.0)	1,394 (27.2)	0.025
Age, years, mean (SD)	66.8 (6.5)	69.7 (7.2)	0.428
Self-reported health, good/very good, N (%)	4,345(84.3)	4,180 (84.0)	0.007
Hemoglobin, g/L, mean (SD)	133.2 (12.0)	132.7 (12.7)	0.041
Hematocrit, %, (SD)	40.0 (3.3)	40.1 (3.7)	0.025
Socioeconomic position			
Education, N (%)			
≤ Primary	1,522 (28.7)	1,910 (37.2)	0..146
Middle school	3,234(61.0)	2,716 (52.9)	
≥ College	546 (10.3)	505 (9.8)	
Occupation, N (%)			
Manual	3,031 (57.6)	2,993 (58.7)	0.023
Non-manual	1,342 (25.5)	1,286 (25.2)	
Other	890 (16.9)	821 (16.1)	
Family income, CNY/year, N (%)			
≤ 30,000	1,798 (33.9)	1,806 (35.2)	<0.001
> 30,000	2,478 (46.8)	2,263 (44.1)	
Don't know	1,023 (19.3)	1,058 (20.6)	
Behavioral factors			
Smoking status, N (%)			
Never	4,458 (84.1)	4,254 (83.0)	0.024
Former	383 (7.2)	405 (7.9)	
Current	461 (8.7)	465 (9.1)	
Alcohol use, N (%)			
Never	3,594 (68.1)	3,576 (70.0)	0.046
Former	172 (3.3)	179 (3.5)	
Current	1,510 (28.6)	1,351 (26.5)	
Physical activity, N (%)			
Inactive	461 (8.7)	443 (8.6)	0.019
Minimally active	2,018 (38.1)	2,021 (39.4)	
Active	2,824 (53.3)	2,668 (52.0)	
Tea intake, N (%)			
Never-drinkers	507 (9.6)	553 (10.8)	0.011
Occasional drinkers	1,877 (35.4)	1,691 (33.0)	
Former drinkers	35 (0.7)	31 (0.6)	
Regular drinkers	2,884 (54.4)	2,857 (55.7)	

CNY = Chinese Yuan Renminbi (US$1 = 7 CNY); SD = standard deviation.

* Cohen classified effect sizes as small (d = 0.2), medium (d = 0.5), and large (d ≥ 0.8).

Table S7. The detailed information on the tea intake instrumental variables used in the two-sample Mendelian randomization.

	SNP	CHR	Other allele	Effect allele	β	Standard error	P	F statistic	Potential pleiotropy
1	rs10741694	11	C	T	0.015	0.0022	7.90E-12	46.7845	
2	rs10752269	10	A	G	-0.0129	0.0021	1.30E-09	36.8782	Qualifications: college or university degree
3	rs10764990	10	A	G	-0.0122	0.0022	1.90E-08	31.5892	
4	rs1156588	2	G	A	-0.0155	0.0026	2.90E-09	35.2411	
5	rs11587444	1	G	A	0.0140	0.0022	1.00E-10	41.7885	
6	rs12591786	15	T	C	-0.0184	0.0029	3.70E-10	39.274	
7	rs13282783	8	T	C	-0.0136	0.0024	7.90E-09	33.2893	
8	rs141071726	7	A	G	0.0407	0.0068	2.20E-09	35.7536	
9	rs1481012	4	G	A	-0.0262	0.0034	5.30E-15	61.1475	
10	rs149805207	6	G	A	-0.0719	0.0126	1.10E-08	32.6847	
11	rs17245213	11	A	G	-0.0146	0.0026	2.00E-08	31.5208	
12	rs17576658	13	A	G	-0.0135	0.0025	4.10E-08	30.1166	
13	rs17685	7	A	G	0.0231	0.0024	1.60E-22	95.364	
14	rs2117137	3	G	A	0.0130	0.0022	1.70E-09	36.3381	
15	rs2279844	17	A	G	-0.012	0.0022	4.00E-08	30.1514	
16	rs2351187	10	A	G	0.0129	0.0023	1.60E-08	31.9587	
17	rs2472297	15	T	C	0.0533	0.0024	2.30E-109	493.6456	
18	rs2478875	6	G	A	0.0219	0.0026	5.10E-17	70.2994	
19	rs2645929	13	G	A	-0.015	0.0027	3.50E-08	30.4240	
20	rs34619	5	A	G	0.0117	0.0021	4.30E-08	30.0212	Years of educational attainment
21	rs4410790	7	C	T	0.0406	0.0022	3.40E-76	341.2698	
22	rs4808193	19	C	T	0.0151	0.0022	1.70E-11	45.2405	
23	rs4817505	21	C	T	0.0151	0.0022	4.20E-12	48.0123	
24	rs56188862	1	C	T	-0.0158	0.0022	4.30E-13	52.4973	
25	rs57462170	3	A	G	0.0192	0.0034	1.90E-08	31.6203	
26	rs57631352	19	G	A	-0.0131	0.0023	1.70E-08	31.8684	
27	rs6829	13	T	C	-0.0119	0.0022	3.70E-08	30.2819	
28	rs72797284	5	G	A	-0.0171	0.0024	7.00E-13	51.5582	Qualifications: college or university degree
29	rs7757102	6	G	A	-0.0118	0.0021	3.10E-08	30.6239	
30	rs9624470	22	A	G	0.0252	0.0022	1.30E-31	136.8396	
31	rs9648476	7	A	G	0.0125	0.0022	1.10E-08	32.7221	
32	rs977474	12	T	C	0.0218	0.0029	2.40E-14	58.1803	
33	rs9937354	16	A	G	-0.0141	0.0021	4.90E-11	43.2313	

34	rs11164870	1	C	G	-0.012	0.0022	4.20E-08	30.0369	Qualifications: college or university degree
35	rs132904	22	G	C	0.0166	0.0026	7.80E-11	42.2958	
36	rs1453548	11	T	A	-0.0133	0.0022	3.00E-09	35.1675	
37	rs2273447	20	A	T	0.0175	0.0026	3.30E-11	43.9906	
38	rs2783129	13	C	G	-0.0117	0.0021	3.80E-08	30.2543	
39	rs56348300	9	C	G	0.0159	0.0027	6.10E-09	33.7987	
40	rs713598	7	C	G	0.0134	0.0022	5.20E-10	38.5899	
41	rs9302428	16	C	G	0.0122	0.0022	2.60E-08	30.9486	Qualifications: college or university degree

SNP: single-nucleotide polymorphisms.

Table S8. Detailed information on the instrumental variables for green tea intake and herbal tea intake used in the two-sample Mendelian randomization.

	SNP	CHR	Other allele	Effect allele	Effect allele frequency	β	Standard error	P	F statistic
					Green tea intake				
1	rs12144868	1	T	C	0.0151	3.0727	0.5275	5.70E-09	33.9363
2	rs142811251	2	G	C	0.0103	3.4598	0.6178	2.10E-08	31.3600
3	rs145313301	2	G	C	0.0061	4.9937	0.8125	7.90E-10	37.7737
4	rs144954030	2	T	C	0.0057	4.8802	0.8211	2.80E-09	35.3273
5	rs115952340	3	G	A	0.0133	3.0097	0.5503	4.50E-08	29.9162
6	rs78547201	5	C	G	0.0116	3.2750	0.5777	1.40E-08	32.1332
7	rs79774709	6	C	T	0.0058	5.1406	0.8538	1.70E-09	36.2513
8	rs116985617	6	C	T	0.0085	3.8927	0.6744	7.80E-09	33.3157
9	rs189140232	7	G	A	0.0100	3.5608	0.6257	1.30E-08	32.3919
10	rs11976995	7	T	G	0.0304	2.0194	0.3487	7.00E-09	33.5411
11	rs116035596	9	C	T	0.0066	4.9036	0.7429	4.10E-11	43.5698
12	rs79638269	10	C	T	0.0163	2.6764	0.4729	1.50E-08	32.0300
13	rs644205	10	G	A	0.1965	0.8489	0.1508	1.80E-08	31.7057
14	rs183788045	11	G	T	0.0087	3.5482	0.6498	4.70E-08	29.8187
15	rs117251267	13	T	C	0.0116	3.5501	0.6178	9.10E-09	33.0254
16	rs142373582	14	T	C	0.0142	3.2463	0.5658	9.60E-09	32.9244
17	rs113898417	16	C	G	0.0070	3.9789	0.7266	4.40E-08	29.9850
18	rs62059726	17	G	A	0.0152	2.8216	0.5118	3.50E-08	30.3925
19	rs12958992	18	A	G	0.0269	2.1609	0.3789	1.20E-08	32.5250
20	rs117077082	20	A	G	0.0318	1.9206	0.3422	2.00E-08	31.5041
21	rs113322644	21	C	A	0.0117	3.2096	0.5551	7.40E-09	33.4352
					Herbal tea intake				
1	rs141595975	1	T	C	0.0097	4.2359	0.6691	2.40E-10	40.0830
2	rs145853157	1	A	T	0.0081	3.9211	0.6721	5.40E-09	34.0349
3	rs142141377	1	A	C	0.0061	4.9595	0.7972	4.90E-10	38.6983
4	rs114605739	4	A	G	0.0109	3.2706	0.5846	2.20E-08	31.3002
5	rs1796468	4	C	T	0.0078	4.1480	0.7077	4.60E-09	34.3537
6	rs79840793	4	C	T	0.0114	3.2899	0.5714	8.50E-09	33.1514
7	rs148443638	6	G	A	0.0098	3.8450	0.6183	5.00E-10	38.6778
8	rs73118299	7	A	G	0.0077	4.3053	0.7444	7.30E-09	33.4522
9	rs9792217	8	C	T	0.0140	2.9309	0.5022	5.40E-09	34.0568
10	rs146680299	8	C	T	0.0142	2.8700	0.5160	2.70E-08	30.9369
11	rs146747894	8	G	A	0.0105	3.4236	0.5970	9.80E-09	32.8843
12	rs79519615	10	T	C	0.0099	3.4516	0.6002	8.90E-09	33.0682
13	rs57042533	11	G	T	0.0054	4.5911	0.8235	2.50E-08	31.0784
14	rs148342659	11	C	T	0.0068	4.2438	0.7483	1.40E-08	32.1601
15	rs79919614	12	A	T	0.0204	2.5317	0.4230	2.20E-09	35.8208

16	rs112423877	14	T	A	0.0070	4.0508	0.7337	3.40E-08	30.4802
17	rs141436163	18	G	T	0.0186	2.4968	0.4430	1.70E-08	31.7650
18	rs77677063	18	C	T	0.0099	3.5350	0.6326	2.30E-08	31.2242
19	rs188433347	18	T	G	0.0087	3.6337	0.6554	3.00E-08	30.7343

SNP: single-nucleotide polymorphisms.

Table S9. Detailed information on the instrumental variables for tea consumption in East Asians used in the two-sample Mendelian randomization.

	SNP	CHR	Other allele	Effect allele	Effect allele frequency	β	Standard error	P	F statistic
1	rs62257549	3	A	G	0.8184	-0.0588	0.0116	6.59E-07	25.8531
2	rs9390773	6	T	G	0.7190	-0.0523	0.0107	1.87E-06	23.7971
3	rs17151746	7	A	G	0.8252	0.0556	0.0118	4.27E-06	22.0995
4	rs7827019	8	T	C	0.8378	0.0641	0.0134	3.00E-06	22.7648
5	rs13295221	9	T	A	0.9164	-0.0761	0.0157	2.03E-06	23.5811
6	rs10500924	11	C	G	0.9641	0.1145	0.0232	1.43E-06	24.2797
7	rs7137708	12	G	A	0.8986	-0.0800	0.0167	2.68E-06	23.0728
8	rs79105258	12	A	C	0.7468	-0.1169	0.0109	6.67E-26	115.7316
9	rs35640546	15	C	T	0.7715	0.0494	0.0105	3.80E-06	22.3476
10	rs8031448	15	C	T	0.5858	0.0427	0.0088	2.36E-06	23.2624

SNP: single-nucleotide polymorphisms.

Table S10. Mendelian randomization associations of tea intake with anemia, hemoglobin, and hematocrit after excluding potential pleiotropic SNPs.

Exposure	Outcome	SNPs	F statistic	Methods	OR (95% CI)	P	IVW Cochran's Q statistic (I^2)	MR-Egger Intercept (P)
Tea intake (cups/day) (IEU OpenGWAS)	Anemia (Ref.: no anemia) (FinnGen)	30[a]	69.66	IVW	1.15 (0.80, 1.64)	0.45	62.19 (53.4%)	-0.010 (0.19)
				WM	1.50 (1.02, 2.20)	0.04		
				MR-Egger	1.79 (0.86, 3.74)	0.13		
				MRPRESSO	1.24 (0.89, 1.72)	0.22		
					β (95% CI)			
Tea intake (cups/day) (IEU OpenGWAS)	Hemoglobin (g/dL) (INTERVAL, UK Biobank, UK BiLEVE)	30[a]	69.66	IVW	-0.02 (-0.12, 0.08)	0.98	52.72 (45.0%)	<0.001 (0.90)
				WM	-0.06 (-0.17, 0.05)	0.93		
				MR-Egger	-0.01 (-0.22, 0.20)	0.99		
				MRPRESSO	-0.04 (-0.13, 0.05)	0.42		
Tea intake (cups/day) (IEU OpenGWAS)	Hematocrit (%) (INTERVAL, UK Biobank, UK BiLEVE)	30[a]	69.66	IVW	0.00 (-0.11, 0.10)	0.94	61.42 (52.8%)	<0.001 (0.90)
				WM	-0.05 (-0.16, 0.06)	0.35		
				MR-Egger	-0.02 (-0.24, 0.21)	0.88		
				MRPRESSO	-0.02 (-0.12, 0.07)	0.62		
Tea intake (cups/day) (IEU OpenGWAS)	Hemoglobin (g/L) (the UK Household Longitudinal Study)	10[b]	78.85	IVW	0.47 (-0.14, 1.08)	0.13	4.41 (0.0%)	0.009 (0.59)
				WM	0.70 (-0.11, 1.51)	0.09		
				MR-Egger	0.09 (-1.35, 1.54)	0.90		
				MRPRESSO	0.47 (0.04, 0.90)	0.06		
Tea intake (cups/day) (IEU OpenGWAS)	Hematocrit (%) (BioVU)	21[c]	80.57	IVW	0.00 (-0.13, 0.13)	0.97	25.30 (20.9%)	<0.001 (0.98)
				WM	0.03 (-0.13, 0.20)	0.67		
				MR-Egger	0.00 (-0.27, 0.27)	0.99		
				MRPRESSO	0.00 (-0.13, 0.13)	0.97		

OR: odds ratio; CI: confidence interval. IVW: inverse-variance weighted; WM: weighted median method; MRPRESSO: Mendelian randomization pleiotropy residual sum and outlier; SNP: single-nucleotide polymorphisms; BioVU: the Vanderbilt University biobank.

[a] 3 SNPs were removed from the remaining instrumental variables when anemia (FinnGen), hemoglobin (INTERVAL, UK Biobank, UK BiLEVE), and hematocrit (INTERVAL, UK Biobank, UK BiLEVE) were outcomes: rs34619, rs72797284, rs10752269.

[b] 1 SNP was removed from the remaining instrumental variables when hemoglobin (The UK Household Longitudinal Study) was outcome: rs72797284.

[c] 2 SNPs were removed from the remaining instrumental variables when hematocrit (BioVU) was outcome: rs72797284, rs34619.

Table S11. Mendelian randomization associations of green tea intake and herbal tea intake with anemia, hemoglobin, and hematocrit.

Exposure	Outcome	SNPs	F statistic	Methods	OR (95% CI)	P	IVW Cochran's Q statistic (I^2)	MR-Egger Intercept (P)
Green tea intake (cups/day) (IEU OpenGWAS)	Anemia (Ref.: no anemia) (FinnGen)	20	33.15	IVW	1.00 (0.99, 1.01)	0.90	17.24 (0.0%)	-0.007 (0.69)
				WM	1.00 (0.99, 1.01)	0.36		
				MR-Egger	1.00 (0.99, 1.02)	0.78		
				MRPRESSO	1.00 (0.99, 1.01)	0.89		
Herbal tea intake (cups/day) (IEU OpenGWAS)	Anemia (Ref.: no anemia) (FinnGen)	19	33.58	IVW	1.00 (0.99, 1.01)	1.00	17.85 (0.0%)	0.086 (0.13)
				WM	1.00 (0.99, 1.01)	0.97		
				MR-Egger	0.98 (0.95, 1.01)	0.14		
				MRPRESSO	1.00 (0.99, 1.01)	1.00		
					β (95% CI)			
Green tea intake (cups/day) (IEU OpenGWAS)	Hemoglobin (g/dL) (INTERVAL, UK Biobank, UK BiLEVE)	21	33.18	IVW	0.001 (-0.002, 0.003)	0.66	22.48 (11.0%)	-0.012 (0.04)
				WM	0.001 (-0.002, 0.004)	0.57		
				MR-Egger	0.005 (0.000, 0.009)	0.05		
				MRPRESSO	0.001 (-0.002, 0.003)	0.67		
Green tea intake (cups/day) (IEU OpenGWAS)	Hematocrit (%) (INTERVAL, UK Biobank, UK BiLEVE)	21	33.18	IVW	0.001 (-0.002, 0.003)	0.69	24.87 (19.6%)	-0.013 (0.03)
				WM	0.001 (-0.003, 0.004)	0.72		
				MR-Egger	0.005 (0.001, 0.010)	0.03		
				MRPRESSO	0.001 (-0.002, 0.003)	0.70		
Herbal tea intake (cups/day) (IEU OpenGWAS)	Hemoglobin (g/dL) (INTERVAL, UK Biobank, UK BiLEVE)	19	33.58	IVW	0.000 (-0.002, 0.002)	0.90	17.63 (0.0%)	-0.022 (0.33)
				WM	0.000 (-0.003, 0.003)	0.88		
				MR-Egger	0.006 (-0.006, 0.018)	0.35		
				MRPRESSO	0.000 (-0.002, 0.002)	0.90		
Herbal tea intake (cups/day) (IEU Open GWAS	Hemoglobin (g/dL) (INTERVAL, UK Biobank, UK	19	33.58	IVW	0.000 (-0.003, 0.002)	0.82	11.34 (0.0%)	-0.018 (0.41)
				WM	-0.001 (-0.004, 0.002)	0.71		
				MR-Egger	0.005 (-0.007, 0.017)	0.44		

BiLEVE)	MRPRESSO	0.000 (-0.002, 0.002)	0.78

OR: odds ratio; CI: confidence interval. IVW: inverse-variance weighted; WM: weighted median method; MRPRESSO: Mendelian randomization pleiotropy residual sum and outlier; SNP: single-nucleotide polymorphisms; BioVU: the Vanderbilt University biobank.

Table S12. Mendelian randomization associations of tea intake with iron deficiency anemia, hemoglobin, and hematocrit in East Asians.

Exposure	Outcome	SNPs	F statistic	Methods	OR (95% CI)	P	IVW Cochran's Q statistic (I^2)	MR-Egger Intercept (P)
Green tea consumption (categorical ordered) (Biobank Japan)	Iron deficiency anemia (Ref: no iron deficiency anemia) (The China Kadoorie Biobank)	10	32.68	IVW	2.49 (0.49, 12.66)	0.27	11.61 (22.5%)	0.058 (0.76)
				WM	2.65 (0.37, 19.03)	0.33		
				MR-Egger	1.15 (0.01, 181.00)	0.96		
				MRPRESSO	2.49 (0.49, 12.66)	0.30		
					β (95% CI)			
Green tea consumption (Categorical Ordered) (Biobank Japan)	Hemoglobin (g/dL) (Korean Genome and Epidemiology Study)	10	32.68	IVW	0.02 (-0.04, 0.08)	0.47	14.14 (36.4%)	0.003 (0.67)
				WM	0.04 (-0.03, 0.11)	0.22		
				MR-Egger	-0.02 (-0.21, 0.17)	0.85		
				MRPRESSO	0.02 (-0.04, 0.08)	0.49		
Green tea consumption (Biobank Japan)	Hematocrit (%) (Korean Genome and Epidemiology Study)	10	32.68	IVW	0.05 (-0.04, 0.14)	0.30	23.70 (62.0%)	-0.008 (0.44)
				WM	0.09 (0.00, 0.18)	0.05		
				MR-Egger	0.15 (-0.12, 0.43)	0.30		
				MRPRESSO	0.02 (-0.06, 0.10)	0.63		

OR: odds ratio; CI: confidence interval. IVW: inverse-variance weighted; WM: weighted median method; MRPRESSO: Mendelian randomization pleiotropy residual sum and outlier; SNP: single-nucleotide polymorphisms.

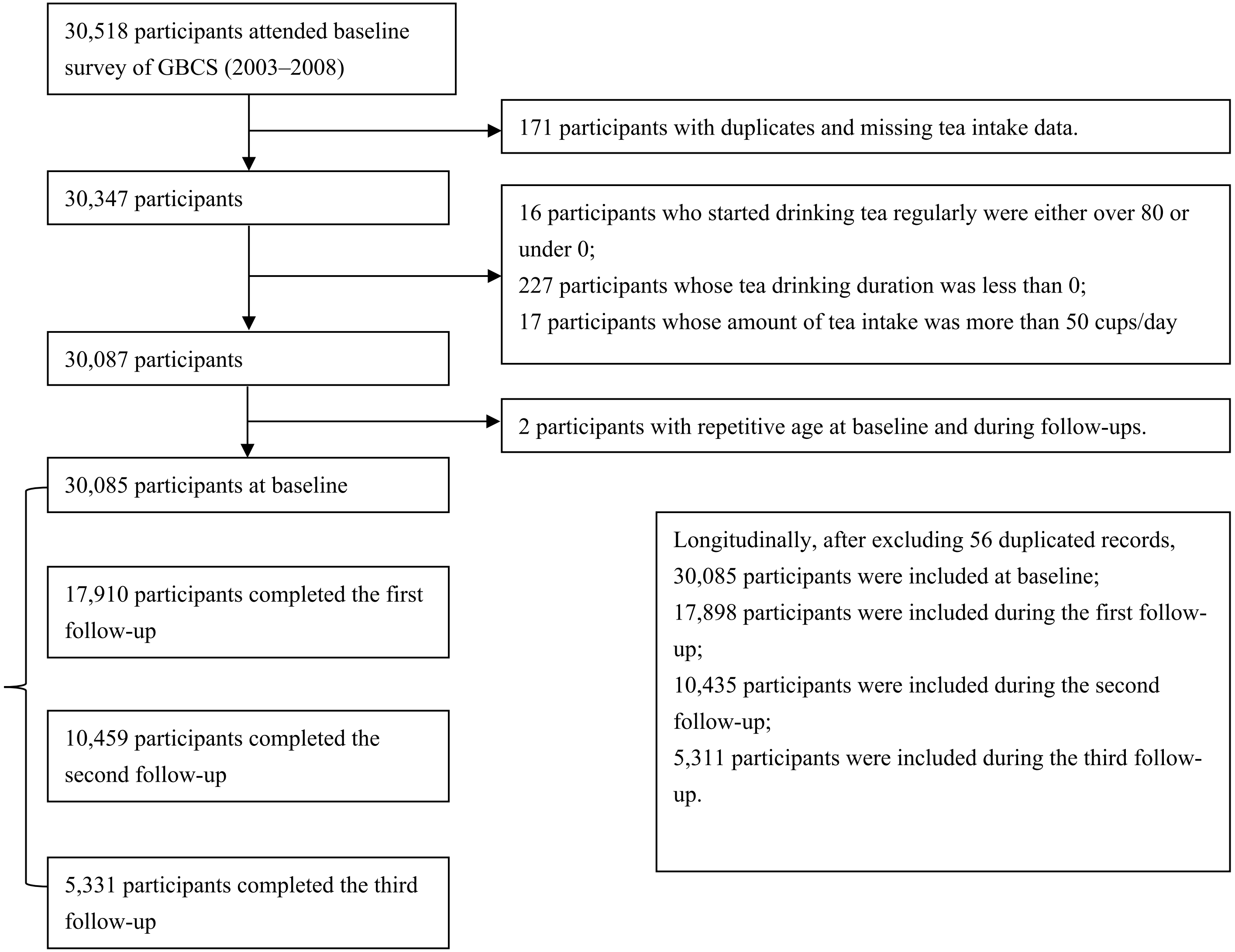

Figure S1. Flow chart of GBCS participants.

GBCS: Guangzhou Biobank Cohort Study.

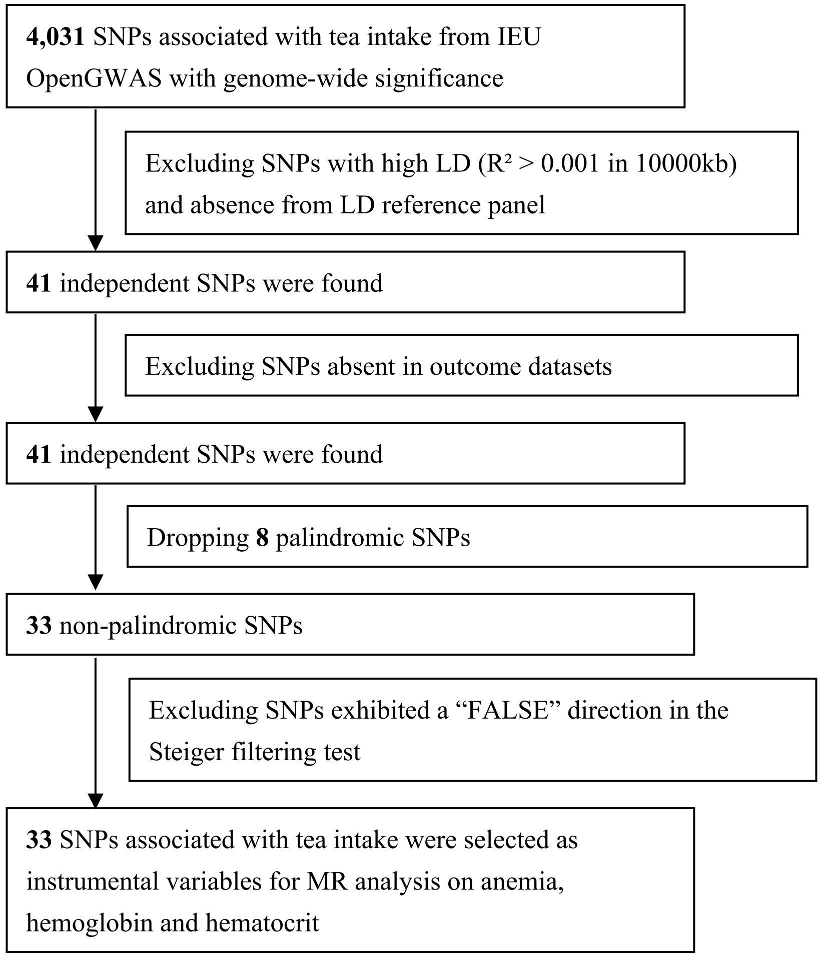

Figure S2. Flow chart about how to select instrumental variables associated with tea intake in main analysis.

SNP: single-nucleotide polymorphisms; LD: linkage disequilibrium; MR: Mendelian randomization; GWAS: genome-wide association study.

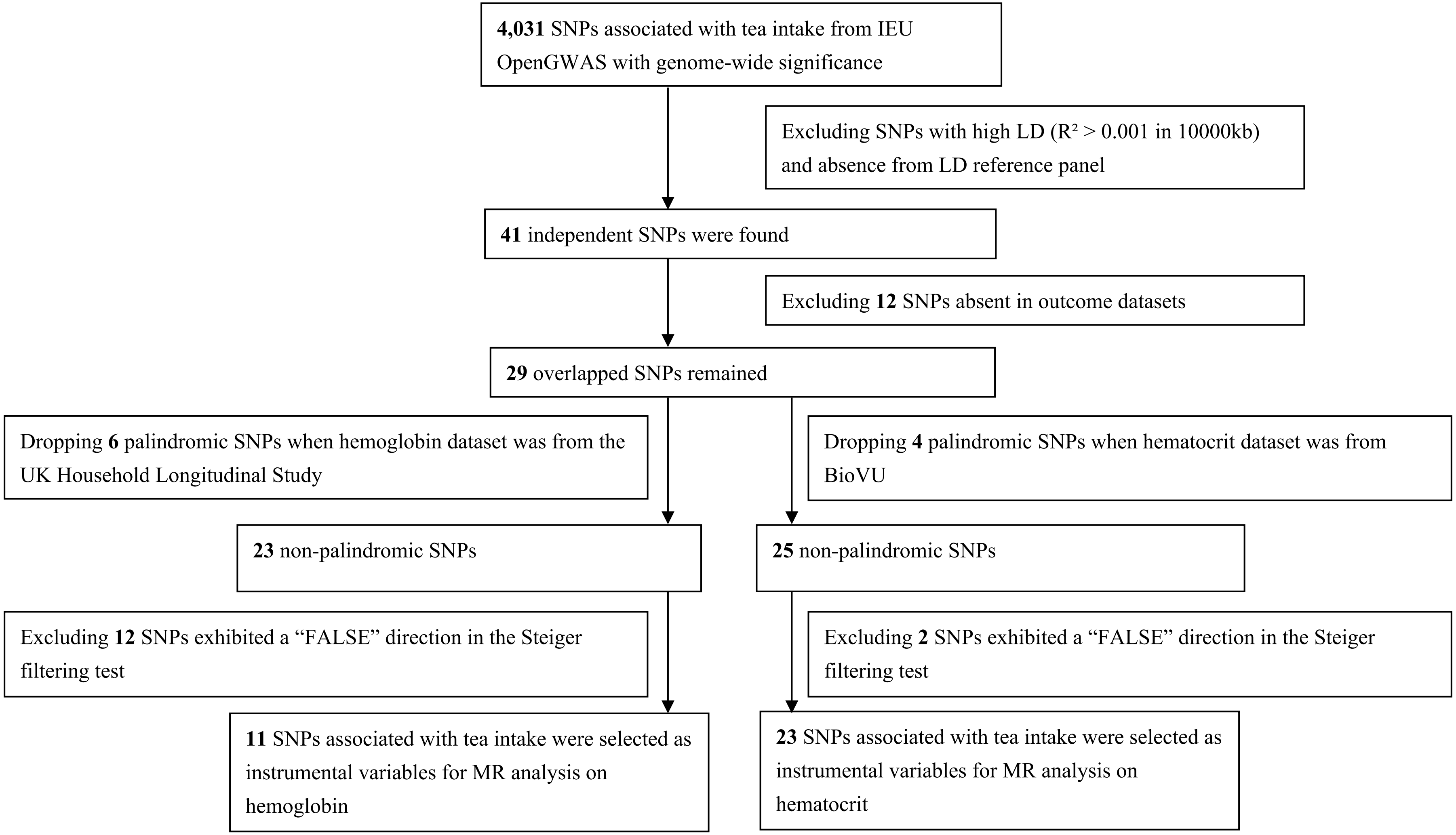

Figure S3. Flow chart about how to select instrumental variables associated with tea intake in sensitive analysis.

SNP: single-nucleotide polymorphisms; LD: linkage disequilibrium; MR: Mendelian randomization; GWAS: genome-wide association study; BioVU: the Vanderbilt University biobank.

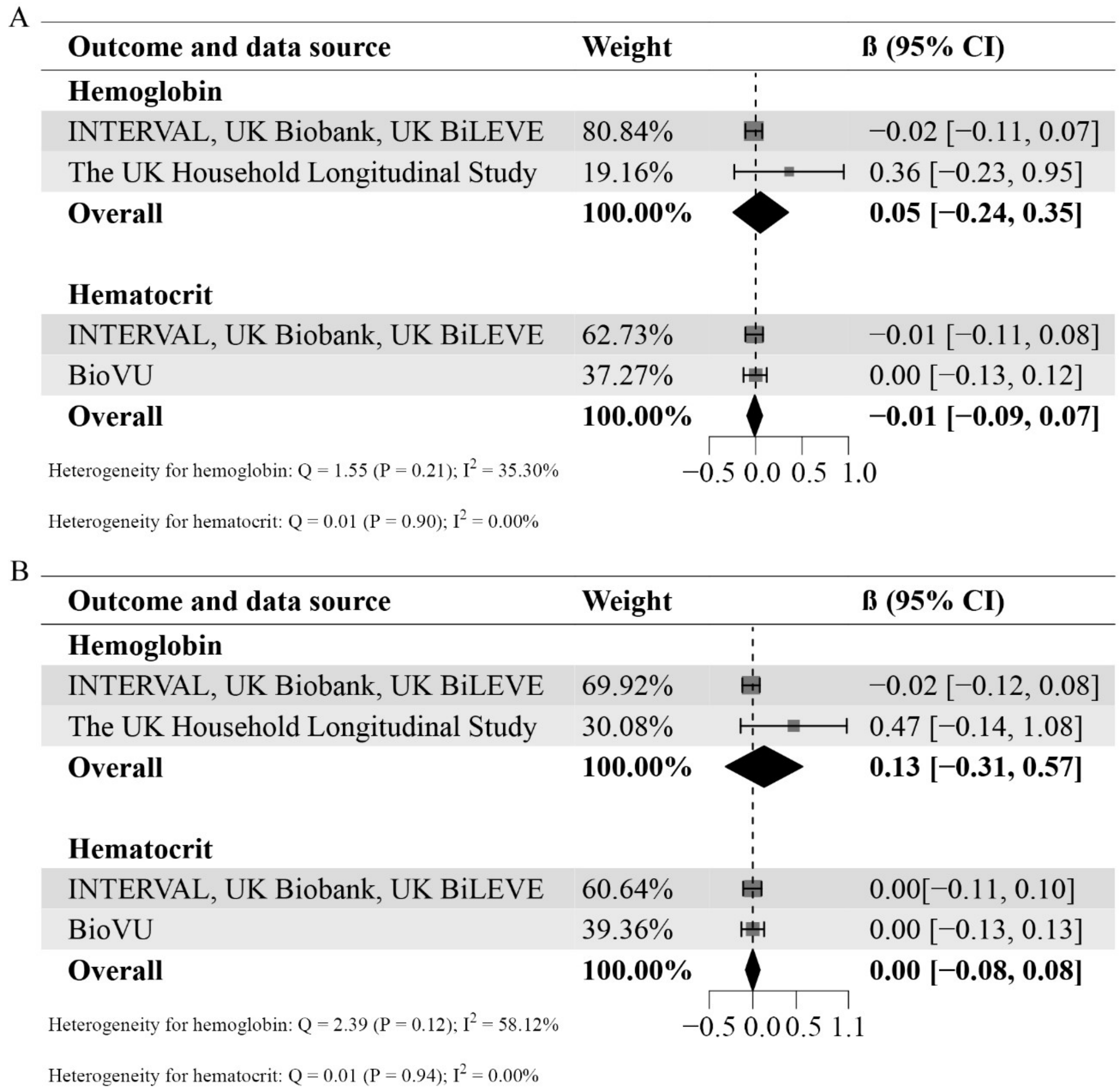

Figure S4: Meta-analysis of inverse-variance weighted results for hemoglobin and hematocrit as outcomes in the main analysis (A) and sensitive analysis after excluding potential pleiotropic SNPs (B).

CI: confidence interval; SNP: single-nucleotide polymorphisms; BioVU: the Vanderbilt University biobank.