Supplementary Material for

Supplementary Table 1. STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies.***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1-2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2-3
Objectives	3	State specific objectives, including any prespecified hypotheses	3-4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	4
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-6
Bias	9	Describe any efforts to address potential sources of bias	5-6
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	4
		(*d*) If applicable, describe analytical methods	6

		taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	6-7
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	10
		(b) Give reasons for non-participation at each stage	4, Study design
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	26, Table 2
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	26, Table 2
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Supplementary Table 4
		(*b*) Report category boundaries when continuous variables were categorized	Supplementary Table 4
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Supplementary Table 5-12
Discussion			
Key results	18	Summarise key results with reference to study objectives	11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14-15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-13
Generalisability	21	Discuss the generalisability (external validity) of the study results	12-13

Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Supplementary Table 2. STROBE-MR checklist of recommended items to address in reports of Mendelian randomization studies[1 2] .

Item No.	Section	Checklist item	Page No.	Relevant text from manuscript
1	**TITLE and ABSTRACT**	Indicate Mendelian randomization (MR) as the study's design in the title and/or the abstract if that is a main purpose of the study	1-2	Association between serum iron status and gout: results from the NHANES and Mendelian randomization study
	INTRODUCTION			
2	**Background**	Explain the scientific background and rationale for the reported study. What is the exposure? Is a potential causal relationship between exposure and outcome plausible? Justify why MR is a helpful method to address the study question	3-4	Mendelian randomization (MR) is a specialized form of instrumental variable (IV) analysis that employs genetic variants as instruments to identify and quantify potential causal relationships between exposure and outcome 16.
3	**Objectives**	State specific objectives clearly, including pre-specified causal hypotheses (if any). State that MR is a method that, under specific assumptions, intends to estimate causal effects	3-4	Subsequently, we further conducted MR analysis utilizing publicly available genetic data to identify the potential causal relationship of ferritin, serum iron, total iron-binding capacity (TIBC), transferrin saturation (TSAT) with the risk of gout.
	METHODS			
4	**Study design and data sources**	Present key elements of the study design early in the article. Consider including a table listing sources of data for all phases of the study. For each data source contributing to the analysis, describe the following:		

		a)	Setting: Describe the study design and the underlying population, if possible. Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection, when available.	7-8	*2.3.1 Exposure sources of serum iron status indicators; 2.3.2 Outcome sources of gout*
		b)	Participants: Give the eligibility criteria, and the sources and methods of selection of participants. Report the sample size, and whether any power or sample size calculations were carried out prior to the main analysis	7-8	*2.3.1 Exposure sources of serum iron status indicators; 2.3.2 Outcome sources of gout*
		c)	Describe measurement, quality control and selection of genetic variants	8-9	*2.3.3 Statistical analysis*
		d)	For each exposure, outcome, and other relevant variables, describe methods of assessment and diagnostic criteria for diseases	7-8	*2.3.1 Exposure sources of serum iron status indicators; 2.3.2 Outcome sources of gout*
		e)	Provide details of ethics committee approval and participant informed consent, if relevant	4	As for MR studies, since it relies on summary-level data obtained from publicly available genome-wide association study (GWAS), no additional ethical approval was deemed necessary.
5	**Assumptions**		Explicitly state the three core IV assumptions for the main analysis (relevance, independence and exclusion restriction) as well assumptions for any additional or sensitivity analysis	4	*2.1 Study design*
6	**Statistical methods: main analysis**		Describe statistical methods and statistics used		
		a)	Describe how quantitative variables were handled in the analyses (i.e., scale, units, model)	NA	
		b)	Describe how genetic variants were handled in the analyses and, if applicable, how their	8-9	*2.3.3 Statistical analysis*

		weights were selected		
		c) Describe the MR estimator (e.g. two-stage least squares, Wald ratio) and related statistics. Detail the included covariates and, in case of two-sample MR, whether the same covariate set was used for adjustment in the two samples	NA	
		d) Explain how missing data were addressed	8-9	*2.3.3 Statistical analysis*
		e) If applicable, indicate how multiple testing was addressed	9	To correct for multiple comparisons, we used the Bonferroni method, setting statistical significance at a P-value ≤ 0.0125 (0.05/4), based on the number of exposures included in the primary MR analyses.
7	**Assessment of assumptions**	Describe any methods or prior knowledge used to assess the assumptions or justify their validity	8-9	*2.3.3 Statistical analysis*
8	**Sensitivity analyses and additional analyses**	Describe any sensitivity analyses or additional analyses performed (e.g. comparison of effect estimates from different approaches, independent replication, bias analytic techniques, validation of instruments, simulations)	8-9	*2.3.3 Statistical analysis*
9	**Software and pre-registration**			
		a) Name statistical software and package(s), including version and settings used	9	The statistical analysis was performed using R software version 4.1.3, using the "TwoSampleMR", "Mendelian Randomization", "Meta" and "MR-PRESSO" packages to explore the causal connection between iron

				homeostasis-related indicators.
		b) State whether the study protocol and details were pre-registered (as well as when and where)	NA	
	RESULTS			
10	**Descriptive data**			
		a) Report the numbers of individuals at each stage of included studies and reasons for exclusion. Consider use of a flow diagram	7-8	*2.3.1 Exposure sources of serum iron status indicators* *2.3.2 Outcome sources of gout* Figure 1
		b) Report summary statistics for phenotypic exposure(s), outcome(s), and other relevant variables (e.g. means, SDs, proportions)	7-8	*2.3.1 Exposure sources of serum iron status indicators* *2.3.2 Outcome sources of gout*
		c) If the data sources include meta-analyses of previous studies, provide the assessments of heterogeneity across these studies	NA	
		d) For two-sample MR: i. Provide justification of the similarity of the genetic variant-exposure associations between the exposure and outcome samples ii. Provide information on the number of individuals who overlap between the exposure and outcome studies	NA	
11	**Main results**			
		a) Report the associations between genetic variant and exposure, and between genetic variant	10-11	*3.2 Mendelian randomization analysis*

			and outcome, preferably on an interpretable scale		
		b)	Report MR estimates of the relationship between exposure and outcome, and the measures of uncertainty from the MR analysis, on an interpretable scale, such as odds ratio or relative risk per SD difference	NA	
		c)	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA	
		d)	Consider plots to visualize results (e.g. forest plot, scatterplot of associations between genetic variants and outcome versus between genetic variants and exposure)	10-11	Figure 2-4
12	**Assessment of assumptions**				
		a)	Report the assessment of the validity of the assumptions	9-10	*3.2 Mendelian randomization analysis*
		b)	Report any additional statistics (e.g., assessments of heterogeneity across genetic variants, such as I^2, Q statistic or E-value)	NA	
13	**Sensitivity analyses and additional analyses**				
		a)	Report any sensitivity analyses to assess the robustness of the main results to violations of the assumptions	8-9	*2.3.3 Statistical analysis*
		b)	Report results from other sensitivity analyses or additional analyses	10-11	Table 3; Supplementary Table 12-13

		c)	Report any assessment of direction of causal relationship (e.g., bidirectional MR)	NA	
		d)	When relevant, report and compare with estimates from non-MR analyses	NA	
		e)	Consider additional plots to visualize results (e.g., leave-one-out analyses)	11	Figure 2-3
	DISCUSSION				
14	**Key results**		Summarize key results with reference to study objectives	11	Paragraph 1
15	**Limitations**		Discuss limitations of the study, taking into account the validity of the IV assumptions, other sources of potential bias, and imprecision. Discuss both direction and magnitude of any potential bias and any efforts to address them	14-15	Paragraph 2
16	**Interpretation**				
		a)	Meaning: Give a cautious overall interpretation of results in the context of their limitations and in comparison with other studies	12	Paragraph 1
		b)	Mechanism: Discuss underlying biological mechanisms that could drive a potential causal relationship between the investigated exposure and the outcome, and whether the gene-environment equivalence assumption is reasonable. Use causal language carefully, clarifying that IV estimates may provide causal effects only under certain assumptions	13-14	Paragraph 2; Paragraph 1
		c)	Clinical relevance: Discuss whether the results have clinical or public policy relevance, and to what extent they inform effect sizes of possible interventions	13-14	Paragraph 2; Paragraph 1

17	**Generalizability**	Discuss the generalizability of the study results (a) to other populations, (b) across other exposure periods/timings, and (c) across other levels of exposure	15	Paragraph 1
	OTHER INFORMATION			
18	**Funding**	Describe sources of funding and the role of funders in the present study and, if applicable, sources of funding for the databases and original study or studies on which the present study is based	17	Funding
19	**Data and data sharing**	Provide the data used to perform all analyses or report where and how the data can be accessed, and reference these sources in the article. Provide the statistical code needed to reproduce the results in the article, or report whether the code is publicly accessible and if so, where	16-17	Data Availability
20	**Conflicts of Interest**	All authors should declare all potential conflicts of interest	16	Conflicts of interest

1. Skrivankova VW, Richmond RC, Woolf BAR, Yarmolinsky J, Davies NM, Swanson SA, et al. Strengthening the Reporting of Observational Studies in Epidemiology using Mendelian Randomization (STROBE-MR) Statement. JAMA. 2021;under review.

2. Skrivankova VW, Richmond RC, Woolf BAR, Davies NM, Swanson SA, VanderWeele TJ, et al. Strengthening the Reporting of Observational Studies in Epidemiology using Mendelian Randomisation (STROBE-MR): Explanation and Elaboration. BMJ. 2021;375:n2233.

Supplementary Table 3. Characteristics of the genetic variants associated with the serum iron status indicators.

Trait	SNP	Chr	Position	Effect allele	Other allele	beta	SE	*P*
Ferritin	rs10801913	1	115671658	A	G	0.024	0.004	2.63E-10
Ferritin	rs75965181	1	22257509	A	T	-0.120	0.011	3.70E-26
Ferritin	rs1250259	2	215435759	T	A	-0.024	0.004	1.84E-10
Ferritin	rs1260326	2	27508073	T	C	0.025	0.004	1.48E-12
Ferritin	rs12693541	2	189553964	C	T	0.079	0.005	2.21E-48
Ferritin	rs6757653	2	28948938	T	C	0.032	0.004	9.34E-16
Ferritin	rs1131262	3	134222476	T	C	-0.032	0.006	6.66E-09
Ferritin	rs1799945	6	26090951	G	C	0.059	0.005	1.51E-31
Ferritin	rs1800562	6	26092913	A	G	0.130	0.007	1.85E-84
Ferritin	rs36184164	6	43813355	G	T	0.036	0.005	6.46E-12
Ferritin	rs2529440	7	30472178	T	C	-0.035	0.004	4.60E-23
Ferritin	rs13253974	8	23520397	A	G	0.024	0.004	2.51E-11
Ferritin	rs2954029	8	125478730	T	A	-0.024	0.003	1.42E-12
Ferritin	rs4841429	8	10711019	G	A	0.060	0.006	8.21E-21
Ferritin	rs7865362	9	33117967	T	C	0.025	0.004	1.03E-11
Ferritin	rs17476364	10	69334748	C	T	0.043	0.006	3.57E-14
Ferritin	rs12419620	11	2211323	G	T	-0.031	0.005	3.43E-11
Ferritin	rs12807014	11	47738526	C	T	-0.029	0.004	2.72E-13
Ferritin	rs4938939	11	60393365	A	G	0.022	0.004	3.01E-09
Ferritin	rs996347	14	33941686	C	T	0.049	0.004	2.99E-41
Ferritin	rs3743171	15	65624189	T	A	-0.024	0.004	2.92E-08
Ferritin	rs57659670	15	45106240	C	T	-0.140	0.006	1.05E-113
Ferritin	rs3747602	16	4752385	G	T	0.021	0.004	2.47E-09
Ferritin	rs9921222	16	325782	C	T	0.025	0.004	1.09E-12
Ferritin	rs1542752	17	74942005	T	C	0.034	0.005	1.44E-12
Ferritin	rs34523089	17	58358748	T	C	0.069	0.005	3.16E-48
Ferritin	rs55789050	17	9890100	T	A	-0.027	0.004	6.07E-14
Ferritin	rs4808802	19	18467063	C	G	0.028	0.004	3.42E-11
Ferritin	rs601338	19	48703417	G	A	0.028	0.003	7.04E-16
Ferritin	rs708686	19	5840608	T	C	-0.031	0.004	1.96E-14
Ferritin	rs6029148	20	40495768	A	G	0.046	0.007	5.56E-12
Ferritin	rs855791	22	37066896	A	G	-0.044	0.003	6.14E-37
Iron	rs2228145	1	154454494	C	A	0.026	0.004	8.42E-11
Iron	rs35945185	1	65671556	A	G	0.031	0.004	1.54E-13
Iron	rs13007705	2	238160555	T	C	0.029	0.004	2.01E-12
Iron	rs4854760	3	133779897	G	A	0.053	0.004	5.67E-33
Iron	rs7630745	3	66376605	C	T	0.025	0.004	2.09E-09
Iron	rs1799945	6	26090951	G	C	0.170	0.006	1.26E-187
Iron	rs1800562	6	26092913	A	G	0.270	0.008	1.00E-200

Iron	rs9399136	6	135081201	C	T	0.057	0.005	1.08E-36
Iron	rs12718598	7	50360747	C	T	0.027	0.004	3.69E-11
Iron	rs7385804	7	100638347	C	A	-0.057	0.004	9.42E-43
Iron	rs57659670	15	45106240	C	T	-0.042	0.007	1.08E-08
Iron	rs77262773	17	69253570	T	C	0.081	0.013	9.54E-10
Iron	rs2005682	19	35456759	T	A	-0.029	0.004	2.37E-11
Iron	rs855791	22	37066896	A	G	-0.170	0.005	1.00E-200
TIBC	rs12693541	2	189553964	C	T	-0.048	0.007	2.53E-11
TIBC	rs3817672	3	196073940	C	T	-0.031	0.005	6.32E-11
TIBC	rs4854760	3	133779897	G	A	0.340	0.009	1.00E-200
TIBC	rs59950280	4	3450618	A	G	0.033	0.005	5.87E-11
TIBC	rs1799945	6	26090951	G	C	-0.120	0.007	4.29E-66
TIBC	rs1800562	6	26092913	A	G	-0.450	0.012	1.00E-200
TIBC	rs9399136	6	135081201	C	T	-0.033	0.005	2.65E-10
TIBC	rs1495743	8	18415790	G	C	-0.043	0.006	9.00E-14
TIBC	rs174546	11	61802358	T	C	0.046	0.005	6.62E-22
TIBC	rs17580	14	94380925	A	T	0.076	0.012	1.19E-10
TIBC	rs57659670	15	45106240	C	T	0.077	0.009	3.67E-19
TIBC	rs112727702	19	49587947	T	G	0.043	0.006	2.08E-14
TIBC	rs1132274	20	17615510	A	C	0.036	0.006	1.93E-08
TIBC	rs855791	22	37066896	A	G	0.026	0.005	2.88E-08
TSAT	rs13007705	2	238160555	T	C	0.033	0.005	1.10E-12
TSAT	rs3817672	3	196073940	C	T	0.026	0.005	2.29E-08
TSAT	rs4854760	3	133779897	G	A	-0.096	0.005	9.95E-83
TSAT	rs1799945	6	26090951	G	C	0.210	0.007	1.00E-200
TSAT	rs1800562	6	26092913	A	G	0.450	0.012	1.00E-200
TSAT	rs9399136	6	135081201	C	T	0.067	0.005	5.32E-39
TSAT	rs7385804	7	100638347	C	A	-0.062	0.005	2.87E-39
TSAT	rs57659670	15	45106240	C	T	-0.058	0.008	5.73E-12
TSAT	rs2005682	19	35456759	T	A	-0.032	0.005	6.25E-11
TSAT	rs855791	22	37066896	A	G	-0.170	0.005	1.00E-200

Abbreviations: Chr, chromosome; SE, standard error; SNP, single-nucleotide polymorphism TIBC, total iron-binding capacity; TSAT, transferrin saturation.

Supplementary Table 4. Odds ratio (95% CI) for prevalent gout according to serum iron status indicators among participants in NHANES 2017–2018 (N=4,635).

Variables	Model 1			Model 2		
	OR	95%CI	*P*	OR	95%CI	*P*
Ferritin (ng/mL)	1.00	1.00-1.00	0.071	1.00	1.00-1.00	0.144
Q1 (1.04-51)	Ref	Ref	Ref	Ref	Ref	Ref
Q2 (51.1-104)	1.03	0.47-2.24	0.939	1.00	0.43-2.32	0.999
Q3 (105-191)	1.33	0.60-2.92	0.508	1.29	0.59-2.83	0.643
Q4 (192-5190)	1.53	0.89-2.65	0.176	1.49	0.83-2.67	0.407
Serum iron (ug/dL)	1.00	0.99-1.00	0.141	1.00	0.99-1.01	0.614
Q1 (11-63)	Ref	Ref	Ref	Ref	Ref	Ref
Q2 (64-84)	0.92	0.57-1.46	0.725	1.01	0.60-1.70	0.987
Q3 (85-107)	0.64	0.34-1.22	0.227	0.76	0.37-1.58	0.601
Q4 (108-296)	0.71	0.41-1.26	0.289	0.92	0.47-1.80	0.846
TIBC (ug/dL)	1.00	1.00-1.01	0.747	1.00	0.99-1.00	0.859
Q1 (139-292)	Ref	Ref	Ref	Ref	Ref	Ref
Q2 (293-322)	1.73	0.87-3.46	0.170	1.67	0.84-3.33	0.381
Q3 (323-353)	1.05	0.56-1.95	0.887	0.92	0.49-1.72	0.831
Q4 (354-605)	1.25	0.68-2.29	0.497	1.07	0.58-1.96	0.863
TSAT (%)	0.98	0.96-1.01	0.178	0.99	0.97-1.02	0.711
Q1 (2-20)	Ref	Ref	Ref	Ref	Ref	Ref
Q2 (21-26)	0.83	0.47-1.48	0.551	0.95	0.51-1.78	0.901
Q3 (27-34)	0.79	0.44-1.44	0.474	0.95	0.46-1.94	0.903
Q4 (35-92)	0.62	0.32-1.20	0.204	0.86	0.40-1.86	0.768

Abbreviations: CI, confidence interval; OR, odds ratio; NHANES, National Health and Nutrition Examination Survey; Ref, reference; TIBC, total iron-binding capacity; TSAT, transferrin saturation.

Model 1 was adjusted for age, gender (male, female) and ethnicity (Mexican American, other Hispanic origins, non-Hispanic White, non-Hispanic Black, and other race).

Model 2 was adjusted for age, gender, ethnicity, body mass index (BMI) (<25.0, 25.0 to <30.0, and ≥30.0 kg/m^2), smoking status (never, former, and current), hypertension and diabetes.

Supplementary Table 5. Odds ratio (95% CI) for prevalent gout according to serum iron status indicators among male adults in NHANES 2017–2018 (N = 2,216).

Variables	Model 1			Model 2		
	OR	95%CI	*P*	OR	95%CI	*P*
Ferritin (ng/mL)	1.00	1.00-1.00	0.596	1.00	1.00-1.00	0.712
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	0.56	0.19-1.69	0.341	1.84	0.16-1.71	0.393
Q3	0.78	0.31-1.99	0.621	1.63	0.30-2.01	0.652
Q4	0.81	0.29-2.23	0.696	1.72	0.27-2.28	0.696
Serum iron (ug/dL)	1.00	0.99-1.01	0.504	1.01	0.99-1.01	0.802
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	0.88	0.43-1.78	0.730	1.45	0.44-1.92	0.850
Q3	0.64	0.25-1.62	0.379	1.71	0.25-2.10	0.618
Q4	0.82	0.33-2.05	0.686	1.67	0.36-2.68	0.981
TIBC (ug/dL)	1.00	1.00-1.01	0.228	1.00	1.00-1.01	0.402
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	1.82	0.88-3.78	0.151	1.46	0.85-3.75	0.265
Q3	1.11	0.61-2.00	0.748	1.37	0.52-1.78	0.916
Q4	1.65	0.76-3.58	0.243	1.51	0.68-3.40	0.416
TSAT (%)	0.98	0.95-1.02	0.419	1.02	0.95-1.03	0.713
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	0.67	0.32-1.41	0.329	1.50	0.34-1.69	0.569
Q3	0.73	0.30-1.78	0.509	1.71	0.29-2.37	0.757
Q4	0.60	0.22-1.68	0.367	1.80	0.25-2.45	0.710

Abbreviations: CI, confidence interval; OR, odds ratio; NHANES, National Health and Nutrition Examination Survey; Ref, reference; TIBC, total iron-binding capacity; TSAT, transferrin saturation.

Model 1 was adjusted for age and ethnicity (Mexican American, other Hispanic origins, non-Hispanic White, non-Hispanic Black, and other race).

Model 2 was adjusted for age, ethnicity, body mass index (BMI) (<25.0, 25.0 to <30.0, and ≥30.0 kg/m^2), smoking status (never, former, and current), hypertension and diabetes.

Supplementary Table 6. Odds ratio (95% CI) for prevalent gout according to serum iron status indicators among female adults in NHANES 2017–2018 (N = 2,419).

Variables	Model 1			Model 2		
	OR	95%CI	*P*	OR	95%CI	*P*
Ferritin (ng/mL)	1.00	1.00-1.00	0.053	1.00	1.00-1.00	0.087
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	1.96	1.09-3.51	0.060	2.06	1.12-3.80	0.146
Q3	2.36	0.85-6.54	0.142	2.12	0.81-5.58	0.267
Q4	4.17	1.45-11.93	0.033	4.16	1.45-11.92	0.118
Serum iron (ug/dL)	0.99	0.98-1.00	0.207	1.00	0.99-1.01	0.520
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	1.02	0.46-2.27	0.962	1.21	0.54-2.70	0.687
Q3	0.68	0.34-1.35	0.306	0.85	0.42-1.71	0.692
Q4	0.45	0.15-1.35	0.195	0.62	0.21-1.80	0.471
TIBC (ug/dL)	1.00	0.99-1.00	0.193	0.99	0.99-1.00	0.060
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	1.56	0.66-3.70	0.344	1.48	0.63-3.48	0.460
Q3	0.91	0.32-2.59	0.867	0.84	0.28-2.53	0.787
Q4	0.75	0.31-1.84	0.553	0.56	0.26-1.18	0.268
TSAT (%)	0.99	0.96-1.02	0.363	1.00	0.97-1.03	0.961
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	1.12	0.62-2.01	0.721	1.27	0.71-2.29	0.502
Q3	0.88	0.41-1.92	0.763	1.14	0.54-2.42	0.768
Q4	0.54	0.22-1.33	0.220	0.83	0.34-2.01	0.719

Abbreviations: CI, confidence interval; OR, odds ratio; NHANES, National Health and Nutrition Examination Survey; Ref, reference; TIBC, total iron-binding capacity; TSAT, transferrin saturation.

Model 1 was adjusted for age and ethnicity (Mexican American, other Hispanic origins, non-Hispanic White, non-Hispanic Black, and other race).

Model 2 was adjusted for age, ethnicity, body mass index (BMI) (<25.0, 25.0 to <30.0, and ≥30.0 kg/m^2), smoking status (never, former, and current), hypertension and diabetes.

Supplementary Table 7. Odds ratio (95% CI) for prevalent gout according to serum iron status indicators among people older than 50 years in NHANES 2017–2018 (N = 2,465).

Variables	Model 1			Model 2		
	OR	95%CI	*P*	OR	95%CI	*P*
Ferritin (ng/mL)	1.00	1.00-1.00	0.921	1.00	1.00-1.00	0.974
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	0.92	0.34-2.51	0.876	1.76	0.29-2.71	0.861
Q3	1.22	0.57-2.64	0.624	1.49	0.55-2.59	0.699
Q4	0.99	0.59-1.68	0.977	1.35	0.55-1.81	0.999
Serum iron (ug/dL)	0.99	0.99-1.00	0.062	1.00	0.99-1.00	0.365
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	0.80	0.48-1.35	0.435	1.33	0.50-1.51	0.667
Q3	0.51	0.26-1.00	0.091	1.48	0.27-1.25	0.302
Q4	0.66	0.40-1.09	0.152	1.38	0.44-1.53	0.591
TIBC (ug/dL)	1.00	1.00-1.01	0.769	1.00	0.99-1.01	0.998
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	1.73	0.81-3.71	0.202	1.50	0.77-3.73	0.322
Q3	1.00	0.51-1.95	0.997	1.42	0.44-1.77	0.766
Q4	1.30	0.72-2.35	0.416	1.34	0.66-2.11	0.624
TSAT (%)	0.98	0.96-1.00	0.126	1.01	0.96-1.01	0.507
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	0.89	0.48-1.65	0.717	1.39	0.51-1.89	0.962
Q3	0.74	0.38-1.42	0.391	1.48	0.38-1.79	0.673
Q4	0.59	0.32-1.10	0.141	1.45	0.37-1.61	0.561

Abbreviations: CI, confidence interval; OR, odds ratio; NHANES, National Health and Nutrition Examination Survey; Ref, reference; TIBC, total iron-binding capacity; TSAT, transferrin saturation.

Model 1 was adjusted for gender (male, female) and ethnicity (Mexican American, other Hispanic origins, non-Hispanic White, non-Hispanic Black, and other race).

Model 2 was adjusted for gender, ethnicity, body mass index (BMI) (<25.0, 25.0 to <30.0, and ≥30.0 kg/m^2), smoking status (never, former, and current), hypertension and diabetes.

Supplementary Table 8. Odds ratio (95% CI) for prevalent gout according to serum iron status indicators among people less than 50 years in NHANES 2017–2018 (N = 2,170).

Variables	Model 1			Model 2		
	OR	95%CI	*P*	OR	95%CI	*P*
Ferritin (ng/mL)	1.00	1.00-1.00	0.001	1.00	1.00-1.00	0.022
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	2.14	0.62-7.36	0.269	1.85	0.53-6.41	0.434
Q3	2.70	0.38-18.96	0.351	2.28	0.33-15.92	0.493
Q4	11.79	1.50-92.74	0.052	9.04	0.98-83.58	0.192
Serum iron (ug/dL)	1.00	0.99-1.01	0.634	1.00	0.99-1.01	0.710
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	1.59	0.45-5.61	0.496	2.01	0.52-7.72	0.417
Q3	1.30	0.43-3.95	0.661	1.97	0.54-7.15	0.412
Q4	0.96	0.26-3.62	0.957	1.39	0.36-5.36	0.678
TIBC (ug/dL)	1.00	0.99-1.00	0.233	0.99	0.98-1.00	0.237
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	1.22	0.43-3.42	0.720	1.05	0.36-3.09	0.932
Q3	0.72	0.20-2.57	0.628	0.63	0.16-2.52	0.582
Q4	0.55	0.17-1.80	0.358	0.42	0.11-1.57	0.325
TSAT (%)	1.00	0.97-1.02	0.873	1.01	0.99-1.04	0.433
Q1	Ref	Ref	Ref	Ref	Ref	Ref
Q2	0.52	0.18-1.52	0.272	0.66	0.21-2.11	0.554
Q3	1.06	0.36-3.07	0.920	1.39	0.48-4.09	0.607
Q4	0.72	0.21-2.43	0.611	1.07	0.31-3.68	0.923

Abbreviations: CI, confidence interval; OR, odds ratio; NHANES, National Health and Nutrition Examination Survey; Ref, reference; TIBC, total iron-binding capacity; TSAT, transferrin saturation.

Model 1 was adjusted for gender (male, female) and ethnicity (Mexican American, other Hispanic origins, non-Hispanic White, non-Hispanic Black, and other race).

Model 2 was adjusted for gender, ethnicity, body mass index (BMI) (<25.0, 25.0 to <30.0, and ≥30.0 kg/m^2), smoking status (never, former, and current), hypertension and diabetes.

Supplementary Table 9. Odds ratio (95% CI) for prevalent gout according to serum iron status indicators among participants in NHANES 2017–2018 (weighted) after multiple imputations (N=4,881).

Variables	Model 1		Model 2	
	OR (95%CI)	*P*	OR (95%CI)	*P*
Ferritin (ng/mL)	1.00 (1.00-1.00)	0.078	1.00 (1.00-1.00)	0.170
Quantile 1	1.00 (Reference)		1.00 (Reference)	
Quantile 2	0.92 (0.41-2.10)	0.855	0.92 (0.38-2.22)	0.878
Quantile 3	1.05 (0.48-2.27)	0.909	1.05 (0.49-2.26)	0.917
Quantile 4	1.22 (0.72-2.07)	0.495	1.22 (0.73-2.05)	0.587
Iron (ug/dL)	0.99 (0.99-1.00)	0.065	1.00 (0.99-1.00)	0.354
Quantile 1	1.00 (Reference)		1.00 (Reference)	
Quantile 2	0.90 (0.57-1.42)	0.660	1.00 (0.62-1.61)	0.994
Quantile 3	0.65 (0.34-1.24)	0.239	0.76 (0.39-1.48)	0.566
Quantile 4	0.70 (0.41-1.20)	0.247	0.88 (0.50-1.55)	0.728
TIBC (ug/dL)	1.00 (1.00-1.01)	0.594	1.00 (1.00-1.00)	0.902
Quantile 1	1.00 (Reference)		1.00 (Reference)	
Quantile 2	1.77 (0.94-3.33)	0.125	1.73 (0.92-3.27)	0.340
Quantile 3	1.17 (0.66-2.05)	0.612	1.01 (0.57-1.78)	0.986
Quantile 4	1.38 (0.79-2.41)	0.306	1.18 (0.68-2.02)	0.664
TSAT (%)	0.98 (0.96-1.00)	0.099	0.99 (0.97-1.01)	0.470
Quantile 1	1.00 (Reference)		1.00 (Reference)	
Quantile 2	1.07 (0.65-1.75)	0.804	1.24 (0.74-2.07)	0.563
Quantile 3	0.69 (0.40-1.20)	0.238	0.84 (0.45-1.57)	0.686
Quantile 4	0.76 (0.43-1.35)	0.391	1.02 (0.55-1.91)	0.958

OR: Odds Ratio, CI: Confidence Interval

Model 1: Adjust: Age, Gender, Race

Model 2: Adjust: Age, Gender, Race, Smoke, BMI, Hypertension, Diabetes

Supplementary Table 10. Odds ratio (95% CI) for prevalent gout according to serum iron status indicators among participants in NHANES 2017–2018 after fully adjusted.

Variables	Model	
	OR (95%CI)	*P*
Ferritin (ng/mL)	1.00 (1.00-1.00)	0.722
Quantile 1	1.00 (Reference)	
Quantile 2	1.81 (0.90-3.63)	0.096
Quantile 3	1.42 (0.71-2.84)	0.327
Quantile 4	1.80 (0.92-3.52)	0.084
Iron (ug/dL)	0.99 (0.99-0.99)	**0.035**
Quantile 1	1.00 (Reference)	
Quantile 2	1.15 (0.66-2.01)	0.624
Quantile 3	0.84 (0.48-1.47)	0.539
Quantile 4	0.75 (0.42-1.36)	0.345
TIBC (ug/dL)	1.00 (1.00-1.00)	0.982
Quantile 1	1.00 (Reference)	
Quantile 2	1.22 (0.73-2.06)	0.450
Quantile 3	1.23 (0.74-2.05)	0.423
Quantile 4	1.02 (0.57-1.82)	0.953
TSAT (%)	0.98 (0.96-0.99)	**0.048**
Quantile 1	1.00 (Reference)	
Quantile 2	0.87 (0.49-1.57)	0.649
Quantile 3	0.87 (0.50-1.51)	0.626
Quantile 4	0.58 (0.32-1.04)	0.068

OR: Odds Ratio, CI: Confidence Interval

Model: Adjust: Age, Gender, Race, education, PIR, BMI, Smoke, Drink, Hypertension, Diabetes, HDL, LDL

Supplementary Table 11. Odds ratio (95% CI) for prevalent gout according to serum iron status indicators after propensity score matching by sex and age in a ratio of 1:4 (N=1,271).

Variables	Model 1		Model 2	
	OR (95%CI)	*P*	OR (95%CI)	*P*
Ferritin (ng/mL)	1.00 (1.00-1.00)	0.689	1.00 (1.00-1.00)	0.814
Quantile 1	1.00 (Reference)		1.00 (Reference)	
Quantile 2	1.27 (0.51-3.19)	0.627	1.30 (0.51-3.32)	0.682
Quantile 3	1.47(0.56-3.86)	0.467	1.43 (0.55-3.72)	0.599
Quantile 4	1.32(0.71-2.45)	0.414	1.31 (0.66-2.58)	0.582
Iron (ug/dL)	1.00 (0.99-1.00)	0.231	1.00 (0.99-1.00)	0.333
Quantile 1	1.00 (Reference)		1.00 (Reference)	
Quantile 2	0.94(0.55-1.58)	0.815	0.96 (0.55-1.68)	0.900
Quantile 3	0.59 (0.30-1.19)	0.192	0.61 (0.28-1.32)	0.428
Quantile 4	0.75 (0.37-1.52)	0.450	0.74 (0.33-1.65)	0.595
TIBC (ug/dL)	1.00 (0.99-1.00)	0.886	1.00 (0.99-1.00)	0.888
Quantile 1	1.00 (Reference)		1.00 (Reference)	
Quantile 2	1.39 (0.61-3.18)	0.459	1.39 (0.62-3.11)	0.566
Quantile 3	0.82 (0.40-1.66)	0.594	0.82 (0.41-1.63)	0.674
Quantile 4	1.12 (0.55-2.25)	0.768	1.10 (0.54-2.26)	0.834
TSAT (%)	0.99 (0.96~ 1.01)	0.308	0.99 (0.96-1.01)	0.407
Quantile 1	1.00 (Reference)		1.00 (Reference)	
Quantile 2	0.77 (0.43-1.39)	0.418	0.79 (0.42-1.49)	0.594
Quantile 3	0.76 (0.37-1.54)	0.469	0.75 (0.34-1.69)	0.615
Quantile 4	0.61 (0.28-1.31)	0.250	0.60 (0.25-1.46)	0.463

OR: Odds Ratio, CI: Confidence Interval

Model 1: Adjust: Age, Gender

Model 2: Adjust: Age, Gender, Smoke, BMI, Hypertension, Diabetes

Supplementary Table 12. Effect estimates of the associations between serum iron status indicators and risk of gout in FinnGen.

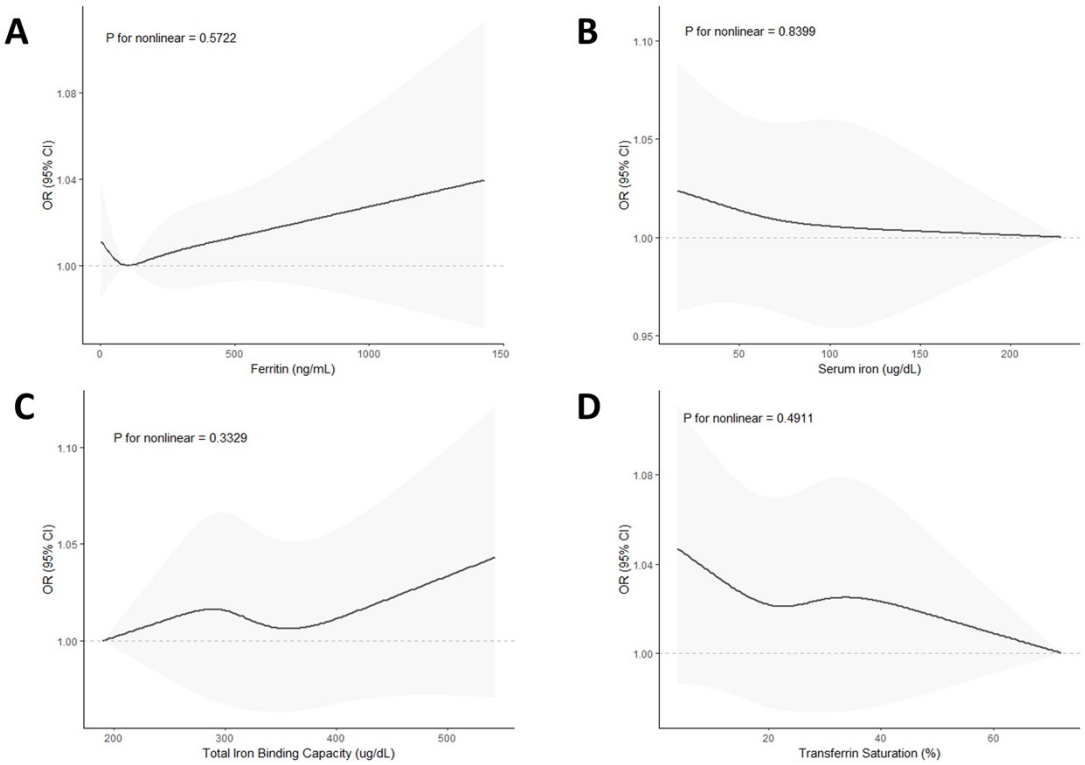
Methods	No. SNPs	OR	95% CI	*P*-value
Ferritin-2021				
Inverse-variance weighted	32	1.24	0.89-1.73	0.199
Weighted median	32	1.10	0.79-1.52	0.574
Maximum-likelihood method	32	1.25	0.90-1.75	0.189
MR-PRESSO test (1 outliers)	31	1.24	0.89-1.73	0.208
MR-Egger	32	/	/	0.435*
Iron-2021				
Inverse-variance weighted	12	1.24	1.06-1.46	0.009
Weighted median	12	1.28	1.03-1.59	0.026
Maximum-likelihood method	12	1.25	1.03-1.50	0.024
MR-PRESSO test	12	1.24	1.03-1.50	0.048
MR-Egger	12	/	/	0.853*
TIBC-2021				
Inverse-variance weighted	12	1.03	0.89-1.20	0.648
Weighted median	12	1.10	0.98-1.23	0.099
Maximum-likelihood method	12	1.04	0.89-1.20	0.643
MR-PRESSO test (1 outliers)	11	1.03	0.89-1.20	0.656
MR-Egger	12	/	/	0.044*
TSAT-2021				
Inverse-variance weighted	9	1.10	0.92-1.32	0.299
Weighted median	9	1.13	0.93-1.39	0.224
Maximum-likelihood method	9	1.10	0.92-1.32	0.297
MR-PRESSO test (1 outliers)	8	1.10	0.92-1.32	0.330
MR-Egger	9	/	/	0.544*

Abbreviations: CI, confidence interval; MR, Mendelian randomization; MR-PRESSO, MR pleiotropy residual sum and outlier; No., number of; OR, odds ratio; TIBC, total iron-binding capacity; TSAT, transferrin saturation. **P*-value of the intercept from MR-Egger regression analysis.

Supplementary Table 13. Effect estimates of the associations between serum iron status indicators and risk of gout in Global Urate Genetics Consortium.

Method	No. SNPs	OR	95% CI	*P*-value
Ferritin-2021				
Inverse-variance weighted	19	1.87	1.00-3.49	0.049
Weighted median	19	1.70	0.87-3.33	0.123
Maximum-likelihood method	19	1.91	1.02-3.59	0.043
MR-PRESSO test (1 outliers)	18	1.87	1.00-3.49	0.065
MR-Egger	19	/	/	0.722*
Iron-2021				
Inverse-variance weighted	6	1.38	1.08-1.78	0.011
Weighted median	6	1.73	1.24-2.40	0.001
Maximum-likelihood method	6	1.38	1.08-1.78	0.011
MR-PRESSO test (1 outliers)	6	1.38	1.11-1.73	0.035
MR-Egger	6	/	/	0.679*
TIBC-2021				
Inverse-variance weighted	8	0.90	0.76-1.05	0.172
Weighted median	8	0.88	0.73-1.07	0.215
Maximum-likelihood method	8	0.21	0.75-1.06	0.895
MR-PRESSO test (1 outliers)	7	0.90	0.75-1.06	0.249
MR-Egger	8	/	/	0.974*
TSAT-2021				
Inverse-variance weighted	6	1.29	1.07-1.57	0.009
Weighted median	6	1.35	1.07-1.70	0.011
Maximum-likelihood method	6	1.29	1.07-1.57	0.009
MR-PRESSO test (1 outliers)	6	1.29	1.10-1.52	0.027
MR-Egger	6	/	/	0.456*

Abbreviations: CI, confidence interval; MR, Mendelian randomization; MR-PRESSO, MR pleiotropy residual sum and outlier; No., number of; OR, odds ratio; TIBC, total iron-binding capacity; TSAT, transferrin saturation. **P*-value of the intercept from MR-Egger regression analysis.



Supplementary Figure 1. Observational association of serum iron status indicators with gout risk using a restricted cubic spline model. (A) Association between serum ferritin (ng/mL) levels and gout risk *(P*-value for nonlinearity = 0.5722). (B) Association between serum iron (μg/dL) levels and gout risk *(P*-value for nonlinearity = 0.8399). (C) Association between total iron-binding capacity (TIBC) (μg/dL) and gout risk *(P*-value for nonlinearity = 0.3329). (D) Association between transferrin saturation (%) and gout risk *(P*-value for nonlinearity = 0.4911). In the analysis, the model was adjusted to age, gender, ethnicity, smoking status, BMI, hypertension and diabetes. Each figure represents the adjusted odds ratio for gout risk relative to specific iron status indicators, with a shaded gray area depicting the 95% confidence interval.