

Supplementary Material

Supplementary Table

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Table S1. Definitions of infections and infectious diseases from UK biobank or US NHANES.

Variables	Subcategories	ICD-10 and 9 code/NHANES related data
Infection	Urinary system infections	ICD-10 codes: N10-12, N13.6, N15.1, N30, and N34; ICD-9 codes: 5901, 5902, 5950-5952, and 5990
	Digestive infections	ICD-10 codes: K35; K36; K37; K65; K81; K83.0; K85; K75.0; ICD-9 codes: 540.0-540.9; 541; 542; 567.0-567.9; 575.0-575.12; 576.1; 577.0; 572.0.
	Surgical-related infections	ICD-10 codes: T81.4; T82.7; T83.5; T83.5; T83.6; T84.5; T84.6; T84.7; ICD-9 codes: 998.59; 996.61; 996.64; 996.69; 996.66; 996.67; 996.78.
	Skin and subcutaneous tissue infections	ICD-10 codes: L00-08; ICD-9 codes: 680-686.
	Others	ICD-10 codes: G00-G09; M00-03; R65.0; R65.1; R65.9; ICD-9 codes: 320-326; 711.0-711.9; 995.91-995.93;
Infectious diseases	Total infectious diseases	ICD-10 codes A00–B99 and J00–J22; ICD-9 codes 001–139 and 480–487
	Respiratory infectious diseases	ICD-10 codes A15, A37, A39, B01, B02, B05, B06, B26, and J00-J06; J09–J11; ICD-9 codes 001, 012, 033, 036, 053, 055, 056, 072 and 487
	Digestive infectious diseases	ICD-10 codes A00–A09, B15, B17.2, B67, B68, B77, B80, and B82; ICD-9 codes 001–009, 0701, and 122
NHANES outcome	Chlamydia	Urine specimens positive for chlamydia
	HBV	Blood sample positive for hepatitis B surface antigen

HCV	Blood sample positive for both hepatitis C antibody and hepatitis C RNA
HDV	Blood sample positive for hepatitis D antibody
HEV	Blood sample positive for both hepatitis C IgG antibody and hepatitis C IgE antibody
HIV	Blood sample positive for HIV-1 or HIV-2 antibody
HSV-2	Blood sample positive for herpes simplex virus Type-2
HPV	Vaginal/Penile swab sample positive for any type of human papillomavirus
Toxocara	Antibody to Toxocara
Toxoplasma	Toxoplasma gondii Antibody
Tuberculosis (TB)	Positive in TB skin testing
Trichomonas	Urine Trichomonas rRNA detection

Table S2. Stability of time-dependent covariates at every follow-up time point.

Sarcopenia	Variables	Time point		
		2006-2010 (67,837)	2012-2013	2013-2022
Non	BMI	26.6 ± 4.3	26.8 ± 4.4	26.6 ± 4.4
	NLR	2.27 ± 1.03	2.31 ± 1.17	2.59 ± 1.49
	CRP	2.04 ± 3.54	2.24 ± 3.94	-
	eGFR	86.8 ± 14.7	83.8 ± 15.4	-
	Low IPAQ	11,267 (17.1)	475 (16.7)	1,641 (17.3)
	Moderate	28,848 (43.8)	1,200 (42.1)	4,127 (43.5)
	High	25,750 (39.1)	1,125 (41.2)	4,032 (39.2)
	Never drink	1,655 (2.5)	607 (3.3)	1,780 (3.2)
	Previous	1,457 (2.2)	557 (3.1)	1,951 (3.5)
	Current	62,753 (95.3)	17,072 (93.6)	51,869 (93.3)
	Never smoke	39,568 (60.1)	10,968 (60.1)	34,715 (62.4)
	Previous	21,891 (33.2)	6,409 (35.1)	18,897 (34.0)
	Current	4,406 (6.7)	862 (4.7)	2,010 (3.6)
	Probable	BMI	28.5 ± 5.9	29.1 ± 6.3
NLR		2.34 ± 1.25	2.67 ± 1.52	2.83 ± 1.74
CRP		3.00 ± 4.93	3.23 ± 5.06	-
eGFR		88.2 ± 16.0	84.8 ± 17.5	-
Low IPAQ		412 (21.5)	31 (21.0)	324 (21.2)
Moderate		838 (43.7)	63 (42.8)	668 (43.8)
High		667 (34.8)	53 (36.1)	533 (35.0)
Never drink		83 (4.3)	34 (5.4)	74 (5.0)
Previous		62 (3.2)	29 (4.6)	78 (5.3)

	Current	1,772 (92.4)	568 (90.0)	1319 (89.7)
	Never smoke	1,110 (57.9)	379 (34.2)	887 (60.3)
	Previous	703 (36.7)	703 (63.5)	525 (35.7)
	Current	104 (5.4)	25 (2.3)	59 (4.0)
Confirmed	BMI	33.5 ± 5.8	33.9 ± 5.6	33.0 ± 6.1
	NLR	2.45 ± 1.07	2.59 ± 1.04	3.81 ± 1.23
	CRP	4.57 ± 5.05	7.44 ± 8.47	-
	eGFR	87.6 ± 15.3	80.4 ± 14.9	-
	Low IPAQ	16 (29.1)	4 (33.3)	6 (28.6)
	Moderate	26 (47.3)	6 (50.0)	10 (47.6)
	High	13 (23.6)	2 (16.7)	5 (23.8)
	Never drink	4 (7.3)	2 (11.1)	5 (12.5)
	Previous	5 (9.1)	1 (5.6)	3 (7.5)
	Current	46 (83.6)	15 (83.3)	32 (80.0)
	Never smoke	29 (52.7)	10 (55.6)	24 (57.1)
	Previous	22 (40.0)	7 (38.9)	16 (38.1)
	Current	4 (7.3)	1 (5.6)	2 (4.8)

Table S3. Subgroup analysis of the association between sarcopenia and the incidence of infections.

Subgroup	N	Sarcopenia			p for interaction
		Non	Probable	Confirmed	
Age					<0.001
<65	372,894	Reference	1.23 (1.18, 1.29)	1.64 (1.37, 1.98)	
≥65	85,438	Reference	1.10 (1.04, 1.17)	1.07 (0.87, 1.30)	
Gender					0.618
Women	250,410	Reference	1.16 (1.10, 1.22)	1.32 (1.01, 1.71)	
Men	207,922	Reference	1.20 (1.14, 1.26)	1.31 (1.12, 1.54)	
BMI					0.002
<30 kg/m ²	348,841	Reference	1.27 (1.21, 1.33)	1.28 (0.99, 1.64)	
≥30 kg/m ²	109,491	Reference	1.17 (1.12, 1.24)	1.49 (1.27, 1.76)	
Race					0.314
White	432,853	Reference	1.17 (1.13, 1.22)	1.30 (1.12, 1.51)	
Asian or Asian British	8,620	Reference	1.27 (1.07, 1.52)	1.51 (1.01, 2.26)	
Black or Black British	8,021	Reference	1.24 (0.93, 1.65)	1.17 (0.00, Inf)	

Other	8,838	Reference	1.20 (0.95, 1.53)	1.68 (0.78, 3.60)	
Townsend deprivation index					0.040
Low	153,084	Reference	1.14 (1.05, 1.23)	1.79 (1.33, 2.41)	
Moderate	152,841	Reference	1.20 (1.12, 1.28)	1.39 (1.06, 1.83)	
High	152,407	Reference	1.28 (1.22, 1.35)	1.33 (1.10, 1.59)	
Education					0.328
College	151,833	Reference	1.22 (1.12, 1.32)	1.29 (0.87, 1.91)	
High school	175,861	Reference	1.24 (1.16, 1.32)	1.40 (1.05, 1.86)	
Middle school	53,146	Reference	1.13 (1.02, 1.25)	1.71 (1.19, 2.47)	
Others	77,492	Reference	1.23 (1.16, 1.31)	1.41 (1.17, 1.69)	
Smoking status					0.073
Never	252,175	Reference	1.28 (1.21, 1.35)	1.39 (1.13, 1.71)	
Previous	156,853	Reference	1.14 (1.08, 1.21)	1.41 (1.15, 1.73)	
Current	49,322	Reference	1.25 (1.13, 1.39)	1.20 (0.78, 1.84)	
Alcohol status					0.515
Never	19,560	Reference	1.26 (1.11, 1.42)	1.24 (0.82, 1.86)	
Previous	15,344	Reference	1.20 (1.05, 1.37)	1.35 (0.83, 2.18)	

Current	423,428	Reference	1.12 (1.07, 1.16)	1.26 (1.08, 1.47)	
Physical inactivity					0.751
Low	79,917	Reference	1.24 (1.15, 1.33)	1.34 (1.06, 1.71)	
Moderate	197,290	Reference	1.22 (1.16, 1.29)	1.48 (1.20, 1.81)	
High	181,125	Reference	1.21 (1.14, 1.29)	1.39 (1.06, 1.83)	
Hypertension					0.428
No	348,499	Reference	1.21 (1.16, 1.27)	1.37 (1.12, 1.66)	
Yes	109,833	Reference	1.24 (1.17, 1.31)	1.48 (1.23, 1.79)	
Diabetes					0.052
No	437,371	Reference	1.23 (1.18, 1.28)	1.50 (1.29, 1.76)	
Yes	20,961	Reference	1.17 (1.07, 1.28)	1.24 (0.94, 1.64)	
eGFR					0.517
<60 mL/min/1.73m ²	15,032	Reference	1.10 (0.96, 1.26)	1.59 (1.05, 2.41)	
≥60 mL/min/1.73m ²	443,300	Reference	1.22 (1.18, 1.27)	1.38 (1.19, 1.59)	

The Cox regression model was adjusted for age, gender, race, BMI, Townsend deprivation index, educational attainment, physical inactivity, drinking and smoking status, diabetes, hypertension, eGFR, CRP, and NLR unless the covariate was used for stratification.

Table S4. Subgroup analysis of the association between sarcopenia and the incidence of infectious diseases.

Subgroup	N	Sarcopenia			<i>p</i> for interaction
		Non	Probable	Confirmed	
Age					<0.001
<65	372,894	Reference	1.40 (1.35, 1.45)	1.70 (1.45, 1.99)	
≥65	85,438	Reference	1.16 (1.11, 1.22)	1.37 (1.18, 1.60)	
Gender					0.927
Women	250,410	Reference	1.30 (1.25, 1.36)	1.48 (1.18, 1.85)	
Men	207,922	Reference	1.30 (1.25, 1.35)	1.53 (1.35, 1.73)	
BMI					0.034
<30 kg/m ²	348,841	Reference	1.32 (1.27, 1.38)	1.44 (1.20, 1.73)	
≥30 kg/m ²	109,491	Reference	1.28 (1.22, 1.33)	1.60 (1.40, 1.83)	
Race					0.216
White	432,853	Reference	1.30 (1.26, 1.34)	1.55 (1.38, 1.74)	
Asian or Asian British	8,620	Reference	1.18 (1.02, 1.35)	1.33 (0.96, 1.86)	
Black or Black British	8,021	Reference	1.09 (0.87, 1.36)	1.05 (0.39, 2.82)	
Other	8,838	Reference	1.48 (1.25, 1.77)	1.76 (0.96, 3.24)	

Townsend deprivation index					0.181
Low	153,084	Reference	1.25 (1.18, 1.33)	1.84 (1.43, 2.37)	
Moderate	152,841	Reference	1.32 (1.25, 1.39)	1.35 (1.07, 1.71)	
High	152,407	Reference	1.31 (1.26, 1.36)	1.51 (1.31, 1.74)	
Education					<0.001
College	151,833	Reference	1.30 (1.22, 1.39)	1.79 (1.33, 2.40)	
High school	175,861	Reference	1.37 (1.30, 1.44)	1.70 (1.36, 2.12)	
Middle school	53,146	Reference	1.28 (1.19, 1.39)	1.63 (1.19, 2.24)	
Others	77,492	Reference	1.24 (1.19, 1.30)	1.39 (1.19, 1.61)	
Smoking status					0.437
Never	252,175	Reference	1.31 (1.26, 1.37)	1.64 (1.39, 1.94)	
Previous	156,853	Reference	1.26 (1.21, 1.32)	1.44 (1.22, 1.70)	
Current	49,322	Reference	1.36 (1.26, 1.46)	1.39 (1.01, 1.91)	
Alcohol status					0.970
Never	19,560	Reference	1.31 (1.18, 1.44)	1.49 (1.07, 2.07)	
Previous	15,344	Reference	1.35 (1.22, 1.50)	1.70 (1.15, 2.51)	
Current	423,428	Reference	1.29 (1.25, 1.33)	1.50 (1.33, 1.69)	

Physical inactivity					0.641
Low	79,917	Reference	1.33 (1.25, 1.41)	1.55 (1.28, 1.88)	
Moderate	197,290	Reference	1.26 (1.21, 1.32)	1.51 (1.28, 1.78)	
High	181,125	Reference	1.32 (1.26, 1.39)	1.49 (1.20, 1.85)	
Hypertension					0.047
No	348,499	Reference	1.31 (1.26, 1.36)	1.56 (1.34, 1.82)	
Yes	109,833	Reference	1.29 (1.23, 1.35)	1.49 (1.28, 1.74)	
Diabetes					0.162
No	437,371	Reference	1.30 (1.26, 1.35)	1.54 (1.36, 1.75)	
Yes	20,961	Reference	1.27 (1.18, 1.36)	1.51 (1.22, 1.87)	
eGFR					0.483
<60 mL/min/1.73m ²	15,032	Reference	1.32 (1.18, 1.46)	1.54 (1.08, 2.21)	
≥60 mL/min/1.73m ²	443,300	Reference	1.29 (1.26, 1.33)	1.50 (1.34, 1.68)	

The Cox regression model was adjusted for age, gender, race, BMI, Townsend deprivation index, educational attainment, physical inactivity, drinking and smoking status, diabetes, hypertension, eGFR, CRP, and NLR unless the covariate was used for stratification.

Abbreviation: NLR, Neutrophil-to-Lymphocyte Ratio.

Table S5. Association of sarcopenia and its components with the incidence of overall infectious diseases after completely excluding cases with missing covariates.

	No. of events (%)	Model 1 HR (95% CI) P	Model 2 HR (95% CI) P
Infections and infectious diseases			
Sarcopenia			
No (320,925)	57,226 (17.8)	Reference	Reference
Probable (14,786)	4,129 (27.9)	1.41 (1.37, 1.46) <0.001	1.17 (1.14, 1.21) <0.001
Confirmed (561)	224 (39.9)	1.86 (1.63, 2.12) <0.001	1.26 (1.11, 1.44) <0.001
Infections			
Sarcopenia			
No (320,925)	28,735 (9.0)	Reference	Reference
Probable (14,786)	2,123 (14.4)	1.40 (1.34, 1.47) <0.001	1.13 (1.08, 1.18) <0.001
Confirmed (561)	115 (20.5)	1.78 (1.48, 2.14) <0.001	1.21 (1.02, 1.34) 0.028
Infectious diseases			
Sarcopenia			
No (320,925)	43,034 (13.4)	Reference	Reference
Probable (14,786)	3,327 (22.5)	1.47 (1.42, 1.52) <0.001	1.22 (1.17, 1.26) <0.001
Confirmed (561)	184 (32.8)	1.89 (1.64, 2.19) <0.001	1.28 (1.11, 1.48) <0.001

Model 1 was adjusted for age, gender and ethnicity.

Based on model 1, model 2 was further adjusted for BMI, Townsend deprivation index, educational attainment, physical inactivity, drinking and smoking status, diabetes, hypertension, eGFR, CRP, and NLR.

Table S6. Association of sarcopenia and its components with the incidence of infections and infectious diseases among population with follow-up time greater than 2 years from the UK Biobank study.

	No. of events (%)	Model 1 HR (95% CI) P	Model 2 HR (95% CI) P
Infections and infectious diseases			
Sarcopenia			
No (431,611)	76,898 (17.6)	Reference	Reference
Probable (22,119)	6,183 (28.0)	1.43 (1.39, 1.47) <0.001	1.17 (1.15, 1.21) <0.001
Confirmed (931)	378 (40.6)	1.98 (1.78, 2.19) <0.001	1.35 (1.22, 1.50) <0.001
Infections			
Sarcopenia			
No (431,611)	38,775 (8.9)	Reference	Reference
Probable (22,119)	3,188 (14.4)	1.42 (1.37, 1.47) <0.001	1.13 (1.09, 1.17) <0.001
Confirmed (931)	206 (22.1)	1.99 (1.73, 2.28) <0.001	1.27 (1.11, 1.46) <0.001
Infectious diseases			
Sarcopenia			
No (432,529) (431,611)	57,914 (13.4)	Reference	Reference
Probable (22,188) (22,119)	4,975 (22.5)	1.48 (1.44, 1.53) <0.001	1.22 (1.18, 1.26) <0.001
Confirmed (931)	320 (34.4)	2.09 (1.87, 2.33) <0.001	1.43 (1.28, 1.60) <0.001

Model 1 was adjusted for age, gender and ethnicity.

Based on model 1, model 2 was further adjusted for BMI, Townsend deprivation index, educational attainment, physical inactivity, drinking and smoking status, diabetes, hypertension, eGFR, CRP, and NLR.

Table S7. Association of sarcopenia and its components with incident infections and infectious diseases using age as the time scale.

	No. of events (%)	Model 1 HR (95% CI) P	Model 2 HR (95% CI) P
Infections and infectious diseases			
Sarcopenia			
No (434,966)	76,898 (17.6)	Reference	Reference
Probable (22,419)	6,183 (28.0)	1.20 (1.17, 1.23) <0.001	1.17 (1.14, 1.20) <0.001
Confirmed (947)	378 (40.6)	1.53 (1.39, 1.69) <0.001	1.40 (1.27, 1.54) <0.001
Infections			
Sarcopenia			
No (434,966)	38,775 (8.9)	Reference	Reference
Probable (22,419)	3,188 (14.4)	1.20 (1.16, 1.24) <0.001	1.17 (1.14, 1.22) <0.001
Confirmed (947)	206 (22.1)	1.57 (1.37, 1.80) <0.001	1.46 (1.28, 1.67) <0.001
Infectious diseases			
Sarcopenia			
No (434,966)	57,914 (13.4)	Reference	Reference
Probable (22,419)	4,975 (22.5)	1.27 (1.23, 1.30) <0.001	1.23 (1.19, 1.26) <0.001
Confirmed (947)	320 (34.4)	1.66 (1.49, 1.85) <0.001	1.50 (1.34, 1.67) <0.001

Model 1 was adjusted for age, gender and ethnicity.

Based on model 1, model 2 was further adjusted for BMI, Townsend deprivation index, educational attainment, physical inactivity, drinking and smoking status, diabetes, hypertension, eGFR, CRP, and NLR.

Table S8. Baseline characteristics of participants categorized by the presence or absence of sarcopenia in the NHANES 2011-2018.

	Non- sarcopenia	Sarcopenia	P value
Number of participants (%)	8,272 (90.3)	891 (9.7)	
Age (years)	39.0 ± 11.5	38.2 ± 12.9	0.04
Male (%)	4,358 (52.7)	350 (39.3)	<0.001
Race (%)			<0.001
Mexican American	1,333 (16.1)	82 (9.2)	
Other Hispanic	864 (10.4)	71 (8.0)	
Non-Hispanic White	2,974 (36.0)	337 (37.8)	
Non-Hispanic Black	1,737 (21.0)	61 (6.8)	
Other	1,364 (16.5)	340 (38.2)	
Body Mass Index (kg/m ²)	29.6 ± 6.5	20.1 ± 2.4	<0.001
Education level (%)			<0.001
Less than 9th grade	490 (5.9)	1,364 (3.8)	
9-11th grade	949 (11.5)	1,364 (11.0)	
High school graduate	1,792 (21.7)	1,364 (20.8)	
Some college or AA degree	2,760 (33.4)	1,364 (29.7)	
College graduate or above	2,281 (27.6)	1,364 (34.7)	
PIR	2.54 ± 1.60	2.53 ± 1.64	0.808
Marital status (%)			<0.001
Married	4,109 (49.7)	406 (45.6)	
Never married	2,125 (25.7)	293 (32.9)	
Divorced	724 (8.8)	76 (8.5)	
Widowed	106 (1.3)	13 (1.5)	
Living with partner	943 (11.4)	82 (9.2)	

Separated	265 (3.2)	21 (2.4)	
Drinking status (%)			<0.001
No	968 (11.7)	153 (17.1)	
Yes	7,304 (88.3)	738 (82.8)	
Smoking status (%)			<0.001
Never	1,796 (21.7)	206 (23.1)	
Former	1,425 (17.2)	108 (12.1)	
Current	5,051 (61.1)	577 (64.8)	
Physical activity (%)			<0.001
Insufficient	1,016 (12.3)	142 (15.9)	
Moderate	3,422 (41.4)	437 (49.0)	
High	3,834 (46.3)	312 (35.0)	
History of diabetes (%)	1,517 (18.3)	117 (13.1)	<0.001
History of hypertension (%)	2,398 (29.0)	140 (15.8)	<0.001
Serum triglycerides (mg/dL)	190.7 ± 39.9	187.2 ± 40.1	0.003
Total cholesterol (mg/dL)	106.2 ± 75.5	91.3 ± 43.3	<0.001
High-density lipoprotein (mg/dL)	51.4 ± 14.9	59.4 ± 16.8	<0.001
eGFR (mL/min/1.73 m ²)	92.6 ± 21.4	103.5 ± 25.5	<0.001

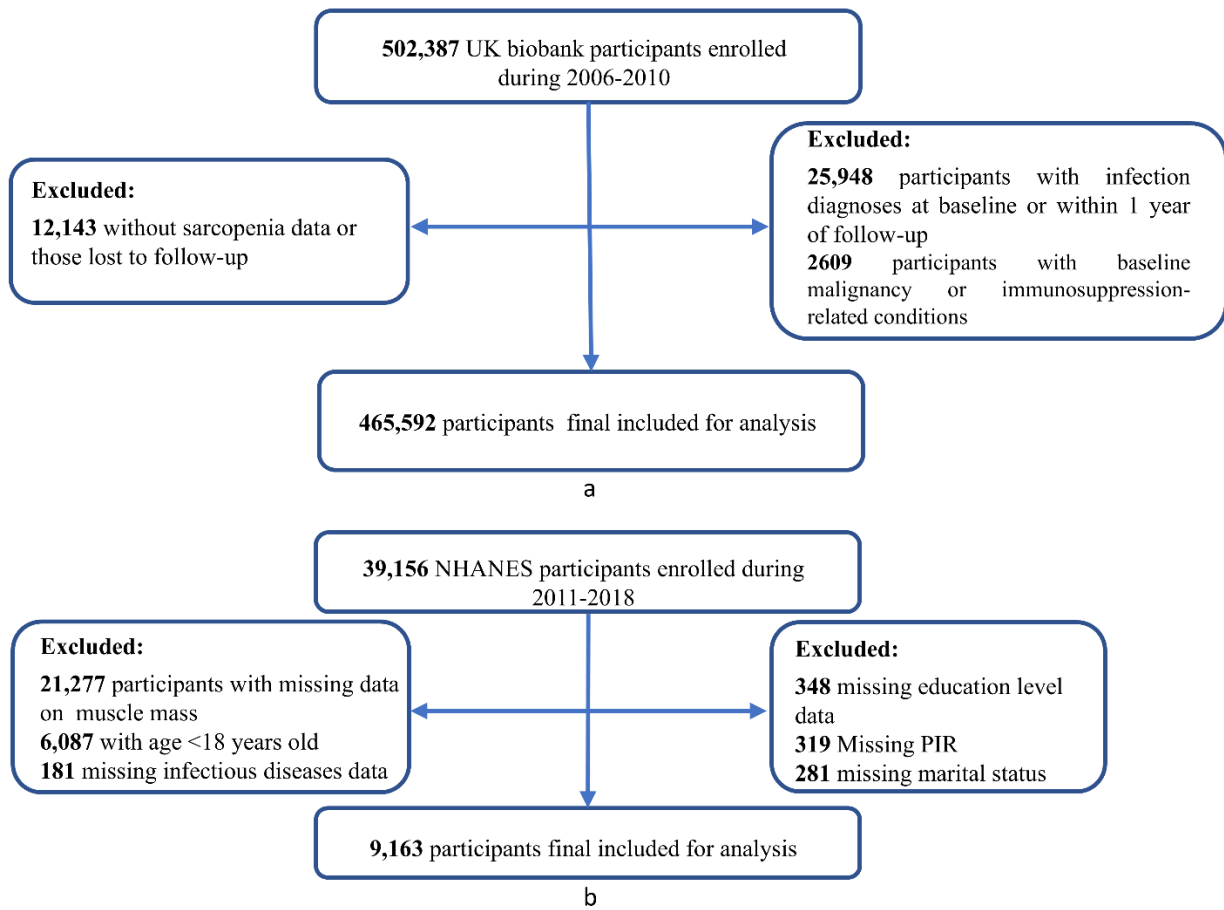


Figure S1. Flowchart of participant enrollment.