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ORIGINAL RESEARCH

Sex-Specific Reproductive Factors Augment Cardiovascular Disease Risk in Women: A Mendelian Randomization Study

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BACKGROUND: Observational studies suggest that reproductive factors are associated with cardiovascular disease, but these are liable to influence by residual confounding. This study explores the causal relevance of reproductive factors on cardiovascular disease in women using Mendelian randomization.

METHODS AND RESULTS: Uncorrelated (r^2<0.001), genome-wide significant (P<5×10^{-8}) single-nucleotide polymorphisms were extracted from sex-specific genome-wide association studies of age at first birth, number of live births, age at menarche, and age at menopause. Inverse-variance weighted Mendelian randomization was used for primary analyses on outcomes of atrial fibrillation, coronary artery disease, heart failure, ischemic stroke, and stroke. Earlier genetically predicted age at first birth increased risk of coronary artery disease (odds ratio [OR] per year, 1.49 [95% CI, 1.28–1.74], P=3.72×10^{-7}) heart failure (OR, 1.27 [95% CI, 1.06–1.53], P=0.009), and stroke (OR, 1.25 [95% CI, 1.00–1.56], P=0.048), with partial mediation through body mass index, type 2 diabetes, blood pressure, and cholesterol traits. Higher genetically predicted number of live births increased risk of atrial fibrillation (OR for <2, versus 2, versus >2 live births, 2.91 [95% CI, 1.16–7.29], P=0.023), heart failure (OR, 1.90 [95% CI, 1.28–2.82], P=0.001), ischemic stroke (OR, 1.86 [95% CI, 1.03–3.37], P=0.039), and stroke (OR, 2.07 [95% CI, 1.22–3.52], P=0.007). Earlier genetically predicted age at menarche increased risk of coronary artery disease (OR per year, 1.10 [95% CI, 1.06–1.14], P=1.68×10^{-6}) and heart failure (OR, 1.12 [95% CI, 1.07–1.17], P=5.06×10^{-7}); both associations were at least partly mediated by body mass index.

CONCLUSIONS: These results support a causal role of a number of reproductive factors on cardiovascular disease in women and identify multiple modifiable mediators amenable to clinical intervention.

Key Words: age at first birth ■ cardiovascular disease ■ menarche ■ menopause ■ parity ■ reproductive

Cardiovascular disease (CVD) is a leading cause of morbidity and mortality in women. In the general population, a large proportion of the burden of CVD can be explained by well-established "traditional" risk factors that include family history, hypertension, diabetes, obesity, smoking, hypercholesterolemia, and male sex.[1] Importantly though, women with cardiovascular events tend to have different clinical presentations than men, are more often mischaracterized as low risk[2] and ultimately have been reported to have a worse prognosis.[3,4] Sex-specific factors might thus improve prediction of cardiovascular risk in women.

In recent years, observational research has identified that reproductive factors such as early menarche, early menopause, recurrent pregnancy loss, and the timing and number of births are all associated with later life CVD in women,[5–14] with important implications for CVD prevention and risk profiling. However, such observational studies are limited by potential bias from residual confounding. This limits causal inference relating

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CLINICAL PERSPECTIVE

What Is New?

- This study provides genetic evidence to support that earlier first birth, higher number of live births, and earlier menarche are associated with higher risk of atrial fibrillation, coronary artery disease, heart failure, and stroke in women.
- For age at first birth, this increased risk was at least partly mediated by traditional cardiometabolic risk factors: body mass index, high-density lipoprotein cholesterol, and systolic blood pressure.
- For age at menarche, this increased risk was largely mediated by higher body mass index.

What Are the Clinical Implications?

- The results support the emerging research focus on female-specific risk factors, stressing the importance of their routine evaluation in clinical risk stratification.
- Additionally, the results highlight that close monitoring and early modification of cardiometabolic factors is a key strategy that will at least partly mitigate the increased cardiovascular risk conferred by these reproductive factors.

Nonstandard Abbreviations and Acronyms

EA	educational attainment
MR	Mendelian randomization
SBP	systolic blood pressure
T2D	type 2 diabetes

to the role of reproductive factors on CVD, and their causal role above and beyond that of other "traditional" cardiovascular risk factors. Indeed, many reproductive factors that are associated with CVD, such as higher parity, are also associated with adverse cardiovascular risk factor profiles[15–17] and differences in socioeconomic and behavioral factors,[17] providing viable pathways for confounding. The potential influence of these time-varying socioeconomic confounders is difficult to account for using observational data, owing to limitations in the ability to optimally measure and adjust for them.

The Mendelian randomization (MR) framework can be used to provide more reliable estimates of the causal effects of risk factors on outcomes in this setting. Because the process of random allele assortment at conception leads to an effective "randomization" of individuals to high or low genetic risk of diseases or phenotypes, the genetic liability for a risk factor (eg, age at menarche) can be used as a proxy indicator for the exposure. Because the allocation to "high" or "low" genetic risk is random and therefore not influenced by confounding or reverse causation, this framework can be used to infer causality of the risk factor on an outcome under a set of key assumptions.

The aim of this study was to use the MR framework to explore the causal pathways underlying the associations between female reproductive history (age at first birth, number of live births, age at menarche, age at menopause) and risk of multiple CVDs (atrial fibrillation, coronary artery disease, heart failure, ischemic stroke, and stroke). For any associations discovered, potential mediating pathways through traditional, modifiable cardiovascular risk factors of body mass index (BMI), type 2 diabetes (T2D), systolic blood pressure (SBP), high-density lipoprotein cholesterol (HDL), and low-density lipoprotein cholesterol were also explored. Finally, based on prior evidence of a genetic correlation between reproductive traits and educational attainment (EA),[18] we aimed to assess whether accounting for EA, an important measure of social, behavioral, and economic domains, might explain part of any putative associations between reproductive factors and CVD.

METHODS

Ethics and Data Access

Publicly available genome-wide association summary data were used for all primary analyses. All data and materials for these are publicly available at cited sources. Ethical approval and participant consent were obtained in each of the original studies that generated the data. Replication analysis on UK Biobank data was performed under application number 48666, covered by the general ethical approval for UK Biobank studies from the National Health Service National Research Ethics. Because of the sensitive individual-level nature of these data, they are not available to share by the authors but can be accessed by application directly to the UK Biobank. The paper is reported on the basis of recommendations by the Strengthening the Reporting of Observational Studies in Epidemiology Using Mendelian Randomization Guidelines.[19] All statistical analyses were performed using R version 4.1.1 (2021-02-15)[20] using the TwoSampleMR[21] and Mendelian Randomization packages.[22]

Instrumental Variable Selection

Instrumental variables were extracted from summary statistics of published sex-specific studies on the exposures of interest: self-reported age at first birth (n=131 987 parous women, unit = years) and number of live births (n=193 953 parous women, number of live births coded into 3 categories of <2, 2, or >2 live births)

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from Neale laboratory's second release analysis of UK Biobank data (http://www.nealelab.is/uk-biobank/), age at menarche (n=329 345, unit = years) from the genome-wide association study (GWAS) on European ancestry participants the ReproGen consortium,[23] and age at menopause (n=106 048, unit=years) from the GWAS of Ruth et al in participants of European ancestry.[24] Further details on study cohorts are provided in Table 1. Instrumental variable single-nucleotide polymorphisms (SNPs) were selected if they were associated with the exposure of interest in the respective GWAS at genome-wide significance ($P<5\times10^{-8}$). After harmonization with the outcome data, which was performed using the "*harmonise_data*" function in the TwoSampleMR package (with attempt to infer positive strand alleles using allele frequencies for palindromes), SNPs were clumped to retain only uncorrelated variants (pair-wise linkage disequilibrium $r^2<0.001$). Instrument strength was quantified using *F*-statistics. *F*-statistic for univariable analyses was calculated using the formula

$$F = \frac{(n-k-1)}{k}\frac{(R^2)}{(1-R^2)}$$

where R^2 is the explained variance in the regression of all SNPs, n is the number of participants in the study, and k is the number of instrumental variants. The R^2 was calculated as the sum of SNP-wise R^2 of instruments, which is obtained with the formula

$$R^2 = \frac{F}{(n-2+F)} \text{ with } F = \left(\frac{\beta}{\mathrm{SE}(\beta)}\right)^2$$

where β represents the effect size of the genetic variant in the exposure GWAS, and SE(β) represents the standard error of the effect size of the genetic variant in the exposure GWAS. For multivariable analyses, instrument strength was assessed using conditional F-statistics calculated using the MVMR package.[25,26]

Study Outcomes

Genetic association estimates for the outcomes were extracted from publicly available GWAS summary statistics on atrial fibrillation (60 620 cases and 970 216 controls),[27] coronary artery disease (122 733 cases and 424 528 controls),[28] heart failure (47 309 cases and 930 014 controls),[29] ischemic stroke (34 217 cases and 406 111 controls),[30] and stroke of any type (40 585 cases and 406 111 controls).[30] All GWASs were on populations of predominantly European ancestry. Further details on study cohorts are provided in Table 1 and Table S1.

Statistical Analysis

The flow chart for the study methods is displayed in Figure 1. The data sources for gene-exposure and gene-outcome associations and methods for primary analysis were established by authors before the commencement of analysis. Inverse-variance weighted (IVW) MR with multiplicative random effects[31] was used as the primary analysis method for all models, to estimate the association between each genetically predicted reproductive factor and each cardiovascular outcome.[32] Results are presented as odds ratios (ORs) with respective 95% CIs for each genetically predicted reproductive factor (exposure) and CVD (outcome) pair. Statistical significance for the primary analyses was considered at a value of $P<0.0125$, based on 4 independent hypotheses tested for each outcome.

Sensitivity Analyses

The first sensitivity analysis was carried out using weighted median MR, MR-Egger, and MR-PRESSO.[33] The validity of the results of the primary IVW analysis rely on each instrumental variable satisfying a set of 3 core assumptions:

1. The instrumental variant must be associated with the exposure.
2. The instrumental variant must not be associated with confounders of the association between the exposure and the outcome.
3. The instrumental variant must exert effects on the outcome only through the exposure, and not directly or through alternative (horizontally pleiotropic) pathways.

In situations where genetic variants act through additional parallel biological pathways, these assumptions are violated. This is termed horizontal pleiotropy. Sensitivity analysis using weighted median MR,[34] MR-PRESSO, and MR-Egger were performed to explore this. The weighted median method can provide consistent estimates assuming at least half the weight is derived from valid SNPs.[34] The MR-Egger method can be used to identify the presence of directional pleiotropy under a weaker assumption that the instrument strength is independent of direct effects (InSIDE assumption).[35] Additionally, the MR-PRESSO analysis aims to detect SNPs with outlier effects and provides an estimate of the causal effect after adjusting for the outlier effects. Finally, the full list of SNPs used for each exposure was queried in PhenoScanner,[36,37] to investigate the presence of association with additional phenotypes in published GWASs.

The second sensitivity analysis involved performing bidirectional MR analyses. Though CVD does not tend to occur during reproductive years, some individuals at extremely high risk develop CVD before the end of the reproductive timespan, and this may feasibly affect future reproductive choices because it makes pregnancy higher risk. This implies that a bidirectional

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Table 1. Information on the Studies and Consortia From Which Genetic Association Data Were Obtained

Phenotype	Study or consortium	Ancestry	Sex	Cases (/controls)	Units	Link
Exposures						
Age at first birth	Neale laboratory	EUR	Female only	131 987	Year	http://www.nealelab.is/uk-biobank/
Number of live births	Neale laboratory	EUR	Female only	193 953	Categorical number of live births (<2, 2, >2)	http://www.nealelab.is/uk-biobank/
Age at menarche	Day et al	EUR	Female only	329 345	Year	https://doi.org/10.1038/ng.3841
Age at menopause	Ruth et al	EUR	Female only	106 048	Year	https://doi.org/10.1038/s41586-021-03779-7
Additional exposure for multivariable analysis						
Educational attainment	Lee et al	EUR	Both (sex-adjusted)	257 841	Years of education	https://doi.org/10.1038/s41588-018-0147-3
Outcomes						
Coronary artery disease	Van der Harst et al	EUR	Both (sex-adjusted)	122 733/424 528	Log(OR) for coronary artery disease	https://doi.org/10.1161/CIRCRESAHA.117.312086
Stroke	Malik et al	EUR	Both (sex-adjusted)	40 585/406 111	Log(OR) for any stroke	https://doi.org/10.1038/s41588-018-0058-3
Ischemic stroke	Malik et al	EUR	Both (sex-adjusted)	34 217/406 111	Log(OR) for ischemic stroke	https://doi.org/10.1038/s41588-018-0058-3
Heart failure	Shah et al	EUR	Both (sex-adjusted)	47 309/930 014	Log(OR) for heart failure	https://doi.org/10.1038/s41467-019-13690-5
Atrial fibrillation	Nielsen et al	EUR	Both (sex-adjusted)	60 620/970 216	Log(OR) for atrial fibrillation	https://doi.org/10.1038/s41588-018-0171-3
Mediators						
Body mass index	Pulit et al	EUR	Both (sex-adjusted)	434 794	1-SD body mass index	https://doi.org/10.1093/hmg/ddy327
High-density lipoprotein cholesterol	Willer et al	EUR	Both (sex-adjusted)	187 167	1-SD high-density lipoprotein cholesterol	https://doi.org/10.1038/ng.2797
Low-density lipoprotein cholesterol	Willer et al	EUR	Both (sex-adjusted)	187 167	1-SD low-density lipoprotein cholesterol	https://doi.org/10.1038/ng.2797
Type 2 diabetes	Xue et al	EUR	Both (sex-adjusted)	80 154 /596 424	Log(OR) type 2 diabetes	https://doi.org/10.1038/s41467-018-04951-w
Systolic blood pressure	Evangelou et al	EUR	Both (sex-adjusted)	757 601	1-mm Hg systolic blood pressure	https://doi.org/10.1038/s41588-018-0205-x
Replication						
Coronary artery disease	UK Biobank	EUR	Female only	11 802/198 815	Log(OR) for coronary artery disease	
Stroke	UK Biobank	EUR	Female only	5411/198 815	Log(OR) for any stroke	
Ischemic stroke	UK Biobank	EUR	Female only	2777/198 815	Log(OR) for ischemic stroke	
Heart failure	UK Biobank	EUR	Female only	4128/198 815	Log(OR) for heart failure	
Atrial fibrillation	UK Biobank	EUR	Female only	9420/198 815	Log(OR) for atrial fibrillation	

EUR indicates European; and OR, odds ratio.

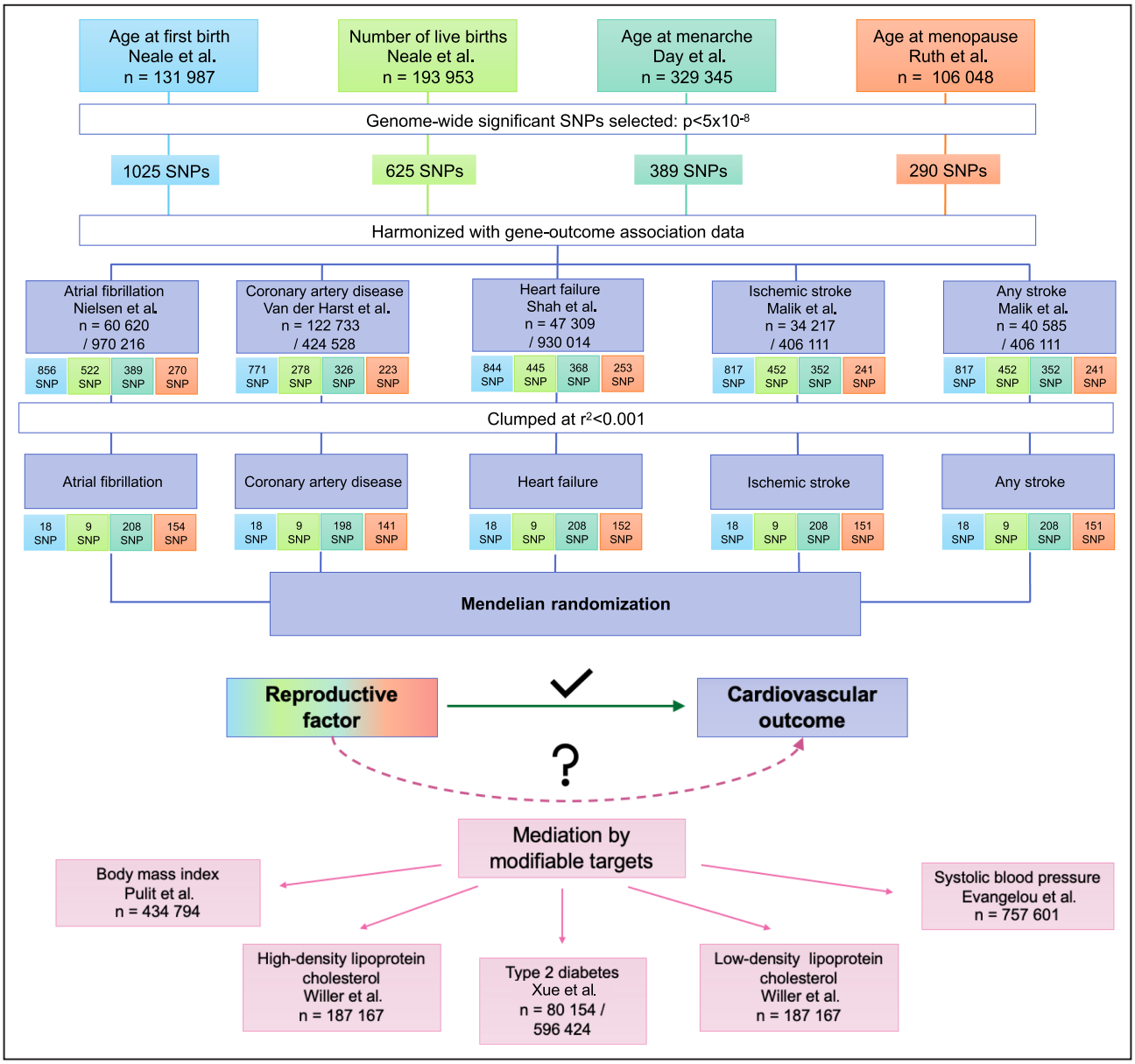

Figure 1. Flow chart of study methodology.
SNP indicates single-nucleotide polymorphism.

association might exist. In order to explore potential bias stemming from this, bidirectional MR was carried out for exposure-outcome pairs significant on primary analysis. This entailed reversing the direction of analysis for exposure-outcome pairs, thereby assessing the impact of cardiovascular events on reproductive factors. Where the outcomes in these analyses are continuous, results are presented as beta coefficients (*b*) with respective SE.

The third sensitivity analysis involved accounting for potential shared genetic effects with sociobehavioral traits. Age at first birth and number of live births have previously been reported to be highly genetically correlated with multiple sociobehavioral traits[18] that are also known causes of CVD. In light of this, we set out to explore whether accounting for EA, an important measure of social, behavioral, and economic domains, might explain part of any putative associations between reproductive factors and CVD. Multivariable MR was thus used to estimate the impact of each reproductive factor on CVD after accounting for EA (measured as number of years of schooling completed, n=257 841 individuals),[38] for the exposure-outcome pairs significant on primary analysis.

The final sensitivity analysis involved replication of the analyses on female-only outcome data. For this analysis, SNP-outcome genetic associations were calculated in the female participants of the UK Biobank.

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Details on genotyping, outcome definition, and protocol of the UK Biobank have been reported previously.[39]

Mediation Analyses

Where an association was discovered between a reproductive factor and an outcome, mediation analysis was carried out using multivariable MR to explore potential mediating pathways amenable to intervention.[40] The putative mediators considered include BMI[41] (n=434 794, European ancestry), HDL[42] (n=187 167, European ancestry), low-density lipoprotein cholesterol[42] (n=187 167, European ancestry), T2D[43] (n=80 154 cases and n=596 424 controls, European ancestry), and SBP[44] (n=757 601, European ancestry).

Mediation analysis was carried out using a stepwise approach. First, exposure-outcome associations that were nominally significant ($P < 0.05$) on primary analysis with IVW MR were identified. Effect estimates from these analyses are considered the 'total effect' of the exposure on the outcome. Second, for each of these exposure-outcome associations, putative exposure-mediator associations were tested for each exposure-mediator pair, using univariable IVW MR. Only pathways where both analyses produced nominally significant results ($P < 0.05$) were carried forward, under the implicit assumption of no reverse causation between the mediator and the outcome. Third, multivariable MR was carried out to estimate the effect of the exposure on the outcome that is conditional on the mediator ("direct" effect, reported as an adjusted OR with respective 95% CI). This was done by extracting genome-wide significant ($P<5\times10^{-8}$) variants associated with either the exposure or the mediator, harmonization of these variants with outcome data, subsequent clumping, and multivariable IVW analysis. Because the study outcomes are binary and not rare, the "indirect" effect and proportion mediated were not calculated, as this calculation relies on linearity of relationships that cannot be assumed when using OR effect measures for a common outcome. The "direct" effect was thus qualitatively compared with the "total" effect, where substantial attenuation of the effect estimates after conditioning by the mediator is taken to suggest the presence of a mediating pathway.[40]

RESULTS

Age at First Birth

Earlier genetically predicted age at first birth was associated with increased risk of coronary artery disease (OR per 1-year earlier age at first birth, 1.49 [95% CI, 1.28–1.74], $P=3.72\times10^{-7}$), increased risk of heart failure (OR, 1.27 [95% CI, 1.06–1.53], $P=0.009$), and increased risk of stroke (OR, 1.25 [95% CI, 1.00–1.56], $P=0.048$) at nominal significance. There was no significant association between genetically predicted age at first birth and atrial fibrillation (OR, 1.03 [95 %CI, 0.86–1.24], $P=0.716$) or ischemic stroke (OR, 1.16 [95% CI, 0.92–1.47], $P=0.202$). The results are summarized in Table 2 and Figure 2.

Sensitivity MR analyses were not suggestive of pleiotropy, and outlier-adjusted analyses remained consistent as outlined in Table S2. However, there was evidence suggestive of a bidirectional relationship between genetically predicted coronary artery disease and age at first birth ($b=-0.029$, SE=0.010, $P=0.005$). There was no evidence of other bidirectional associations. The full results of bidirectional analysis are outlined in Table S3. The associations remained consistent when evaluated on female-specific outcome data from UK Biobank (Table S4), though additional associations were identified between age at first birth and atrial fibrillation (OR, 1.77 [95% CI, 1.31–2.39], $P=2.11\times10^{-4}$) and ischemic stroke (OR, 2.25 [95% CI, 1.29–3.93], $P=0.004$) that were consistent in direction with the other outcomes and main analysis. Additional adjustment for genetically predicted EA attenuated all associations between age at first birth and cardiovascular outcomes: coronary artery disease (OR, 1.30 [95% CI, 0.85–1.98], $P=0.231$), heart failure (OR, 0.93 [95% CI, 0.68–1.27], $P=0.664$) and stroke (OR, 1.01 [95% CI, 0.75–1.36], $P=0.961$), as reported in Table S5.

Earlier genetically predicted age at first birth was associated with higher BMI ($b=0.357$, SE=0.054, $P=4.00\times10^{-11}$), lower HDL ($b=-0.216$, SE=0.065, $P=0.001$), higher T2D odds ($b=0.682$, SE=0.138, $P=8.24\times10^{-7}$), and higher SBP ($b=1.681$, SE=0.506, $P=0.001$), identifying these factors as potential mediators as displayed in Table S6.

Mediation analysis for the association between genetically predicted age at first birth and coronary artery disease (unadjusted OR, 1.49 [95% CI, 1.28–1.74]) revealed some attenuation after adjustment for T2D (adjusted OR, 1.36 [95% CI, 0.88–2.10], $P=0.165$), suggesting T2D is a mediator, as reported in Table 3 and Figure 3. However, the instruments used in this mediation analysis were weak (all F-statistics <10, as displayed in Table S7). Additional phenotypic associations for the instrumental SNPs are reported in Table S8.Mediation analysis for the association between genetically predicted age at first birth and heart failure (unadjusted OR, 1.27 [95% CI, 1.06–1.53]) revealed an attenuation of effect estimates after adjustment for BMI (adjusted OR, 1.01 [95% CI, 0.48–2.13], $P=0.970$), T2D (adjusted OR, 0.81 [95% CI, 0.50–1.32], $P=0.405$), HDL (adjusted OR, 1.03 [95% CI, 0.60–1.75], $P=0.923$), and SBP (adjusted OR, 1.06 [95% CI, 0.39–2.89], $P=0.903$), as reported in Table 3 and Figure 3.

Mediation analysis for the association between genetically predicted age at first birth and stroke

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Table 2. Mendelian Randomization Estimates for the Effects of Reproductive Factors on Cardiovascular Outcomes, Using an Inverse Variance Weighted Model With Multiplicative Random Effects, or Wald Ratio Method in Cases Where Only 1 Instrument Was Present

Exposure	Outcome	#SNP	Odds ratio	Lower 95% CI	Upper 95% CI	*P* value
Age at first birth (per 1-y reduction)	Atrial fibrillation	18	1.03	0.86	1.24	0.716
	Coronary artery disease	18	1.49	1.28	1.74	3.72×10^{-7}
	Heart failure	18	1.27	1.06	1.53	0.009
	Ischemic stroke	18	1.16	0.92	1.47	0.202
	Stroke	18	1.25	1.00	1.56	0.048
Number of live births (per increase in category across <2, vs 2, vs >2 live births)	Atrial fibrillation	9	2.91	1.16	7.29	0.023
	Coronary artery disease	9	1.41	1.00	2.00	0.051
	Heart failure	9	1.90	1.28	2.82	0.001
	Ischemic stroke	9	1.86	1.03	3.37	0.039
	Stroke	9	2.07	1.22	3.52	0.007
Age at menarche (per 1-y reduction)	Atrial fibrillation	208	1.01	0.97	1.05	0.664
	Coronary artery disease	198	1.10	1.06	1.14	1.68×10^{-6}
	Heart failure	208	1.12	1.07	1.17	5.06×10^{-7}
	Ischemic stroke	208	1.04	0.98	1.09	0.182
	Stroke	208	1.03	0.98	1.08	0.222
Age at menopause (per 1-y increase)	Atrial fibrillation	154	1.00	0.99	1.01	0.940
	Coronary artery disease	141	1.00	0.99	1.01	0.894
	Heart failure	152	1.00	0.99	1.01	0.735
	Ischemic stroke	151	1.00	0.98	1.01	0.693
	Stroke	151	1.00	0.98	1.01	0.606

#SNP indicates number of SNPs used in analysis; and SNP, single-nucleotide polymorphism.

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(unadjusted OR, 1.25 [95% CI, 1.00–1.56]) revealed an attenuation of effect estimates after adjustment for BMI (adjusted OR, 0.72 [95% CI, 0.28–1.83], *P*=0.486), T2D (adjusted OR, 1.24 [95% CI, 0.74–2.08], *P*=0.414), and HDL (adjusted OR, 1.01 [95% CI, 0.60–1.70], *P*=0.978), as reported in Table 3 and Figure 3.

Number of Live Births

Higher genetically predicted number of live births was associated with increased risk of heart failure (OR, 1.90 [95% CI, 1.28–2.82], *P*=0.001), ischemic stroke (OR, 1.86 [95% CI, 1.03–3.37], *P*=0.039) stroke of any type (OR, 2.07 [95% CI, 1.22–3.52], *P*=0.007), and increased risk of atrial fibrillation (OR per increase in category of <2, 2, or >2 live births, 2.91 [95% CI, 1.16–7.29], *P*=0.023) at nominal significance. Higher genetically predicted number of live births was not significantly associated with coronary artery disease (OR, 1.41 [95% CI, 1.00–2.00], *P*=0.051). Results are summarized in Table 2 and Figure 2.

Sensitivity analysis results were suggestive of pleiotropy in the association between genetically predicted number of live births and stroke (MR-Egger intercept *P*=0.050). The remaining sensitivity analyses and outlier-adjusted analyses remained consistent as outlined in Table S2. There was no evidence of bidirectional associations, as outlined in Table S3. The associations remained consistent when evaluated on female-specific outcome data from UK Biobank (Table S4), though additional association were identified between number of live births and coronary artery disease (OR, 2.29 [95% CI, 1.10–4.74], *P*=0.026) that was consistent in direction with the other outcomes and main analysis. Additional adjustment for genetically predicted EA only attenuated the association between number of live births and atrial fibrillation (OR, 1.71 [95% CI, 0.43–6.85], *P*=0.451) but not for heart failure nor stroke, as reported in Table S5. Additional phenotypic associations for the SNPs used in this analysis are reported in Table S9.

Higher number of live births was not associated with BMI (*b*=0.069, SE=0.135, *P*=0.609), HDL (*b*=0.264, SE=0.418, *P*=0.527), low-density lipoprotein cholesterol (*b*=0.867, SE=0.645, *P*=0.179), T2D (0.227, SE=0.322, *P*=0.481), or SBP (*b*=−2.946, SE=3.903, *P*=0.450) as displayed in Table S6, these factors were thus not carried forward to mediation analysis.

Age at Menarche

Earlier genetically predicted age at menarche was associated with increased risk of coronary artery disease (OR per 1-year earlier age, 1.10 [95% CI, 1.06–1.14],

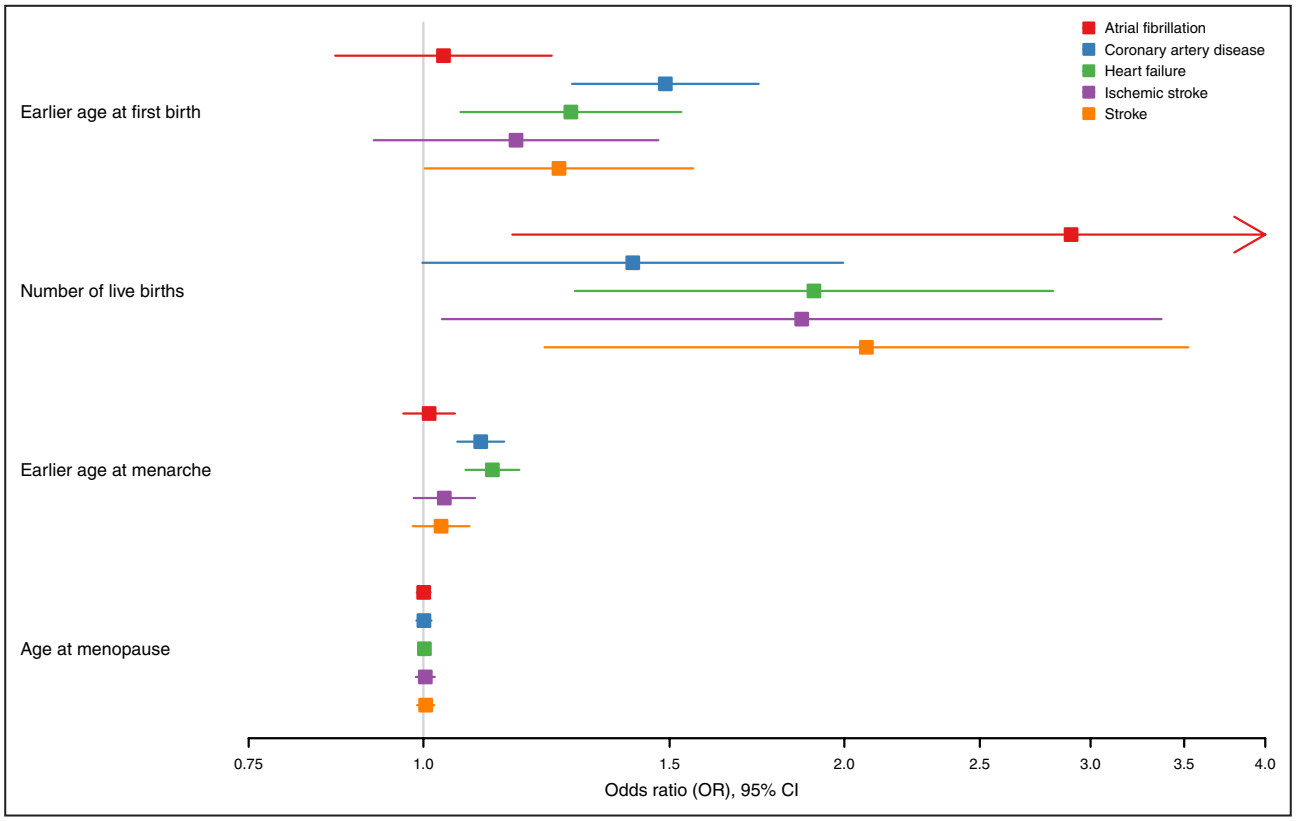

Figure 2. Mendelian randomization estimates for the effects of age at first birth, number of live births, age at menarche, and age at menopause on cardiovascular outcomes.
OR indicates odds ratio.

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P=1.68×10^{-6}) and increased risk of heart failure (OR, 1.12 [95% CI, 1.07–1.17], P=5.06×10^{-7}). Earlier genetically predicted age at menarche was not associated with atrial fibrillation (OR, 1.01 [95% CI, 0.97–1.05], P=0.664), stroke (OR, 1.03 [95% CI, 0.98–1.08], P=0.222), or ischemic stroke (OR, 1.04 [95% CI, 0.98–1.09], P=0.182). The results are summarized in Table 2 and Figure 2.

Sensitivity analysis results were not suggestive of pleiotropy, and outlier-adjusted estimates remained consistent as outlined in Table S2. There was no evidence of bidirectional associations, as outlined in Table S3. The associations remained consistent when evaluated on female-specific outcome data from UK Biobank (Table S4). Additional adjustment for genetically predicted EA attenuated none of the associations between age at menarche and cardiovascular outcomes, as reported in Table S6. Additional phenotypic associations for the SNPs used in this analysis are reported in Table S10.

Earlier genetically predicted age at menarche was associated with BMI (b=0.145, SE=0.024, P=1.43×10^{-9}) and T2D (b=0.173, SE=0.035, P=9.02×10^{-7}), but there was no association with SBP (b=0.272, SE=0.178, P=0.127), HDL (b=−0.035, SE=0.020, P=0.078), or low-density lipoprotein cholesterol (b=−0.003, SE=0.017, P=0.864), as displayed in Table S6. Mediation analysis was therefore carried out to explore potential mediation by BMI and T2D.

Mediation analysis for the association between age at menarche and coronary artery disease (unadjusted OR, 1.10 [95% CI, 1.06–1.14]) revealed an attenuation after adjustment for BMI (adjusted OR, 0.95 [95% CI, 0.80–1.13], P=0.561) but not T2D (adjusted OR, 1.10 [95% CI, 0.97–1.25], P=0.124), as presented in Figure 4 and Table 3.

Mediation analysis for the association between age at menarche and heart failure (unadjusted OR, 1.12 [95% CI, 1.07–1.17]) revealed an attenuation after adjustment for BMI (adjusted OR, 0.98 [95% CI, 0.79–1.21], P=0.827) and T2D (adjusted OR, 1.08 [95% CI, 0.96–1.21], P=0.228), as presented in Figure 4 and Table 3.

Age at Menopause

Higher genetically predicted age at menopause was not associated with atrial fibrillation (OR, 1.00 [95% CI, 0.99–1.01], P=0.940), coronary artery disease (OR, 1.00 [95% CI, 0.99–1.01], P=0.894), heart failure (OR, 1.00 [95% CI, 0.99–1.01], P=0.735), ischemic stroke

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Table 3. Mediation Analysis Results Using Multivariable Mendelian Randomization

Exposure	Outcome	Mediator adjusted for in analysis	#SNP	Odds ratio	Lower 95% CI	Upper 95% CI	*P* value
Age at first birth (per 1-y reduction)	Coronary artery disease	None	18	1.49	1.28	1.74	3.72×10^{-7}
		Body mass index	4	2.18	1.24	3.83	0.007
		High-density lipoprotein cholesterol	6	1.48	1.07	2.05	0.018
		Type 2 diabetes	9	1.36	0.88	2.10	0.165
		Systolic blood pressure	3	1.51	0.83	2.75	0.182
	Heart failure	None	18	1.27	1.06	1.53	0.009
		Body mass index	4	1.01	0.48	2.13	0.970
		High-density lipoprotein cholesterol	6	1.03	0.60	1.75	0.923
		Type 2 diabetes	9	0.81	0.50	1.32	0.405
		Systolic blood pressure	3	1.06	0.39	2.89	0.903
	Stroke	None	18	1.25	1.00	1.56	0.048
		Body mass index	4	0.72	0.28	1.83	0.486
		High-density lipoprotein cholesterol	6	1.36	0.28	6.57	0.701
		Type 2 diabetes	11	1.24	0.74	2.08	0.414
		Systolic blood pressure	3	1.01	0.60	1.70	0.978
Age at menarche (per 1-y reduction)	Coronary artery disease	None	198	1.10	1.06	1.14	1.68×10^{-6}
		Body mass index	42	0.95	0.80	1.13	0.561
		Type 2 diabetes	71	1.10	0.97	1.25	0.124
	Heart failure	None	208	1.12	1.07	1.17	5.06×10^{-7}
		Body mass index	42	0.98	0.79	1.21	0.827
		Type 2 diabetes	71	1.08	0.96	1.21	0.228

For each exposure-outcome pair, the univariable, inverse-variance weighted Mendelian randomization estimate of the marginal effect of the exposure on the outcome ("total" effect) is reported in the first row, and subsequently the effect of the exposure on the outcome that is conditional on each putative mediator ("direct" effect) is reported. #SNP indicates number of SNPs used in analysis; and SNP, single-nucleotide polymorphism.

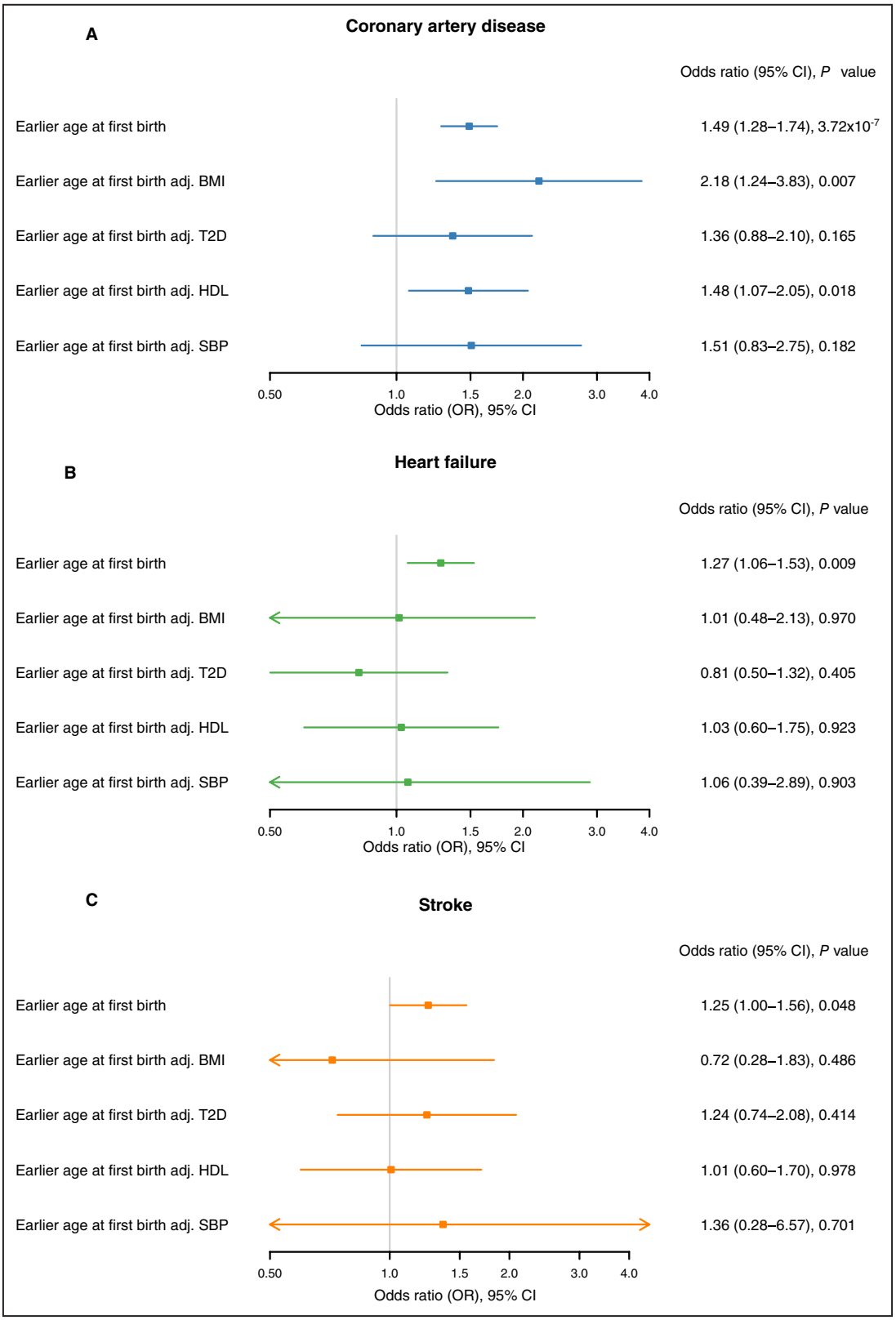

Figure 3. Mendelian randomization estimates for the effects of age at first birth on the cardiovascular outcomes significant on primary analysis, before and after adjustment for potential mediators.
A, Mendelian randomization estimates for the effects of age at first birth on coronary artery disease, before and after adjustment for potential mediators. **B**, Mendelian randomization estimates for the effects of age at first birth on heart failure, before and after adjustment for potential mediators. **C**, Mendelian randomization estimates for the effects of age at first birth on stroke, before and after adjustment for potential mediators. Adj. indicates adjusted for; BMI, body mass index; HDL, high-density lipoprotein; SBP, systolic blood pressure; and T2D, type 2 diabetes.

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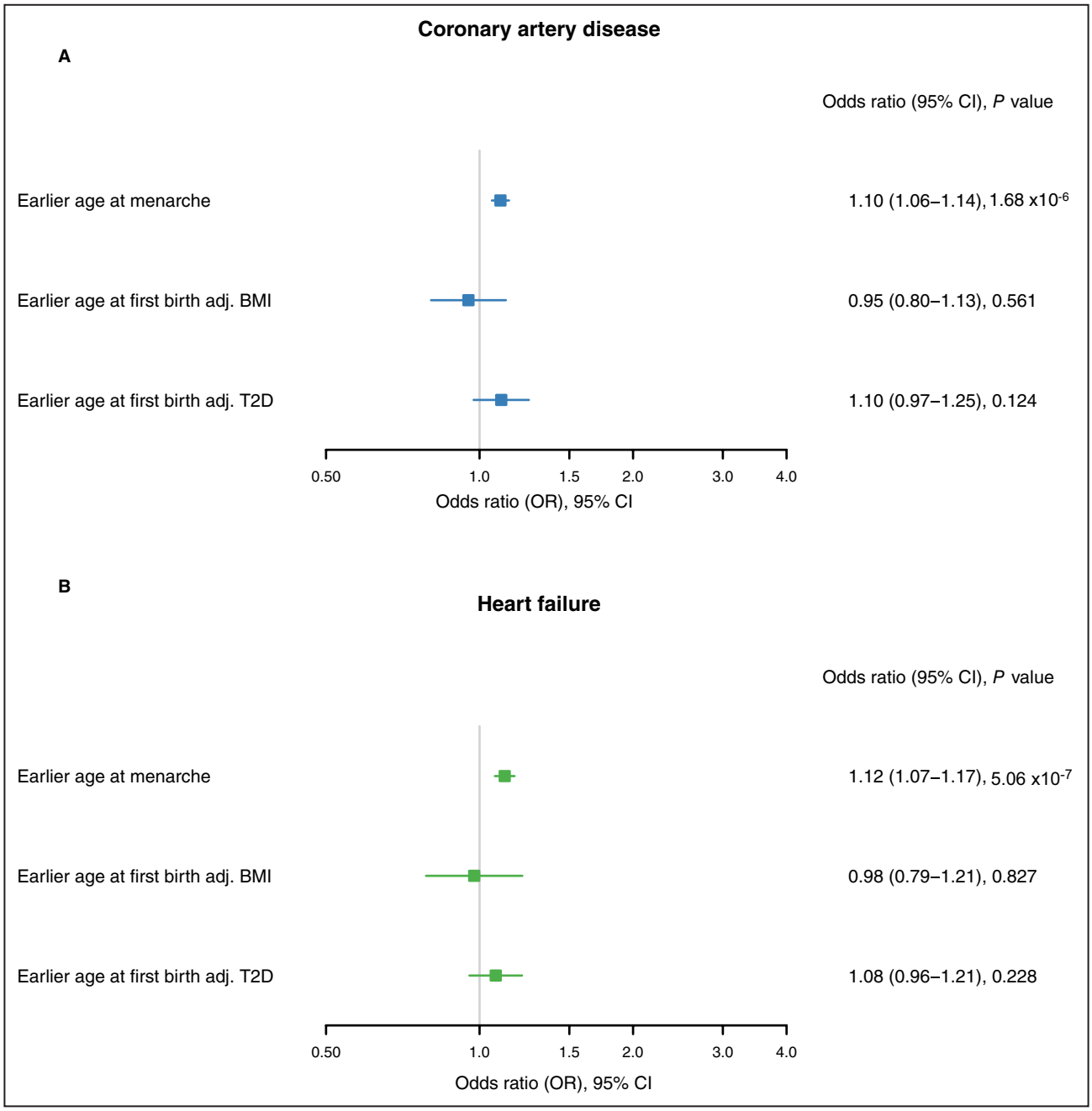

Figure 4. Mendelian randomization estimates for the effects of age at menarche on the cardiovascular outcomes significant on primary analysis, before and after adjustment for potential mediators.
A, Mendelian randomization estimates for the effects of age at menarche on coronary artery disease, before and after adjustment for potential mediators. **B**, Mendelian randomization estimates for the effects of age at menarche on heart failure, before and after adjustment for potential mediators. Adj. indicates adjusted for; BMI, body mass index; and T2D, type 2 diabetes.

(OR, 1.00 [95% CI, 0.98–1.01], *P*=0.693), or stroke (OR, 1.00 [95% CI, 0.98–1.01], *P*=0.606). The results are summarized in Table 2 and Figure 2. The results were consistent on sensitivity analyses as displayed in Table S2. Because no associations were identified on primary analysis, mediation analysis was not carried out. Additional phenotypic associations for the SNPs used in the analysis are reported in Table S11.

DISCUSSION

We used genetic epidemiology to evaluate the causal relevance of female reproductive factors on risk of multiple CVDs. Our results support an association between earlier age at first birth, higher number of live births, and earlier menarche, with higher risk of multiple CVDs, including atrial fibrillation, coronary artery disease, heart failure,

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and stroke. In most instances, these associations are of likely causal relevance, though some evidence suggestive of pleiotropy was observed for age at first birth and number of live births that likely relates to sociobehavioral traits such as EA. We also demonstrate important causal associations of reproductive factors with established cardiovascular risk markers such as obesity, diabetes, dyslipidemia, and hypertension. Mediation analyses suggested that these at least partly drive the augmented CVD caused by reproductive factors. Importantly, these mediators are amenable to clinical intervention. Overall, our results highlight the importance of taking a detailed reproductive history in women when assessing cardiovascular risk and highlight key opportunities for personalized preventive strategies.

Age at First Birth and Number of Live Births

In this study, earlier genetically predicted age at first birth and higher genetically predicted number of live births were associated with increased risk of multiple CVD. It is well known that age at first birth and number of live births are tightly correlated, and an inverse genetic correlation between these factors has also been established.[18] Broadly, our results demonstrating higher cardiovascular risk with a more "reproductive" phenotype corroborate observational findings[5,6,10,16,45–50] but additionally offer insight on the likely causal relevance of these factors. There are multiple potential mechanisms by which earlier first birth and higher numbers of live births might affct future cardiovascular risk.

The association between a more "reproductive" phenotype and CVD might result from direct effects of physiological changes that occur during pregnancy. These include changes that, at least temporarily, augment "traditional" cardiovascular risk factors including increased weight, hyperlipidemia, and insulin resistance but also other processes that promote CVD including heightened inflammatory profiles, more prothrombotic clotting function, and endothelial reactivity.[51–53] Exposure to these factors for 9 months might suffice to increase cardiovascular risk. Repeated exposure across multiple pregnancies and the potential persistence of some of these changes beyond delivery is likely to augment risk, especially for some factors such as weight gain that require active motivation to reverse. The results of our study corroborate a key role of these cardiometabolic factors: we demonstrate that BMI, SBP, HDL, and T2D all mediate at least part of the associations between age and first birth and the outcomes of heart failure and stroke. This suggests a mechanistic relevance of these "traditional" risk factors. Beyond the mechanistic relevance, the mediating role of these factors should be considered clinically as it identifies an important opportunity for targeted risk stratification and prevention strategies.

A further potential explanation for the associations observed might be that the impact of at least some of the reproductive factors is not directly causal but rather might relate to other phenotypes that share a genetic basis with reproductive factors. This is a distinct possibility, in light of previous genetic studies that identified a close correlation between reproductive traits and multiple established social and behavioral risk factors for CVD: lower EA, higher adult risk tolerance, higher risk of attention deficit hyperactivity disorder and major depressive disorder, and earlier age at onset of smoking.[18] In order to investigate this, we performed multivariable MR to account for the potential effects of EA, an established marker of social, behavioral, and economic status. The results of this analysis highlighted that EA, and therefore the broader sociobehavioral domain, is likely to account for at least part of the association between age at first birth and CVD. Though this suggests that at least a part of the association between reproductive factors and CVD is driven by pleiotropy, these associations still bear important clinical relevance for risk stratification. Our results demonstrate that, whether causal or not, age at first birth is able to capture the cardiovascular impact of a notoriously difficult-to-quantify sociobehavioral trajectory. Age at first birth, which is easy to measure, thus remains instrumental for quantifying a broad underlying set of circumstances that, when taken together, contribute to CVD risk in women.

Overall, the results of our study suggest that the association between a more "reproductive" phenotype and higher risk of CVD is likely to be driven by a combination of direct cardiometabolic effects of pregnancy and indirect effects of underlying sociobehavioral trajectories that share a genetic basis with reproductive behaviors. Specifically, the association between age at first birth and CVD appeared to strongly relate to EA, though we establish that this factor remains useful in clinical risk stratification as it captures the augmented cardiovascular risk conferred by sociobehavioral factors, which is otherwise difficult to quantify. On the other hand, the association between number of live births and CVD did not appear to be influenced by EA, highlighting a likely direct causal relevance of this factor. Finally, we identify multiple modifiable mediators of the association between reproductive factors and CVD, which should be key targets for clinical monitoring and personalized prevention.

Age at Menarche

In our study, we identified an association between genetically predicted age at menarche and higher risk of both coronary artery disease and heart failure. Earlier menarche has been established as a predictor of cardiovascular risk in multiple studies.[5,8,9,54] However, age at menarche is closely correlated with childhood and

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adult-life adiposity, and both are associated with higher risk of CVD. This makes BMI both an important potential confounder and a potential mediator. By design, MR mitigates the potential confounding role of childhood BMI, because childhood BMI cannot influence genetic liability to early menarche. Prior MR analyses have established an association between earlier age at menarche and higher coronary artery disease risk.[55–57] The results of our study corroborate this evidence supporting a causal role of age at menarche on coronary artery disease on a larger study cohort and additionally provide evidence supporting a causal association of earlier age at menarche with heart failure.

Early menarche is known to be strongly associated with higher rates of obesity and metabolic ill health in adulthood, and this is a clear potential mediating pathway.[58] In light of this well-established association, we performed mediation analysis to explore the potential role of BMI and other cardiovascular risk factors in the association between age at menarche and CVD. This has not been done in prior MR studies. There was substantial evidence of mediation by BMI in for both coronary artery disease and heart failure. From a clinical perspective, the fact that adjustment for genetically predicted BMI in our study appeared to explain the vast majority of the increase in risk conferred by earlier age at menarche identifies BMI the chief driver of increased cardiovascular risk in women with early menarche. This should therefore be a major focus for primary prevention in women whose reproductive history features this factor.

Age at Menopause

We investigated the impact of age at menopause on CVD. Observationally, earlier menopause has been associated with increased cardiovascular risk,[59,60] and this is postulated to be an effect of diminishing cardioprotective effects of estrogen. In our study, we had high statistical power to detect potentially small associations per year difference in timing of menopause, as reflected by the small CIs in the result, but there was no evidence of an association between age at menopause and CVDs. Considering the high power of this analysis, the results suggest that timing of menopause is unlikely to be causally related to CVD risk.

Clinical Implications

Our results have important implications for both clinical risk stratification and targeted primary prevention strategies. In terms of risk stratification, these results suggest that reproductive history should be an important component of clinical evaluation of cardiovascular risk in women, given the multiple associations between reproductive factors and CVD of causal relevance. Even where we detect presence of pleiotropy and therefore suspect that some associations are not of causal relevance, information on reproductive factors is still likely to improve clinical risk stratification, because the underlying pleiotropic pathway is likely to relate to notoriously difficult-to-quantify metrics of a broad sociobehavioral and socioeconomic trajectory. Women are at particular risk from mischaracterization as low risk for cardiovascular risk, and the majority of those with CVD have an absence of traditional risk factors. However, despite the growing wealth of evidence supporting associations between reproductive factors and CVD,[61] there is a paucity of evidence directly assessing the uplift in predictive performance of established clinical risk scores after additional incorporation of reproductive factors. Where 1 study exists on the outcome of heart failure,[62] it was performed in a relatively small cohort and assessed only a few reproductive factors, and no diagnostic uplift was demonstrated. Given the results of our study, future work should imperatively focus on large-scale assessment of the incremental benefit of addition of key reproductive factors to conventional cardiovascular risk stratification.

The results of this study can also help guide prevention strategies. Because reproductive factors such as age at menarche are not modifiable, and others such as age at first birth are unlikely to be realistically modifiable for the majority of women for the purpose of cardiovascular risk reduction, we explored multiple potentially modifiable mediators of the effect of reproductive factors on CVD. The rationale behind this was to establish the relevance of clinically "targetable" factors that can be monitored for, and aggressively managed, in order to curtail the augmented risk conferred by the reproductive factors. We demonstrate that the effects of age at menarche were substantially mediated by BMI. We also demonstrate that the effects of age at first birth on multiple CVDs were at least partly mediated by BMI, T2D, HDL, and SBP. Clinical surveillance of at-risk women and early, aggressive management of these risk factors is a key priority that will at least partly mitigate the unfavorable effects of reproductive factors on CVD burden.

Strengths and Limitations

The major strengths of this study stem from its genetic epidemiological approach, which mitigates the potential impact of confounding. In the hierarchy of evidence, MR has been advocated as providing "critical" evidence on risk factor–outcome relationships,[63] especially when the risk factor in question is not practically or ethically amenable to randomization. The confidence with which causal relationships can be drawn from MR results depends on the plausibility of the instrumental variable assumptions for the selected genetic instruments. We explored these assumptions through checking instrument strength

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using F-statistics, multiple sensitivity analyses more robust to pleiotropy, and bidirectional MR. This was used to distinguish the reproductive factors of causal relevance.

There are some limitations to consider. First, our analysis was carried out in populations of European ancestry; therefore, the results may not be generalizable to populations of other ancestries. Second, the second assumption of MR (of no existing confounders of the association between the variant and outcome) can be violated owing to population stratification. Population stratification can lead to a degree of confounding that is only avoidable through the use of within-sibship GWASs. Although we attempted this, the largest available within-sibship GWAS did not have sufficient instruments at genome-wide significance level to allow analysis. This remains a target for further research when larger studies are available. Third, the lack of individual-level data for the analyses is a limitation as summary-level analysis is less flexible, which precludes exploration of potential nonlinear effects. This is an important target for future work, especially for the exposures of number of live births and age at first birth, for which prior observational studies have highlighted nonlinear associations with cardiovascular and mortality outcomes.[10,64] Fourth, there was partial sample overlap in the primary analyses and complete sample overlap in the sex-specific sensitivity analyses for the exposures of age at first birth and number of live births. However, this is expected to have very limited impact on the results, bcause 2-sample MR methods (except MR-Egger) have been shown to produce reliable results in the setting of large biobanks even with complete sample overap.[65] Finally, negative results in both univariable and multivariable analyses might be related to lack of a true causal association but might also be because of lack of sufficient statistical power. The results should therefore be interpreted in the context of instrument strength in all cases. This is particularly true for the mediation analyses, where attenuation to null was observed in some cases where instruments were weak (F-statistics <10). Attenuation to the null in the mediation analyses should thus not be taken as indication of "full" mediation, as reaching the null invariably partly relates to a reduction in power.

CONCLUSIONS

This study comprehensively explored the role and causal relevance of female-specific reproductive risk factors on multiple CVDs, including atrial fibrillation, coronary artery disease, heart failure, and stroke. The findings support the emerging research focus on female-specific risk factors for CVD, by demonstrating that earlier first birth, higher number of live births, and earlier menarche are all associated with increased CVD in women. Importantly, the associations for age at first birth are at least partly driven by pleiotropy through EA. By providing evidence to support the causal relevance of these factors, and additionally identifying key potential modifiable pathways to mitigate the increased risk that they entail, we stress the importance of routine evaluation of reproductive history in clinical risk stratification and consideration of targeted prevention strategies for women.

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Disclosures

None.

Supplemental Material

Tables S1–S11

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SUPPLEMENTAL MATERIAL

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Table S1 – Case definitions for study outcomes in the genome-wide association studies used for genetic association estimates. Further details are available at the individual study publications. EUR = European, ICD = International Classification of Diseases

Outcome	Case definition
Atrial fibrillation	HUNT: ICD-9 427.3 and ICD-10 I48 codes on hospital or outpatient record deCODE: ICD-10 code I48 and ICD-9 code 427.3 on hospital record MGI: ICD-9 427.31 billing code DiscovEHR: ICD-10 I48 on electronic health record either as one problem code, or two separate diagnosis codes UK Biobank: ICD-9 427.3 and ICD-10 I48 on healthcare record
Coronary artery disease	UKB: ICD10 codes I21-I25, OPCS-4 codes K40-K46, K49, K50 and K75 Cardiogram/C4D: See original publications
Heart failure	ARIC: ICD9 428.x code; ICD10 I50 BIOSTAT-CHF: Physician diagnosis CHS: Self-report validated by doctor; or medical records COGEN: LVEF<40% or clinical HF with NYHA>1 by clinician deCODE: ICD9 428.x code; ICD10 I50 EGCUT: ICD10 I50 code EPHESUS: Physician diagnosis EPIC-Norfolk: ICD10 I50 code FHS: Physician/clinical diagnosis FINRISK: ICD-10: I50, I110, I130 and I132; ICD-9: 4029B, 404, 4148, 428; ICD-7: 42700, 42710, 428 or HF medication use GODARTS: Physician/clinical diagnosis GRADE: Physician/clinical diagnosis LURIC: Physician/clinical diagnosis MDCS: ICD8 427.00, 427.10, and 428.99; ICD9 428; ICD10 I50 and I11.0 PHFS: Physician/clinical diagnosis PIVUS: ICD9 427.00, 427.10, 428; ICD10 I50 or I11.0 PREVEND: Physician/clinical diagnosis PROSPER: Physician/clinical diagnosis Regeneron/Geisinger: Rotterdam study 1: Physician/clinical diagnosis SHIP: Physician/clinical diagnosis SOLID: Physician/clinical diagnosis TwinGene: ICD-10: I50; ICD-8 and ICD-9 428 UK Biobank: ICD-10: I11.0, I13.0, I13.2, I25.5, I42.0, I42.5, I42.8, I42.9, I50.0, I50.1, I50.9; ICD-9: 4254, 4280, 4281, 4289 ULSAM: ICD9 427.00, 427.10, 428; ICD10 I50 or I11.0 WGHS: Physician/clinical diagnosis
Stroke	World Health Organization (WHO) definition: rapidly developing signs of focal/global disturbance of cerebral function, lasting more than 24 hours with no cause other than vascular.
Ischemic stroke	Stroke defined as above; ischaemic origin based on clinical and imaging criteria

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Table S2 – Mendelian randomization (MR) sensitivity analyses for effects reproductive factors on cardiovascular outcomes, using weighted median MR, MR-PRESSO and MR-Egger method. CI = confidence interval, SNP= single nucleotide polymorphism, #SNP = number of SNPs used in analysis.

Exposure	Outcome	Method	Odds ratio	Lower 95% CI	Upper 95% CI	P-value
Age at first birth (per 1-year reduction)	Atrial fibrillation #SNP =18	Weighted median	1.00	0.83	1.21	0.999
		MR-PRESSO	1.10	0.95	1.26	0.216
		Mr-Egger	0.68	0.22	2.09	0.512
					intercept	0.471
	Coronary artery disease #SNP =18	Weighted median	1.58	1.33	1.88	2.02×10^{-7}
		MR-PRESSO	1.56	1.37	1.78	6.27×10^{-6}
		Mr-Egger	2.37	0.90	6.29	0.101
					intercept	0.356
	Heart failure #SNP =18	Weighted median	1.35	1.08	1.68	0.007
		MR-PRESSO	1.27	1.06	1.53	0.018
		Mr-Egger	1.18	0.38	3.72	0.776
					intercept	0.900
	Ischaemic stroke #SNP =18	Weighted median	1.30	0.98	1.72	0.068
		MR-PRESSO	1.16	0.92	1.47	0.219
		Mr-Egger	3.34	0.79	14.08	0.120
					intercept	0.166
	Stroke #SNP =18	Weighted median	1.35	1.03	1.78	0.032
		MR-PRESSO	1.25	1.00	1.56	0.066
		Mr-Egger	4.21	1.13	15.62	0.047
					intercept	0.085
Number of live births (per increase in category across <2, vs 2, vs >2 live births)	Atrial fibrillation #SNP =9	Weighted median	1.83	0.94	3.55	0.075
		MR-PRESSO	3.08	1.87	5.07	0.011
		Mr-Egger	0.28	0.00	11601	0.820
					intercept	0.677
	Coronary artery disease #SNP =9	Weighted median	1.33	0.93	1.92	0.120
		MR-PRESSO	1.41	1.00	2.00	0.087
		Mr-Egger	0.95	0.02	55.38	0.980
					intercept	0.853
	Heart failure #SNP =9	Weighted median	1.87	1.09	3.20	0.022
		MR-PRESSO	1.90	1.30	2.79	0.011

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		Mr-Egger	0.59	0.01	69.57	0.835
					intercept	0.645
	Ischaemic stroke #SNP =9	Weighted median	1.65	0.81	3.35	0.165
		MR-PRESSO	1.86	1.03	3.37	0.077
		Mr-Egger	559	1.41	221492	0.077
					intercept	0.103
	Stroke #SNP =9	Weighted median	1.61	0.80	3.22	0.178
		MR-PRESSO	2.07	1.22	3.52	0.027
		Mr-Egger	1083	5.90	198842	0.034
					intercept	0.050
Age at menarche (per 1-year reduction)	Atrial fibrillation #SNP =208	Weighted median	0.95	0.90	1.00	0.045
		MR-PRESSO	0.99	0.96	1.03	0.638
		Mr-Egger	0.90	0.81	1.00	0.057
					intercept	0.024
	Coronary artery disease #SNP =198	Weighted median	1.07	1.02	1.12	0.003
		MR-PRESSO	1.09	1.06	1.13	2.71×10^{-7}
		Mr-Egger	1.08	0.98	1.19	0.115
					intercept	0.733
	Heart failure #SNP =208	Weighted median	1.11	1.04	1.18	0.001
		MR-PRESSO	1.11	1.06	1.15	2.68×10^{-6}
		Mr-Egger	1.08	0.97	1.21	0.174
					intercept	0.520
	Ischaemic stroke #SNP =208	Weighted median	1.05	0.98	1.13	0.170
		MR-PRESSO	1.04	0.99	1.09	0.114
		Mr-Egger	1.04	0.91	1.19	0.556
					intercept	0.933
	Stroke #SNP =208	Weighted median	1.02	0.96	1.09	0.499
		MR-PRESSO	1.03	0.99	1.08	0.167
		Mr-Egger	1.02	0.90	1.15	0.769
					intercept	0.846
Age at menopause (per 1-year increase)	Atrial fibrillation #SNP =154	Weighted median	1.00	0.99	1.01	0.932
		MR-PRESSO	1.00	0.99	1.01	0.548
		Mr-Egger	1.00	0.98	1.02	0.685
					intercept	0.664
		Weighted median	1.00	0.98	1.01	0.589

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	Coronary artery disease #SNP =141	MR-PRESSO	1.00	0.99	1.01	0.813
		Mr-Egger	1.00	0.97	1.02	0.779
					intercept	0.804
	Heart failure #SNP =152	Weighted median	1.00	0.98	1.01	0.552
		MR-PRESSO	1.00	0.99	1.01	0.854
		Mr-Egger	1.00	0.98	1.02	0.883
					intercept	0.695
	Ischaemic stroke #SNP =151	Weighted median	0.99	0.96	1.01	0.220
		MR-PRESSO	1.00	0.98	1.01	0.613
		Mr-Egger	1.00	0.97	1.03	0.822
					intercept	0.610
	Stroke #SNP =151	Weighted median	0.98	0.96	1.00	0.685
		MR-PRESSO	1.00	0.98	1.01	0.545
		Mr-Egger	1.00	0.97	1.02	0.883
					intercept	0.881

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Table S3 – Mendelian randomization (MR) sensitivity analysis to assess for bidirectional association, exploring the effects of cardiovascular disease on reproductive factors using inverse-variance weighted model with multiplicative random effects. Std. Error = standard error.

Exposure	Outcome	#SNP	Beta coefficient	Std. Error	P-value
Atrial fibrillation (per log(OR) increase)	Age at first birth	110	-0.009	0.009	0.317
	Age at menarche	110	-0.002	0.006	0.762
	Number of live births	110	0.003	0.004	0.521
Coronary artery disease (per log(OR) increase)	Age at first birth	143	-0.029	0.010	0.005
	Age at menarche	143	0.001	0.008	0.941
	Number of live births	143	0.009	0.005	0.061
Heart failure (per log(OR) increase)	Age at first birth	10	0.010	0.025	0.685
	Age at menarche	10	-0.082	0.066	0.214
	Number of live births	10	0.006	0.021	0.784
Stroke (per log(OR) increase)	Age at first birth	8	-0.005	0.034	0.888
	Age at menarche	8	0.007	0.017	0.694
	Number of live births	8	0.005	0.020	0.804
Ischaemic stroke (per log(OR) increase)	Age at first birth	10	-0.009	0.028	0.746
	Age at menarche	10	0.009	0.021	0.676
	Number of live births	10	-0.006	0.015	0.691

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Table S4 – Sensitivity analysis using Mendelian randomization to estimate the effects of reproductive factors on cardiovascular outcomes, where SNP-outcome associations were calculated in the UK Biobank cohort restricted to female participants. CI = confidence interval.

Exposure	Outcome	Odds ratio	Lower 95% CI	Upper 95% CI	P-value
Age at first birth (per 1-year reduction)	Atrial fibrillation	1.77	1.31	2.39	2.11×10^{-4}
	Coronary artery disease	2.32	1.78	3.03	5.69×10^{-10}
	Heart failure	2.64	1.71	4.09	1.37×10^{-5}
	Ischaemic stroke	2.25	1.29	3.93	0.004
	Stroke	1.75	1.19	2.57	0.004
Number of live births (per increase in category across <2, vs 2, vs >2 live births)	Atrial fibrillation	3.19	1.42	7.19	0.005
	Coronary artery disease	2.29	1.10	4.74	0.026
	Heart failure	1.52	0.46	5.06	0.491
	Ischaemic stroke	2.54	0.43	14.87	0.302
	Stroke	3.22	0.82	12.57	0.093
Age at menarche (per 1-year reduction)	Atrial fibrillation	0.99	0.92	1.06	0.706
	Coronary artery disease	1.11	1.04	1.18	0.003
	Heart failure	1.15	1.05	1.27	0.005
	Ischaemic stroke	1.03	0.91	1.15	0.672
	Stroke	1.05	0.97	1.14	0.229
Age at menopause (per 1-year increase)	Atrial fibrillation	1.01	0.99	1.03	0.337
	Coronary artery disease	1.01	0.99	1.03	0.599
	Heart failure	1.01	0.98	1.04	0.651
	Ischaemic stroke	1.01	0.97	1.04	0.663
	Stroke	1.00	0.98	1.03	0.892

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Table S5 – Sensitivity analysis using multivariable Mendelian randomization (MR) to estimate the effect of reproductive factors on cardiovascular outcomes after accounting for educational attainment. EA = Educational attainment, CI = confidence interval, SNP= single nucleotide polymorphism, #SNP = number of SNPs used in analysis.

Exposure	Outcome	Adjusted for	#SNP	Odds ratio	Lower 95% CI	Upper 95% CI	P-value
Age at first birth (per 1-year reduction)	Coronary artery disease	None	18	1.49	1.28	1.74	3.72×10^{-7}
		EA	11	1.30	0.85	1.98	0.231
	Heart failure	None	18	1.27	1.06	1.53	0.009
		EA	11	0.93	0.68	1.27	0.664
	Stroke	None	18	1.25	1.00	1.56	0.048
		EA	11	1.01	0.75	1.36	0.961
Number of live births (per 1-year reduction)	Atrial fibrillation	None	9	2.91	1.16	7.29	0.023
		EA	4	1.71	0.43	6.85	0.451
	Heart failure	None	9	1.90	1.28	2.82	0.001
		EA	4	1.77	0.97	3.21	0.062
	Ischaemic stroke	None	9	1.86	1.03	3.37	0.039
		EA	4	2.36	1.22	4.58	0.011
	Stroke	None	9	2.07	1.22	3.52	0.007
		EA	4	2.38	1.03	5.53	0.043
Age at menarche (per 1-year reduction)	Coronary artery disease	None	198	1.10	1.06	1.14	1.68×10^{-6}
		EA	81	1.23	1.11	1.36	5.00×10^{-5}
	Heart failure	None	208	1.12	1.07	1.17	5.06×10^{-7}
		EA	81	1.21	1.07	1.37	0.003

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Table S6 – Mendelian randomization analyses to the association between reproductive factors and putative mediators using inverse-variance weighted model with multiplicative random effects. Only carried out for reproductive factors that displayed at least one nominally significant association with a cardiovascular outcome on primary analysis. Std. Error = standard error, SNP= single nucleotide polymorphism, #SNP = number of SNPs used in analysis.

Exposure	Outcome	#SNP	Beta coefficient	Std. Error	P-value	Used in mediation analysis?
Age at first birth (per 1-year reduction)	Body mass index	14	0.357	0.054	4.00×10^{-11}	Yes
	High-density lipoprotein cholesterol	12	-0.216	0.065	0.001	Yes
	Low-density lipoprotein cholesterol	12	-0.032	0.130	0.805	No
	Type 2 diabetes	16	0.682	0.138	8.24×10^{-7}	Yes
	Systolic blood pressure	17	1.681	0.506	0.001	Yes
Number of live births (per increase in category across <2, vs 2, vs >2 live births)	Body mass index	8	0.069	0.135	0.609	No
	High-density lipoprotein cholesterol	5	0.264	0.418	0.527	No
	Low-density lipoprotein cholesterol	5	0.867	0.645	0.179	No
	Type 2 diabetes	6	0.227	0.322	0.481	No
	Systolic blood pressure	8	-2.946	3.903	0.450	No
Age at menarche (per 1-year reduction)	Body mass index	109	0.145	0.024	1.43×10^{-9}	Yes
	High-density lipoprotein cholesterol	88	-0.035	0.020	0.078	No
	Low-density lipoprotein cholesterol	88	-0.003	0.017	0.864	No
	Type 2 diabetes	166	0.173	0.035	9.02×10^{-7}	Yes
	Systolic blood pressure	158	0.272	0.178	0.127	No

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Table S7 – F-statistics for instrument strength in univariable and multivariable analyses.

Univariable analyses		
Exposure	**Outcome**	**F-Statistic**
Age at first birth	Atrial fibrillation	38.89
	Coronary artery disease	38.89
	Heart failure	38.89
	Ischemic stroke	38.89
	Stroke	38.89
Number of live births	Atrial fibrillation	34.41
	Coronary artery disease	34.41
	Heart failure	34.41
	Ischemic stroke	34.41
	Stroke	34.41
Age at menarche	Atrial fibrillation	80.06
	Coronary artery disease	79.90
	Heart failure	80.06
	Ischemic stroke	80.06
	Stroke	80.06
Age at menopause	Atrial fibrillation	139.64
	Coronary artery disease	141.33
	Heart failure	140.06
	Ischemic stroke	140.57
	Stroke	140.57

Multivariable analyses			
Exposure	**Outcome**	**Mediator**	**F-statistic**
Age at first birth	Coronary artery disease	Body mass index	7.50
		Systolic blood pressure	1.97
		High-density lipoprotein cholesterol	4.62
		Type 2 diabetes	4.82
Age at menarche	Coronary artery disease	Body mass index	19.14
		Type 2 diabetes	44.47
		Low-density lipoprotein cholesterol	26.87
Age at first birth	Heart failure	Body mass index	7.50
		Systolic blood pressure	36.70

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		High-density lipoprotein cholesterol	75.73
		Type 2 diabetes	31.54
Age at menarche	Heart failure	Body mass index	19.14
		Type 2 diabetes	30.82
		Low-density lipoprotein cholesterol	27.17
Age at first birth	Stroke	Body mass index	7.49
		Systolic blood pressure	36.70
		High-density lipoprotein cholesterol	4.62
		Type 2 diabetes	31.92

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Table S8 – Phenotype associations at genome-wide significance level ($p<5x10^{-8}$) of instrumental variants for age at first birth on PhenoScanner. SNP= single-nucleotide polymorphism, PMID = PubMed ID.

SNP	Alllele1	Allele2	Trait	Study	PMID/Source	Year
rs113905912	C	T	Alcohol usually taken with meals	Neale B	UKBB	2017
rs11669516	A	G	Comparative height size at age 10	Neale B	UKBB	2017
rs11669516	A	G	Height	GIANT	25282103	2014
rs11669516	A	G	Height	Neale B	UKBB	2017
rs11669516	A	G	Impedance of arm right	Neale B	UKBB	2017
rs11669516	A	G	Leg fat percentage left	Neale B	UKBB	2017
rs11669516	A	G	Leg fat percentage right	Neale B	UKBB	2017
rs11669516	A	G	Sitting height	Neale B	UKBB	2017
rs11669516	A	G	Total cholesterol	GLGC	24097068	2013
rs11669516	A	G	Total cholesterol	GLGC	20686565	2010
rs11669516	A	G	Total cholesterol	GLGC	20686565	2010
rs11669516	A	G	Triglycerides	GLGC	24097068	2013
rs11669516	A	G	Triglycerides	GLGC	20686565	2010
rs11669516	A	G	Triglycerides	GLGC	20686565	2010
rs12089815	A	G	Alcohol usually taken with meals	Neale B	UKBB	2017
rs12089815	A	G	Average weekly beer plus cider intake	Neale B	UKBB	2017
rs12089815	A	G	Body mass index	Neale B	UKBB	2017
rs12089815	A	G	Impedance of arm left	Neale B	UKBB	2017
rs12089815	A	G	Qualifications: A levels or as levels or equivalent	Neale B	UKBB	2017
rs12089815	A	G	Qualifications: college or university degree	Neale B	UKBB	2017
rs12089815	A	G	Qualifications: none	Neale B	UKBB	2017
rs12089815	A	G	Townsend deprivation index at recruitment	Neale B	UKBB	2017
rs12089815	A	G	Years of educational attainment	SSGAC	27225129	2016
rs2230590	T	C	Age completed full time education	Neale B	UKBB	2017
rs2230590	T	C	Alcohol intake frequency	Neale B	UKBB	2017
rs2230590	T	C	Alcohol intake versus 10 years previously	Neale B	UKBB	2017
rs2230590	T	C	Arm fat mass left	Neale B	UKBB	2017
rs2230590	T	C	Arm fat mass right	Neale B	UKBB	2017
rs2230590	T	C	Arm fat percentage left	Neale B	UKBB	2017
rs2230590	T	C	Arm fat percentage right	Neale B	UKBB	2017
rs2230590	T	C	Arm fat-free mass left	Neale B	UKBB	2017
rs2230590	T	C	Arm fat-free mass right	Neale B	UKBB	2017
rs2230590	T	C	Arm predicted mass left	Neale B	UKBB	2017
rs2230590	T	C	Arm predicted mass right	Neale B	UKBB	2017
rs2230590	T	C	Basal metabolic rate	Neale B	UKBB	2017
rs2230590	T	C	Body fat percentage	Neale B	UKBB	2017
rs2230590	T	C	Body mass index	GIANT	29273807	2018
rs2230590	T	C	Body mass index	GIANT	29273807	2018

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rs2230590	T	C	Body mass index	Neale B	UKBB	2017
rs2230590	T	C	Crohns disease	IBDGC	23128233	2012
rs2230590	T	C	Diastolic blood pressure	Neale B	UKBB	2017
rs2230590	T	C	Fluid intelligence score	Neale B	UKBB	2017
rs2230590	T	C	Heel bone mineral density	Neale B	UKBB	2017
rs2230590	T	C	Hip circumference	Neale B	UKBB	2017
rs2230590	T	C	Impedance of arm left	Neale B	UKBB	2017
rs2230590	T	C	Impedance of arm right	Neale B	UKBB	2017
rs2230590	T	C	Impedance of leg left	Neale B	UKBB	2017
rs2230590	T	C	Impedance of leg right	Neale B	UKBB	2017
rs2230590	T	C	Impedance of whole body	Neale B	UKBB	2017
rs2230590	T	C	Inflammatory bowel disease	IBDGC	26192919	2015
rs2230590	T	C	Job involves heavy manual or physical work	Neale B	UKBB	2017
rs2230590	T	C	Job involves mainly walking or standing	Neale B	UKBB	2017
rs2230590	T	C	Leg fat mass left	Neale B	UKBB	2017
rs2230590	T	C	Leg fat mass right	Neale B	UKBB	2017
rs2230590	T	C	Leg fat percentage left	Neale B	UKBB	2017
rs2230590	T	C	Leg fat percentage right	Neale B	UKBB	2017
rs2230590	T	C	Leg fat-free mass left	Neale B	UKBB	2017
rs2230590	T	C	Leg fat-free mass right	Neale B	UKBB	2017
rs2230590	T	C	Leg predicted mass left	Neale B	UKBB	2017
rs2230590	T	C	Leg predicted mass right	Neale B	UKBB	2017
rs2230590	T	C	Miserableness	Neale B	UKBB	2017
rs2230590	T	C	Number of treatments or medications taken	Neale B	UKBB	2017
rs2230590	T	C	Overall health rating	Neale B	UKBB	2017
rs2230590	T	C	Qualifications: A levels or as levels or equivalent	Neale B	UKBB	2017
rs2230590	T	C	Qualifications: college or university degree	Neale B	UKBB	2017
rs2230590	T	C	Qualifications: none	Neale B	UKBB	2017
rs2230590	T	C	Taking other prescription medications	Neale B	UKBB	2017
rs2230590	T	C	Time spent watching television	Neale B	UKBB	2017
rs2230590	T	C	Trunk fat mass	Neale B	UKBB	2017
rs2230590	T	C	Trunk fat percentage	Neale B	UKBB	2017
rs2230590	T	C	Trunk fat-free mass	Neale B	UKBB	2017
rs2230590	T	C	Trunk predicted mass	Neale B	UKBB	2017
rs2230590	T	C	Usual walking pace	Neale B	UKBB	2017
rs2230590	T	C	Waist circumference	Neale B	UKBB	2017
rs2230590	T	C	Weight	Neale B	UKBB	2017
rs2230590	T	C	Wheeze or whistling in the chest in last year	Neale B	UKBB	2017
rs2230590	T	C	Whole body fat mass	Neale B	UKBB	2017
rs2230590	T	C	Whole body fat-free mass	Neale B	UKBB	2017
rs2230590	T	C	Whole body water mass	Neale B	UKBB	2017
rs2230590	T	C	Years of educational attainment	SSGAC	27225129	2016

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rs2230590	T	C	Years of educational attainment in females	SSGAC	27225129	2016
rs2230590	T	C	Years of educational attainment in males	SSGAC	27225129	2016
rs2645977	A	G	Qualifications: college or university degree	Neale B	UKBB	2017
rs2667360	T	A	Body mass index	Neale B	UKBB	2017
rs2667360	T	A	Leg fat mass left	Neale B	UKBB	2017
rs2667360	T	A	Leg fat mass right	Neale B	UKBB	2017
rs2667360	T	A	Weight	Neale B	UKBB	2017
rs2667360	T	A	Whole body fat mass	Neale B	UKBB	2017
rs2667360	T	A	Years of educational attainment	SSGAC	27225129	2016
rs2667360	T	A	Years of educational attainment in females	SSGAC	27225129	2016
rs359240	A	G	Illness, injury, bereavement, stress in last 2 years: financial difficulties	Neale B	UKBB	2017
rs362307	T	C	Alcohol intake frequency	Neale B	UKBB	2017
rs362307	T	C	Arm fat mass left	Neale B	UKBB	2017
rs362307	T	C	Arm fat mass right	Neale B	UKBB	2017
rs362307	T	C	Arm fat percentage left	Neale B	UKBB	2017
rs362307	T	C	Arm fat percentage right	Neale B	UKBB	2017
rs362307	T	C	Body mass index	Neale B	UKBB	2017
rs362307	T	C	Drive faster than motorway speed limit	Neale B	UKBB	2017
rs362307	T	C	Leg fat mass left	Neale B	UKBB	2017
rs362307	T	C	Leg fat mass right	Neale B	UKBB	2017
rs362307	T	C	Leg fat percentage left	Neale B	UKBB	2017
rs362307	T	C	Leg fat percentage right	Neale B	UKBB	2017
rs362307	T	C	Overall health rating	Neale B	UKBB	2017
rs362307	T	C	Qualifications: college or university degree	Neale B	UKBB	2017
rs3757323	C	T	Height	Neale B	UKBB	2017
rs3757323	C	T	Qualifications: college or university degree	Neale B	UKBB	2017
rs4799936	A	G	Depressive symptoms	SSGAC	29292387	2018
rs4799936	A	G	Depressive symptoms	SSGAC	29292387	2018
rs4799936	A	G	Depressive symptoms multi trait analysis	SSGAC	29292387	2018
rs4799936	A	G	Overall health rating	Neale B	UKBB	2017
rs4799936	A	G	Qualifications: college or university degree	Neale B	UKBB	2017
rs4799936	A	G	Qualifications: none	Neale B	UKBB	2017
rs4799936	A	G	Sensitivity or hurt feelings	Neale B	UKBB	2017
rs72829857	A	G	Qualifications: A levels or as levels or equivalent	Neale B	UKBB	2017
rs72829857	A	G	Qualifications: college or university degree	Neale B	UKBB	2017
rs9372625	A	G	Alcohol intake frequency	Neale B	UKBB	2017
rs9372625	A	G	Arm fat mass left	Neale B	UKBB	2017
rs9372625	A	G	Arm fat mass right	Neale B	UKBB	2017
rs9372625	A	G	Arm fat percentage left	Neale B	UKBB	2017
rs9372625	A	G	Arm fat percentage right	Neale B	UKBB	2017
rs9372625	A	G	Average weekly red wine intake	Neale B	UKBB	2017
rs9372625	A	G	Body fat percentage	Neale B	UKBB	2017

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rs9372625	A	G	Body mass index	Neale B	UKBB	2017
rs9372625	A	G	Fluid intelligence score	Neale B	UKBB	2017
rs9372625	A	G	Job involves heavy manual or physical work	Neale B	UKBB	2017
rs9372625	A	G	Job involves mainly walking or standing	Neale B	UKBB	2017
rs9372625	A	G	Leg fat mass left	Neale B	UKBB	2017
rs9372625	A	G	Leg fat mass right	Neale B	UKBB	2017
rs9372625	A	G	Leg fat percentage left	Neale B	UKBB	2017
rs9372625	A	G	Leg fat percentage right	Neale B	UKBB	2017
rs9372625	A	G	Overall health rating	Neale B	UKBB	2017
rs9372625	A	G	Qualifications: A levels or as levels or equivalent	Neale B	UKBB	2017
rs9372625	A	G	Qualifications: college or university degree	Neale B	UKBB	2017
rs9372625	A	G	Qualifications: CSEs or equivalent	Neale B	UKBB	2017
rs9372625	A	G	Qualifications: none	Neale B	UKBB	2017
rs9372625	A	G	Qualifications: O levels or GCSEs or equivalent	Neale B	UKBB	2017
rs9372625	A	G	Time spent using computer	Neale B	UKBB	2017
rs9372625	A	G	Time spent watching television	Neale B	UKBB	2017
rs9372625	A	G	Trunk fat mass	Neale B	UKBB	2017
rs9372625	A	G	Trunk fat percentage	Neale B	UKBB	2017
rs9372625	A	G	Whole body fat mass	Neale B	UKBB	2017
rs9372625	A	G	Years of educational attainment	SSGAC	27225129	2016
rs9372625	A	G	Years of educational attainment in females	SSGAC	27225129	2016
rs9372625	A	G	Years of educational attainment in males	SSGAC	27225129	2016

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Table S9 – Phenotype associations at genome-wide significance level ($p<5x10^{-8}$) of instrumental variants for number of live births on PhenoScanner. SNP= single-nucleotide polymorphism, PMID = PubMed ID.

SNP	Alllele1	Allele2	Trait	Study	PMID/Source	Year
rs116956554	A	G	Eosinophil count	Astle W	27863252	2016
rs116956554	A	G	Eosinophil percentage of granulocytes	Astle W	27863252	2016
rs116956554	A	G	Eosinophil percentage of white cells	Astle W	27863252	2016
rs116956554	A	G	Hematocrit	Astle W	27863252	2016
rs116956554	A	G	Hemoglobin concentration	Astle W	27863252	2016
rs116956554	A	G	High grade serous ovarian cancer	Phelan M	28346442	2017
rs116956554	A	G	High light scatter reticulocyte count	Astle W	27863252	2016
rs116956554	A	G	Invasive ovarian cancer	Phelan M	28346442	2017
rs116956554	A	G	Lymphocyte percentage of white cells	Astle W	27863252	2016
rs116956554	A	G	Neutrophil percentage of granulocytes	Astle W	27863252	2016
rs116956554	A	G	Neutrophil percentage of white cells	Astle W	27863252	2016
rs116956554	A	G	Red blood cell count	Astle W	27863252	2016
rs116956554	A	G	Red cell distribution width	Astle W	27863252	2016
rs116956554	A	G	Reticulocyte count	Astle W	27863252	2016
rs116956554	A	G	Serous invasive ovarian cancer	Phelan M	28346442	2017
rs116956554	A	G	Sum eosinophil basophil counts	Astle W	27863252	2016
rs1496108	G	A	Heel bone mineral density	Neale B	UKBB	2017
rs1496108	G	A	Heel bone mineral density left	Neale B	UKBB	2017
rs1496108	G	A	Heel bone mineral density right	Neale B	UKBB	2017
rs174557	A	G	Eosinophil count	Astle W	27863252	2016
rs174557	A	G	Granulocyte count	Astle W	27863252	2016
rs174557	A	G	Granulocyte percentage of myeloid white cells	Astle W	27863252	2016
rs174557	A	G	Hematocrit	Astle W	27863252	2016
rs174557	A	G	Hemoglobin concentration	Astle W	27863252	2016
rs174557	A	G	Mean corpuscular volume	Astle W	27863252	2016
rs174557	A	G	Mean platelet volume	Astle W	27863252	2016
rs174557	A	G	Monocyte percentage of white cells	Astle W	27863252	2016
rs174557	A	G	Myeloid white cell count	Astle W	27863252	2016
rs174557	A	G	Neutrophil count	Astle W	27863252	2016
rs174557	A	G	Platelet count	Astle W	27863252	2016
rs174557	A	G	Red blood cell count	Astle W	27863252	2016
rs174557	A	G	Red cell distribution width	Astle W	27863252	2016
rs174557	A	G	Sum basophil neutrophil counts	Astle W	27863252	2016
rs174557	A	G	Sum eosinophil basophil counts	Astle W	27863252	2016
rs174557	A	G	Sum neutrophil eosinophil counts	Astle W	27863252	2016
rs174557	A	G	White blood cell count	Astle W	27863252	2016
rs2044725	T	C	Arm fat mass left	Neale B	UKBB	2017
rs2044725	T	C	Arm fat-free mass left	Neale B	UKBB	2017
rs2044725	T	C	Arm fat-free mass right	Neale B	UKBB	2017
rs2044725	T	C	Arm predicted mass left	Neale B	UKBB	2017
rs2044725	T	C	Arm predicted mass right	Neale B	UKBB	2017
rs2044725	T	C	Basal metabolic rate	Neale B	UKBB	2017
rs2044725	T	C	Body mass index	Neale B	UKBB	2017
rs2044725	T	C	Comparative body size at age 10	Neale B	UKBB	2017

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rs2044725	T	C	Drive faster than motorway speed limit	Neale B	UKBB	2017
rs2044725	T	C	Ever smoked	Neale B	UKBB	2017
rs2044725	T	C	Hand grip strength left	Neale B	UKBB	2017
rs2044725	T	C	Impedance of arm left	Neale B	UKBB	2017
rs2044725	T	C	Impedance of arm right	Neale B	UKBB	2017
rs2044725	T	C	Impedance of leg left	Neale B	UKBB	2017
rs2044725	T	C	Impedance of leg right	Neale B	UKBB	2017
rs2044725	T	C	Impedance of whole body	Neale B	UKBB	2017
rs2044725	T	C	Leg fat mass left	Neale B	UKBB	2017
rs2044725	T	C	Leg fat mass right	Neale B	UKBB	2017
rs2044725	T	C	Leg fat-free mass left	Neale B	UKBB	2017
rs2044725	T	C	Leg fat-free mass right	Neale B	UKBB	2017
rs2044725	T	C	Leg predicted mass left	Neale B	UKBB	2017
rs2044725	T	C	Leg predicted mass right	Neale B	UKBB	2017
rs2044725	T	C	Nervous feelings	Neale B	UKBB	2017
rs2044725	T	C	Past tobacco smoking	Neale B	UKBB	2017
rs2044725	T	C	Risk taking	Neale B	UKBB	2017
rs2044725	T	C	Smoking status: previous	Neale B	UKBB	2017
rs2044725	T	C	Suffer from nerves	Neale B	UKBB	2017
rs2044725	T	C	Trunk fat-free mass	Neale B	UKBB	2017
rs2044725	T	C	Trunk predicted mass	Neale B	UKBB	2017
rs2044725	T	C	Weight	Neale B	UKBB	2017
rs2044725	T	C	Whole body fat-free mass	Neale B	UKBB	2017
rs2044725	T	C	Whole body water mass	Neale B	UKBB	2017
rs2044725	T	C	Worrier or anxious feelings	Neale B	UKBB	2017
rs4838926	C	G	Self-reported atrial fibrillation	Neale B	UKBB	2017
rs7515106	C	T	Female genital prolapse	Neale B	UKBB	2017
rs7515106	C	T	Forced vital capacity	Neale B	UKBB	2017
rs7515106	C	T	Forced vital capacity, best measure	Neale B	UKBB	2017
rs7515106	C	T	Heel bone mineral density	Neale B	UKBB	2017
rs7515106	C	T	Heel bone mineral density left	Neale B	UKBB	2017
rs7515106	C	T	Heel bone mineral density right	Neale B	UKBB	2017
rs7515106	C	T	Hip circumference	Neale B	UKBB	2017
rs7515106	C	T	Impedance of leg left	Neale B	UKBB	2017
rs7515106	C	T	Impedance of leg right	Neale B	UKBB	2017
rs7515106	C	T	Leg fat-free mass left	Neale B	UKBB	2017
rs7515106	C	T	Leg fat-free mass right	Neale B	UKBB	2017
rs7515106	C	T	Leg predicted mass left	Neale B	UKBB	2017
rs7515106	C	T	Leg predicted mass right	Neale B	UKBB	2017
rs7515106	C	T	Sitting height	Neale B	UKBB	2017

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Table S10 – Phenotype associations at genome-wide significance level ($p<5x10^{-8}$) of instrumental variants for age at menarche on PhenoScanner. SNP= single-nucleotide polymorphism, PMID = PubMed ID.

SNP	Alllele 1	Allele 2	Trait	Study	PMID/Source	Year
rs10136330	C	T	Comparative body size at age 10	Neale B	UKBB	2017
rs10138913	C	T	Age at menarche	Neale B	UKBB	2017
rs10138913	C	T	Arm fat-free mass left	Neale B	UKBB	2017
rs10138913	C	T	Arm fat-free mass right	Neale B	UKBB	2017
rs10138913	C	T	Arm predicted mass left	Neale B	UKBB	2017
rs10138913	C	T	Arm predicted mass right	Neale B	UKBB	2017
rs10138913	C	T	Basal metabolic rate	Neale B	UKBB	2017
rs10138913	C	T	Comparative height size at age 10	Neale B	UKBB	2017
rs10138913	C	T	Height	Neale B	UKBB	2017
rs10138913	C	T	Hip circumference	Neale B	UKBB	2017
rs10138913	C	T	Impedance of leg right	Neale B	UKBB	2017
rs10138913	C	T	Leg fat-free mass left	Neale B	UKBB	2017
rs10138913	C	T	Leg fat-free mass right	Neale B	UKBB	2017
rs10138913	C	T	Leg predicted mass left	Neale B	UKBB	2017
rs10138913	C	T	Leg predicted mass right	Neale B	UKBB	2017
rs10138913	C	T	Sitting height	Neale B	UKBB	2017
rs10138913	C	T	Trunk fat-free mass	Neale B	UKBB	2017
rs10138913	C	T	Trunk predicted mass	Neale B	UKBB	2017
rs10138913	C	T	Weight	Neale B	UKBB	2017
rs10138913	C	T	Whole body fat-free mass	Neale B	UKBB	2017
rs10138913	C	T	Whole body water mass	Neale B	UKBB	2017
rs10143972	C	T	Body mass index	Neale B	UKBB	2017
rs10156597	A	T	Height	GIANT	25282103	2014
rs10156597	A	T	Age at menarche	Neale B	UKBB	2017
rs10156597	A	T	Forced expiratory volume in 1-second	Neale B	UKBB	2017
rs10156597	A	T	Forced vital capacity	Neale B	UKBB	2017
rs10156597	A	T	Forced vital capacity, best measure	Neale B	UKBB	2017
rs10156597	A	T	Height	Neale B	UKBB	2017
rs10156597	A	T	Relative age of first facial hair	Neale B	UKBB	2017
rs10156597	A	T	Relative age voice broke	Neale B	UKBB	2017
rs10156597	A	T	Age at menarche	ReproGen	25231870	2014
rs10237306	G	T	Arm fat mass left	Neale B	UKBB	2017
rs10237306	G	T	Arm fat mass right	Neale B	UKBB	2017
rs10237306	G	T	Arm fat-free mass left	Neale B	UKBB	2017
rs10237306	G	T	Arm fat-free mass right	Neale B	UKBB	2017
rs10237306	G	T	Arm predicted mass left	Neale B	UKBB	2017
rs10237306	G	T	Arm predicted mass right	Neale B	UKBB	2017
rs10237306	G	T	Basal metabolic rate	Neale B	UKBB	2017
rs10237306	G	T	Height	Neale B	UKBB	2017
rs10237306	G	T	Hip circumference	Neale B	UKBB	2017
rs10237306	G	T	Leg fat mass left	Neale B	UKBB	2017
rs10237306	G	T	Leg fat mass right	Neale B	UKBB	2017

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rs10237306	G	T	Leg fat-free mass left	Neale B	UKBB	2017
rs10237306	G	T	Leg fat-free mass right	Neale B	UKBB	2017
rs10237306	G	T	Leg predicted mass left	Neale B	UKBB	2017
rs10237306	G	T	Leg predicted mass right	Neale B	UKBB	2017
rs10237306	G	T	Trunk fat mass	Neale B	UKBB	2017
rs10237306	G	T	Trunk fat-free mass	Neale B	UKBB	2017
rs10237306	G	T	Trunk predicted mass	Neale B	UKBB	2017
rs10237306	G	T	Waist circumference	Neale B	UKBB	2017
rs10237306	G	T	Weight	Neale B	UKBB	2017
rs10237306	G	T	Whole body fat mass	Neale B	UKBB	2017
rs10237306	G	T	Whole body fat-free mass	Neale B	UKBB	2017
rs10237306	G	T	Whole body water mass	Neale B	UKBB	2017
rs1023955	G	T	Age at menarche	Neale B	UKBB	2017
rs1023955	G	T	Arm fat mass left	Neale B	UKBB	2017
rs1023955	G	T	Arm fat mass right	Neale B	UKBB	2017
rs1023955	G	T	Arm fat percentage left	Neale B	UKBB	2017
rs1023955	G	T	Arm fat percentage right	Neale B	UKBB	2017
rs1023955	G	T	Body fat percentage	Neale B	UKBB	2017
rs1023955	G	T	Body mass index	Neale B	UKBB	2017
rs1023955	G	T	Hip circumference	Neale B	UKBB	2017
rs1023955	G	T	Leg fat mass left	Neale B	UKBB	2017
rs1023955	G	T	Leg fat mass right	Neale B	UKBB	2017
rs1023955	G	T	Leg fat percentage left	Neale B	UKBB	2017
rs1023955	G	T	Leg fat percentage right	Neale B	UKBB	2017
rs1023955	G	T	Trunk fat mass	Neale B	UKBB	2017
rs1023955	G	T	Trunk fat percentage	Neale B	UKBB	2017
rs1023955	G	T	Types of physical activity in last 4 weeks: walking for pleasure	Neale B	UKBB	2017
rs1023955	G	T	Waist circumference	Neale B	UKBB	2017
rs1023955	G	T	Weight	Neale B	UKBB	2017
rs1023955	G	T	Whole body fat mass	Neale B	UKBB	2017
rs1025128	G	C	Height	Neale B	UKBB	2017
rs1025128	G	C	Qualifications: college or university degree	Neale B	UKBB	2017
rs1040070	G	C	Childhood BMI	EGGC	26604143	2016
rs1040070	G	C	Childhood obesity	EGGC	22484627	2012
rs1040070	G	C	Body mass index in females less than or equal to 50 years of age	GIANT	26426971	2015
rs1040070	G	C	Body mass index in females	GIANT	23754948	2013
rs1040070	G	C	Body mass index in females	GIANT	25673413	2015
rs1040070	G	C	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs1040070	G	C	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs1040070	G	C	Body mass index adjusted for smoking	GIANT	28443625	2017
rs1040070	G	C	Body mass index	Speliotes EK	20935630	2010
rs1040070	G	C	Body mass index	GIANT	23754948	2013
rs1040070	G	C	Body mass index	GIANT	25673413	2015
rs1040070	G	C	Body mass index	GIANT	25673413	2015
rs1040070	G	C	Hip circumference	GIANT	25673412	2015
rs1040070	G	C	Hip circumference	GIANT	25673412	2015
rs1040070	G	C	Waist circumference	GIANT	25673412	2015

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rs1040070	G	C	Body mass index	Speliotes EK	20935630	2010
rs1040070	G	C	Obesity with early age of onset	EGGC	22484627	2012
rs1040070	G	C	Obesity with early age of onset age 2	EGGC	22484627	2012
rs1040070	G	C	Menarche age at onset	Pickrell JK	27182965	2016
rs1040070	G	C	Age at menarche	Neale B	UKBB	2017
rs1040070	G	C	Arm fat mass left	Neale B	UKBB	2017
rs1040070	G	C	Arm fat mass right	Neale B	UKBB	2017
rs1040070	G	C	Arm fat percentage left	Neale B	UKBB	2017
rs1040070	G	C	Arm fat percentage right	Neale B	UKBB	2017
rs1040070	G	C	Basal metabolic rate	Neale B	UKBB	2017
rs1040070	G	C	Body mass index	Neale B	UKBB	2017
rs1040070	G	C	Comparative body size at age 10	Neale B	UKBB	2017
rs1040070	G	C	Comparative height size at age 10	Neale B	UKBB	2017
rs1040070	G	C	Hip circumference	Neale B	UKBB	2017
rs1040070	G	C	Impedance of arm left	Neale B	UKBB	2017
rs1040070	G	C	Impedance of leg left	Neale B	UKBB	2017
rs1040070	G	C	Impedance of leg right	Neale B	UKBB	2017
rs1040070	G	C	Impedance of whole body	Neale B	UKBB	2017
rs1040070	G	C	Leg fat-free mass left	Neale B	UKBB	2017
rs1040070	G	C	Leg fat-free mass right	Neale B	UKBB	2017
rs1040070	G	C	Leg predicted mass left	Neale B	UKBB	2017
rs1040070	G	C	Leg predicted mass right	Neale B	UKBB	2017
rs1040070	G	C	Relative age voice broke	Neale B	UKBB	2017
rs1040070	G	C	Weight	Neale B	UKBB	2017
rs1040070	G	C	Age at menarche	ReproGen	25231870	2014
rs10750766	A	C	High light scatter percentage of red cells	Astle W	27863252	2016
rs10750766	A	C	High light scatter reticulocyte count	Astle W	27863252	2016
rs10750766	A	C	Immature fraction of reticulocytes	Astle W	27863252	2016
rs10750766	A	C	High light scatter reticulocyte count	Astle W	27863252	2016
rs10750766	A	C	High light scatter reticulocyte percentage of red cells	Astle W	27863252	2016
rs10750766	A	C	Immature fraction of reticulocytes	Astle W	27863252	2016
rs10750766	A	C	Diastolic blood pressure	Neale B	UKBB	2017
rs10750766	A	C	Heel bone mineral density	Neale B	UKBB	2017
rs10750766	A	C	Heel bone mineral density right	Neale B	UKBB	2017
rs10750766	A	C	Self-reported hypertension	Neale B	UKBB	2017
rs10750766	A	C	Treatment with blood pressure medication	Neale B	UKBB	2017
rs10750766	A	C	Vascular or heart problems diagnosed by doctor: high blood pressure	Neale B	UKBB	2017
rs10750766	A	C	Vascular or heart problems diagnosed by doctor: none of the above	Neale B	UKBB	2017
rs1079866	G	C	Age at menarche	Elks CE	21102462	2010
rs1079866	G	C	Menarche age at onset	Elks CE	21102462	2010
rs1079866	G	C	Menarche age at onset	ReproGen	25231870	2014
rs1079866	G	C	Age at menarche	Neale B	UKBB	2017
rs1079866	G	C	Age at menarche	ReproGen	25231870	2014
rs1079866	G	C	Menarche	Elks CE	21102462	2010
rs10832021	A	G	Age at menarche	Neale B	UKBB	2017
rs10832021	A	G	Body mass index	Neale B	UKBB	2017

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rs10832021	A	G	Height	Neale B	UKBB	2017
rs10832021	A	G	Worry too long after embarrassment	Neale B	UKBB	2017
rs10832021	A	G	Age at menarche	ReproGen	25231870	2014
rs10931831	C	T	Age at menarche	Neale B	UKBB	2017
rs10931831	C	T	Impedance of leg left	Neale B	UKBB	2017
rs10931831	C	T	Impedance of leg right	Neale B	UKBB	2017
rs10931831	C	T	Impedance of whole body	Neale B	UKBB	2017
rs10934420	C	T	Age at menarche	Neale B	UKBB	2017
rs10934420	C	T	Height	Neale B	UKBB	2017
rs10934420	C	T	Age at menarche	ReproGen	25231870	2014
rs11031040	G	T	Bilateral oophorectomy	Neale B	UKBB	2017
rs11031040	G	T	Excessive, frequent and irregular menstruation	Neale B	UKBB	2017
rs11031040	G	T	Length of menstrual cycle	Neale B	UKBB	2017
rs11065822	G	T	Eosinophil count	Astle W	27863252	2016
rs11065822	G	T	Eosinophil percentage of granulocytes	Astle W	27863252	2016
rs11065822	G	T	Eosinophil percentage of white cells	Astle W	27863252	2016
rs11065822	G	T	Hematocrit	Astle W	27863252	2016
rs11065822	G	T	Hemoglobin concentration	Astle W	27863252	2016
rs11065822	G	T	High light scatter percentage of red cells	Astle W	27863252	2016
rs11065822	G	T	High light scatter reticulocyte count	Astle W	27863252	2016
rs11065822	G	T	Immature fraction of reticulocytes	Astle W	27863252	2016
rs11065822	G	T	Lymphocyte count	Astle W	27863252	2016
rs11065822	G	T	Lymphocyte percentage of white cells	Astle W	27863252	2016
rs11065822	G	T	Monocyte count	Astle W	27863252	2016
rs11065822	G	T	Neutrophil percentage of granulocytes	Astle W	27863252	2016
rs11065822	G	T	Neutrophil percentage of white cells	Astle W	27863252	2016
rs11065822	G	T	Platelet count	Astle W	27863252	2016
rs11065822	G	T	Plateletcrit	Astle W	27863252	2016
rs11065822	G	T	Red blood cell count	Astle W	27863252	2016
rs11065822	G	T	Reticulocyte count	Astle W	27863252	2016
rs11065822	G	T	Reticulocyte fraction of red cells	Astle W	27863252	2016
rs11065822	G	T	Sum eosinophil basophil counts	Astle W	27863252	2016
rs11065822	G	T	White blood cell count	Astle W	27863252	2016
rs11065822	G	T	Arm fat-free mass left	Neale B	UKBB	2017
rs11065822	G	T	Arm fat-free mass right	Neale B	UKBB	2017
rs11065822	G	T	Arm predicted mass left	Neale B	UKBB	2017
rs11065822	G	T	Arm predicted mass right	Neale B	UKBB	2017
rs11065822	G	T	Basal metabolic rate	Neale B	UKBB	2017
rs11065822	G	T	Birth weight	Neale B	UKBB	2017
rs11065822	G	T	Diastolic blood pressure	Neale B	UKBB	2017
rs11065822	G	T	Impedance of arm left	Neale B	UKBB	2017
rs11065822	G	T	Impedance of arm right	Neale B	UKBB	2017
rs11065822	G	T	Impedance of whole body	Neale B	UKBB	2017
rs11065822	G	T	Self-reported hypertension	Neale B	UKBB	2017
rs11065822	G	T	Self-reported hypothyroidism or myxoedema	Neale B	UKBB	2017
rs11065822	G	T	Treatment with levothyroxine sodium	Neale B	UKBB	2017
rs11065822	G	T	Trunk fat-free mass	Neale B	UKBB	2017
rs11065822	G	T	Trunk predicted mass	Neale B	UKBB	2017

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rs11065822	G	T	Vascular or heart problems diagnosed by doctor: high blood pressure	Neale B	UKBB	2017
rs11065822	G	T	Vascular or heart problems diagnosed by doctor: none of the above	Neale B	UKBB	2017
rs11065822	G	T	Whole body fat-free mass	Neale B	UKBB	2017
rs11065822	G	T	Whole body water mass	Neale B	UKBB	2017
rs11065822	G	T	Coronary artery disease	van der Harst P	29212778	2018
rs11065822	G	T	Coronary artery disease	van der Harst P	29212778	2018
rs11165924	A	G	Menarche age at onset	ReproGen	25231870	2014
rs11165924	A	G	Age at menarche	ReproGen	25231870	2014
rs11209331	C	T	Height	GIANT	20881960	2010
rs11209331	C	T	Height	GIANT	23754948	2013
rs11209331	C	T	Height	GIANT	25282103	2014
rs11209331	C	T	Height	GIANT	20881960	2010
rs11209331	C	T	Arm fat-free mass left	Neale B	UKBB	2017
rs11209331	C	T	Arm fat-free mass right	Neale B	UKBB	2017
rs11209331	C	T	Arm predicted mass left	Neale B	UKBB	2017
rs11209331	C	T	Arm predicted mass right	Neale B	UKBB	2017
rs11209331	C	T	Basal metabolic rate	Neale B	UKBB	2017
rs11209331	C	T	Comparative height size at age 10	Neale B	UKBB	2017
rs11209331	C	T	Forced expiratory volume in 1-second	Neale B	UKBB	2017
rs11209331	C	T	Forced expiratory volume in 1-second, best measure	Neale B	UKBB	2017
rs11209331	C	T	Forced expiratory volume in 1-second, predicted	Neale B	UKBB	2017
rs11209331	C	T	Forced vital capacity	Neale B	UKBB	2017
rs11209331	C	T	Forced vital capacity, best measure	Neale B	UKBB	2017
rs11209331	C	T	Height	Neale B	UKBB	2017
rs11209331	C	T	Leg fat-free mass left	Neale B	UKBB	2017
rs11209331	C	T	Leg fat-free mass right	Neale B	UKBB	2017
rs11209331	C	T	Leg predicted mass left	Neale B	UKBB	2017
rs11209331	C	T	Leg predicted mass right	Neale B	UKBB	2017
rs11209331	C	T	Sitting height	Neale B	UKBB	2017
rs11209331	C	T	Trunk fat-free mass	Neale B	UKBB	2017
rs11209331	C	T	Trunk predicted mass	Neale B	UKBB	2017
rs11209331	C	T	Weight	Neale B	UKBB	2017
rs11209331	C	T	Whole body fat-free mass	Neale B	UKBB	2017
rs11209331	C	T	Whole body water mass	Neale B	UKBB	2017
rs11210871	C	G	Intelligence multi trait analysis	Hill WD	29326435	2018
rs11210871	C	G	Age at menarche	Neale B	UKBB	2017
rs11210871	C	G	Current tobacco smoking	Neale B	UKBB	2017
rs11210871	C	G	Qualifications: A levels or as levels or equivalent	Neale B	UKBB	2017
rs11210871	C	G	Qualifications: college or university degree	Neale B	UKBB	2017
rs11210871	C	G	Qualifications: none	Neale B	UKBB	2017
rs11210871	C	G	Smoking status: current	Neale B	UKBB	2017
rs11210871	C	G	Age at menarche	ReproGen	25231870	2014
rs11210871	C	G	Years of educational attainment	SSGAC	27225129	2016
rs11240695	A	C	Age at menarche	Neale B	UKBB	2017
rs1131017	C	G	Eosinophil count	Astle W	27863252	2016
rs1131017	C	G	Eosinophil percentage of granulocytes	Astle W	27863252	2016

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rs1131017	C	G	Eosinophil percentage of white cells	Astle W	27863252	2016
rs1131017	C	G	Neutrophil percentage of granulocytes	Astle W	27863252	2016
rs1131017	C	G	Sum eosinophil basophil counts	Astle W	27863252	2016
rs1131017	C	G	Allergic disease	Ferreira M	29083406	2017
rs1131017	C	G	Inflammatory skin disease	Baurecht H	25574825	2015
rs1131017	C	G	Arm fat-free mass left	Neale B	UKBB	2017
rs1131017	C	G	Arm fat-free mass right	Neale B	UKBB	2017
rs1131017	C	G	Arm predicted mass left	Neale B	UKBB	2017
rs1131017	C	G	Arm predicted mass right	Neale B	UKBB	2017
rs1131017	C	G	Asthma	Neale B	UKBB	2017
rs1131017	C	G	Basal metabolic rate	Neale B	UKBB	2017
rs1131017	C	G	Body mass index	Neale B	UKBB	2017
rs1131017	C	G	Forced expiratory volume in 1-second, best measure	Neale B	UKBB	2017
rs1131017	C	G	Hayfever, allergic rhinitis or eczema	Neale B	UKBB	2017
rs1131017	C	G	Impedance of arm left	Neale B	UKBB	2017
rs1131017	C	G	Impedance of arm right	Neale B	UKBB	2017
rs1131017	C	G	Impedance of leg left	Neale B	UKBB	2017
rs1131017	C	G	Impedance of leg right	Neale B	UKBB	2017
rs1131017	C	G	Impedance of whole body	Neale B	UKBB	2017
rs1131017	C	G	Leg fat-free mass left	Neale B	UKBB	2017
rs1131017	C	G	Leg fat-free mass right	Neale B	UKBB	2017
rs1131017	C	G	Leg predicted mass left	Neale B	UKBB	2017
rs1131017	C	G	Leg predicted mass right	Neale B	UKBB	2017
rs1131017	C	G	No blood clot, bronchitis, emphysema, asthma, rhinitis, eczema or allergy diagnosed by doctor	Neale B	UKBB	2017
rs1131017	C	G	Qualifications: college or university degree	Neale B	UKBB	2017
rs1131017	C	G	Qualifications: none	Neale B	UKBB	2017
rs1131017	C	G	Self-reported asthma	Neale B	UKBB	2017
rs1131017	C	G	Self-reported hypothyroidism or myxoedema	Neale B	UKBB	2017
rs1131017	C	G	Treatment with levothyroxine sodium	Neale B	UKBB	2017
rs1131017	C	G	Trunk fat-free mass	Neale B	UKBB	2017
rs1131017	C	G	Trunk predicted mass	Neale B	UKBB	2017
rs1131017	C	G	Whole body fat-free mass	Neale B	UKBB	2017
rs1131017	C	G	Whole body water mass	Neale B	UKBB	2017
rs1131017	C	G	Rheumatoid arthritis	Okada Y	24390342	2014
rs1131017	C	G	Years of educational attainment	SSGAC	27225129	2016
rs113388806	A	T	Height	GIANT	28146470	2017
rs113388806	A	T	Height	GIANT	28146470	2017
rs115435316	A	G	Age at menarche	Neale B	UKBB	2017
rs115435316	A	G	Arm fat-free mass right	Neale B	UKBB	2017
rs115435316	A	G	Arm predicted mass right	Neale B	UKBB	2017
rs115435316	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs115435316	A	G	Height	Neale B	UKBB	2017
rs115435316	A	G	Sitting height	Neale B	UKBB	2017
rs115435316	A	G	Trunk fat-free mass	Neale B	UKBB	2017

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rs115435316	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs115435316	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs115435316	A	G	Whole body water mass	Neale B	UKBB	2017
rs117143374	C	T	Platelet count	Astle W	27863252	2016
rs117143374	C	T	Plateletcrit	Astle W	27863252	2016
rs117143374	C	T	Age at menarche	Neale B	UKBB	2017
rs117143374	C	T	Morning or evening person	Neale B	UKBB	2017
rs1172955	T	A	Age at menarche	Neale B	UKBB	2017
rs11767400	A	C	Menarche age at onset	ReproGen	25231870	2014
rs11767400	A	C	Age at menarche	ReproGen	25231870	2014
rs11786868	C	G	Birth weight of first child	Neale B	UKBB	2017
rs11786868	C	G	Hair or balding pattern: pattern 4	Neale B	UKBB	2017
rs11786868	C	G	Systolic blood pressure	Neale B	UKBB	2017
rs11873906	A	G	Age at menarche	Neale B	UKBB	2017
rs11873906	A	G	Impedance of arm left	Neale B	UKBB	2017
rs11873906	A	G	Impedance of arm right	Neale B	UKBB	2017
rs11873906	A	G	Impedance of whole body	Neale B	UKBB	2017
rs12460047	A	G	Arm fat mass left	Neale B	UKBB	2017
rs12460047	A	G	Arm fat mass right	Neale B	UKBB	2017
rs12460047	A	G	Arm fat percentage left	Neale B	UKBB	2017
rs12460047	A	G	Arm fat percentage right	Neale B	UKBB	2017
rs12460047	A	G	Body fat percentage	Neale B	UKBB	2017
rs12460047	A	G	Leg fat mass left	Neale B	UKBB	2017
rs12460047	A	G	Leg fat mass right	Neale B	UKBB	2017
rs12460047	A	G	Leg fat percentage left	Neale B	UKBB	2017
rs12460047	A	G	Leg fat percentage right	Neale B	UKBB	2017
rs12460047	A	G	Qualifications: college or university degree	Neale B	UKBB	2017
rs12460047	A	G	Trunk fat mass	Neale B	UKBB	2017
rs12460047	A	G	Trunk fat percentage	Neale B	UKBB	2017
rs12460047	A	G	Waist circumference	Neale B	UKBB	2017
rs12460047	A	G	Whole body fat mass	Neale B	UKBB	2017
rs12571664	C	T	Menarche age at onset	ReproGen	25231870	2014
rs12571664	C	T	Age at menarche	ReproGen	25231870	2014
rs12603280	A	G	Age at menarche	ReproGen	25231870	2014
rs12663002	C	T	Mean corpuscular hemoglobin	Astle W	27863252	2016
rs12663002	C	T	Mean corpuscular volume	Astle W	27863252	2016
rs12663002	C	T	Sitting height	Neale B	UKBB	2017
rs12894936	C	T	Menarche age at onset	Pickrell JK	27182965	2016
rs12894936	C	T	Age at menarche	Neale B	UKBB	2017
rs12915845	C	T	Menarche age at onset	ReproGen	25231870	2014
rs12915845	C	T	Age at menarche	Neale B	UKBB	2017
rs12915845	C	T	Height	Neale B	UKBB	2017
rs12915845	C	T	Relative age of first facial hair	Neale B	UKBB	2017
rs12915845	C	T	Age at menarche	ReproGen	25231870	2014
rs13043968	A	C	Comparative height size at age 10	Neale B	UKBB	2017

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rs13173441	C	T	Mean platelet volume	Astle W	27863252	2016
rs13173441	C	T	Platelet distribution width	Astle W	27863252	2016
rs13322435	A	G	Birthweight	EGGC	23202124	2013
rs13322435	A	G	Waist circumference adjusted for BMI	GIANT	25673412	2015
rs13322435	A	G	Birth weight	EGGC	23202124	2013
rs13322435	A	G	Birth weight	Horikoshi M	27680694	2016
rs13322435	A	G	Birth weight	Neale B	UKBB	2017
rs13322435	A	G	Heel bone mineral density	Neale B	UKBB	2017
rs13322435	A	G	Heel bone mineral density left	Neale B	UKBB	2017
rs13322435	A	G	Sitting height	Neale B	UKBB	2017
rs13322435	A	G	Waist circumference	Neale B	UKBB	2017
rs13322435	A	G	Age at menarche	ReproGen	25231870	2014
rs1414186	T	G	Age at menarche	Neale B	UKBB	2017
rs141847393	C	T	Granulocyte percentage of myeloid white cells	Astle W	27863252	2016
rs141847393	C	T	Forced vital capacity	Neale B	UKBB	2017
rs142058842	C	G	Age at voice drop	Pickrell JK	27182965	2016
rs142058842	C	G	Age at menarche	Neale B	UKBB	2017
rs142058842	C	G	Height	Neale B	UKBB	2017
rs142058842	C	G	Relative age of first facial hair	Neale B	UKBB	2017
rs142058842	C	G	Relative age voice broke	Neale B	UKBB	2017
rs1428120	T	G	Arm fat mass left	Neale B	UKBB	2017
rs1428120	T	G	Arm fat mass right	Neale B	UKBB	2017
rs1428120	T	G	Arm fat percentage left	Neale B	UKBB	2017
rs1428120	T	G	Arm fat percentage right	Neale B	UKBB	2017
rs1428120	T	G	Body fat percentage	Neale B	UKBB	2017
rs1428120	T	G	Body mass index	Neale B	UKBB	2017
rs1428120	T	G	Comparative body size at age 10	Neale B	UKBB	2017
rs1428120	T	G	Hip circumference	Neale B	UKBB	2017
rs1428120	T	G	Leg fat mass left	Neale B	UKBB	2017
rs1428120	T	G	Leg fat mass right	Neale B	UKBB	2017
rs1428120	T	G	Leg fat percentage left	Neale B	UKBB	2017
rs1428120	T	G	Leg fat percentage right	Neale B	UKBB	2017
rs1428120	T	G	Trunk fat mass	Neale B	UKBB	2017
rs1428120	T	G	Trunk fat percentage	Neale B	UKBB	2017
rs1428120	T	G	Waist circumference	Neale B	UKBB	2017
rs1428120	T	G	Weight	Neale B	UKBB	2017
rs1428120	T	G	Whole body fat mass	Neale B	UKBB	2017
rs1435753	C	T	Arm fat percentage left	Neale B	UKBB	2017
rs1435753	C	T	Arm fat percentage right	Neale B	UKBB	2017
rs1470750	G	C	Arm fat-free mass left	Neale B	UKBB	2017
rs1470750	G	C	Arm fat-free mass right	Neale B	UKBB	2017
rs1470750	G	C	Arm predicted mass left	Neale B	UKBB	2017
rs1470750	G	C	Arm predicted mass right	Neale B	UKBB	2017
rs1470750	G	C	Basal metabolic rate	Neale B	UKBB	2017
rs1470750	G	C	Hip circumference	Neale B	UKBB	2017

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rs1470750	G	C	Leg fat-free mass left	Neale B	UKBB	2017
rs1470750	G	C	Leg fat-free mass right	Neale B	UKBB	2017
rs1470750	G	C	Leg predicted mass left	Neale B	UKBB	2017
rs1470750	G	C	Leg predicted mass right	Neale B	UKBB	2017
rs1470750	G	C	Morning or evening person	Neale B	UKBB	2017
rs1470750	G	C	Trunk fat mass	Neale B	UKBB	2017
rs1470750	G	C	Trunk fat-free mass	Neale B	UKBB	2017
rs1470750	G	C	Trunk predicted mass	Neale B	UKBB	2017
rs1470750	G	C	Waist circumference	Neale B	UKBB	2017
rs1470750	G	C	Weight	Neale B	UKBB	2017
rs1470750	G	C	Whole body fat-free mass	Neale B	UKBB	2017
rs1470750	G	C	Whole body water mass	Neale B	UKBB	2017
rs150821390	C	T	Comparative height size at age 10	Neale B	UKBB	2017
rs150821390	C	T	Height	Neale B	UKBB	2017
rs150821390	C	T	Sitting height	Neale B	UKBB	2017
rs1512238	G	A	Age at menarche	Neale B	UKBB	2017
rs1512238	G	A	Nap during day	Neale B	UKBB	2017
rs153793	G	A	Dihomo-gamma-linolenic acid	Guan W	24823311	2014
rs157877	A	G	Age at menarche	Neale B	UKBB	2017
rs16841867	C	G	Height	GIANT	25282103	2014
rs16841867	C	G	Height	Neale B	UKBB	2017
rs16841867	C	G	Self-reported high cholesterol	Neale B	UKBB	2017
rs16917237	G	T	Body mass index females	Akiyama M	28892062	2017
rs16917237	G	T	Body mass index males	Akiyama M	28892062	2017
rs16917237	G	T	Body mass index	Akiyama M	28892062	2017
rs16917237	G	T	Body mass index in physically active females	GIANT	28448500	2017
rs16917237	G	T	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs16917237	G	T	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs16917237	G	T	Body mass index in females greater than 50 years of age	GIANT	26426971	2015
rs16917237	G	T	Body mass index in females	GIANT	25673413	2015
rs16917237	G	T	Body mass index in physically inactive indivdiuals	GIANT	28448500	2017
rs16917237	G	T	Body mass index in males greater than 50 years of age	GIANT	26426971	2015
rs16917237	G	T	Body mass index in males	GIANT	25673413	2015
rs16917237	G	T	Body mass index in female non-smokers	GIANT	28443625	2017
rs16917237	G	T	Body mass index in non-smokers	GIANT	28443625	2017
rs16917237	G	T	Body mass index in non-smokers	GIANT	28443625	2017
rs16917237	G	T	Body mass index in smokers	GIANT	28443625	2017
rs16917237	G	T	Body mass index in smokers	GIANT	28443625	2017
rs16917237	G	T	Body mass index ajusted for physical activity in females	GIANT	28448500	2017
rs16917237	G	T	Body mass index adjsuted for physical activity in males	GIANT	28448500	2017
rs16917237	G	T	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs16917237	G	T	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs16917237	G	T	Body mass index adjusted for smoking in females	GIANT	28443625	2017
rs16917237	G	T	Body mass index adjusted for smoking in males	GIANT	28443625	2017
rs16917237	G	T	Body mass index adjusted for smoking	GIANT	28443625	2017

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rs16917237	G	T	Body mass index adjusted for smoking	GIANT	28443625	2017
rs16917237	G	T	Body mass index	Speliotes EK	20935630	2010
rs16917237	G	T	Body mass index	GIANT	23754948	2013
rs16917237	G	T	Body mass index	GIANT	25673413	2015
rs16917237	G	T	Body mass index	GIANT	25673413	2015
rs16917237	G	T	Hip circumference in females	GIANT	25673412	2015
rs16917237	G	T	Hip circumference	GIANT	25673412	2015
rs16917237	G	T	Hip circumference	GIANT	25673412	2015
rs16917237	G	T	Obesity class 1	GIANT	23563607	2013
rs16917237	G	T	Overweight	GIANT	23563607	2013
rs16917237	G	T	Waist circumference in females	GIANT	25673412	2015
rs16917237	G	T	Waist circumference in males	GIANT	25673412	2015
rs16917237	G	T	Waist circumference	GIANT	25673412	2015
rs16917237	G	T	Waist circumference	GIANT	25673412	2015
rs16917237	G	T	Weight	GIANT	23754948	2013
rs16917237	G	T	Body mass index	Speliotes EK	20935630	2010
rs16917237	G	T	Age at menarche	Neale B	UKBB	2017
rs16917237	G	T	Arm fat mass left	Neale B	UKBB	2017
rs16917237	G	T	Arm fat mass right	Neale B	UKBB	2017
rs16917237	G	T	Arm fat percentage left	Neale B	UKBB	2017
rs16917237	G	T	Arm fat percentage right	Neale B	UKBB	2017
rs16917237	G	T	Arm fat-free mass left	Neale B	UKBB	2017
rs16917237	G	T	Arm fat-free mass right	Neale B	UKBB	2017
rs16917237	G	T	Arm predicted mass left	Neale B	UKBB	2017
rs16917237	G	T	Arm predicted mass right	Neale B	UKBB	2017
rs16917237	G	T	Basal metabolic rate	Neale B	UKBB	2017
rs16917237	G	T	Body fat percentage	Neale B	UKBB	2017
rs16917237	G	T	Body mass index	Neale B	UKBB	2017
rs16917237	G	T	Hip circumference	Neale B	UKBB	2017
rs16917237	G	T	Impedance of arm left	Neale B	UKBB	2017
rs16917237	G	T	Impedance of arm right	Neale B	UKBB	2017
rs16917237	G	T	Impedance of leg left	Neale B	UKBB	2017
rs16917237	G	T	Impedance of leg right	Neale B	UKBB	2017
rs16917237	G	T	Impedance of whole body	Neale B	UKBB	2017
rs16917237	G	T	Leg fat mass left	Neale B	UKBB	2017
rs16917237	G	T	Leg fat mass right	Neale B	UKBB	2017
rs16917237	G	T	Leg fat percentage left	Neale B	UKBB	2017
rs16917237	G	T	Leg fat percentage right	Neale B	UKBB	2017
rs16917237	G	T	Leg fat-free mass left	Neale B	UKBB	2017
rs16917237	G	T	Leg fat-free mass right	Neale B	UKBB	2017
rs16917237	G	T	Leg predicted mass left	Neale B	UKBB	2017
rs16917237	G	T	Leg predicted mass right	Neale B	UKBB	2017
rs16917237	G	T	Past tobacco smoking	Neale B	UKBB	2017
rs16917237	G	T	Trunk fat mass	Neale B	UKBB	2017
rs16917237	G	T	Trunk fat percentage	Neale B	UKBB	2017
rs16917237	G	T	Trunk fat-free mass	Neale B	UKBB	2017
rs16917237	G	T	Trunk predicted mass	Neale B	UKBB	2017

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rs16917237	G	T	Waist circumference	Neale B	UKBB	2017
rs16917237	G	T	Weight	Neale B	UKBB	2017
rs16917237	G	T	Whole body fat mass	Neale B	UKBB	2017
rs16917237	G	T	Whole body fat-free mass	Neale B	UKBB	2017
rs16917237	G	T	Whole body water mass	Neale B	UKBB	2017
rs16917237	G	T	Age at menarche	ReproGen	25231870	2014
rs16918378	C	T	Age at menarche	ReproGen	25231870	2014
rs16937956	A	G	Body mass index	Akiyama M	28892062	2017
rs16937956	A	G	Body mass index	Akiyama M	28892062	2017
rs16937956	A	G	Age at menarche	Neale B	UKBB	2017
rs16937956	A	G	Leg fat percentage left	Neale B	UKBB	2017
rs16937956	A	G	Leg fat percentage right	Neale B	UKBB	2017
rs16937956	A	G	Age at menarche	ReproGen	25231870	2014
rs17035311	A	C	Age at menarche	Neale B	UKBB	2017
rs17035311	A	C	Impedance of leg right	Neale B	UKBB	2017
rs1704528	T	C	Menarche age at onset	Pickrell JK	27182965	2016
rs1704528	T	C	Age at menarche	Neale B	UKBB	2017
rs1704528	T	C	Arm fat-free mass left	Neale B	UKBB	2017
rs1704528	T	C	Arm fat-free mass right	Neale B	UKBB	2017
rs1704528	T	C	Arm predicted mass left	Neale B	UKBB	2017
rs1704528	T	C	Arm predicted mass right	Neale B	UKBB	2017
rs1704528	T	C	Hair or balding pattern: pattern 4	Neale B	UKBB	2017
rs1704528	T	C	Height	Neale B	UKBB	2017
rs1704528	T	C	Relative age of first facial hair	Neale B	UKBB	2017
rs1704528	T	C	Relative age voice broke	Neale B	UKBB	2017
rs1704528	T	C	Trunk fat-free mass	Neale B	UKBB	2017
rs1704528	T	C	Trunk predicted mass	Neale B	UKBB	2017
rs1704528	T	C	Whole body fat-free mass	Neale B	UKBB	2017
rs1704528	T	C	Whole body water mass	Neale B	UKBB	2017
rs17085593	C	G	Height	GIANT	25282103	2014
rs17085593	C	G	log Proinsulin	MAGIC	21873549	2011
rs17085593	C	G	Arm fat-free mass left	Neale B	UKBB	2017
rs17085593	C	G	Arm fat-free mass right	Neale B	UKBB	2017
rs17085593	C	G	Arm predicted mass left	Neale B	UKBB	2017
rs17085593	C	G	Arm predicted mass right	Neale B	UKBB	2017
rs17085593	C	G	Basal metabolic rate	Neale B	UKBB	2017
rs17085593	C	G	Comparative height size at age 10	Neale B	UKBB	2017
rs17085593	C	G	Height	Neale B	UKBB	2017
rs17085593	C	G	Leg fat-free mass left	Neale B	UKBB	2017
rs17085593	C	G	Leg fat-free mass right	Neale B	UKBB	2017
rs17085593	C	G	Leg predicted mass left	Neale B	UKBB	2017
rs17085593	C	G	Leg predicted mass right	Neale B	UKBB	2017
rs17085593	C	G	Trunk fat-free mass	Neale B	UKBB	2017
rs17085593	C	G	Trunk predicted mass	Neale B	UKBB	2017
rs17085593	C	G	Weight	Neale B	UKBB	2017
rs17085593	C	G	Whole body fat-free mass	Neale B	UKBB	2017
rs17085593	C	G	Whole body water mass	Neale B	UKBB	2017
rs17390720	C	G	Height	Neale B	UKBB	2017

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rs1984870	T	G	Age at menarche	Neale B	UKBB	2017
rs1984870	T	G	Age at menarche	ReproGen	25231870	2014
rs2066323	G	A	High light scatter percentage of red cells	Astle W	27863252	2016
rs2066323	G	A	High light scatter reticulocyte count	Astle W	27863252	2016
rs2066323	G	A	Immature fraction of reticulocytes	Astle W	27863252	2016
rs2066323	G	A	Mean corpuscular hemoglobin	Astle W	27863252	2016
rs2066323	G	A	Mean corpuscular volume	Astle W	27863252	2016
rs2066323	G	A	Reticulocyte count	Astle W	27863252	2016
rs2066323	G	A	Reticulocyte fraction of red cells	Astle W	27863252	2016
rs2066323	G	A	Arm fat-free mass left	Neale B	UKBB	2017
rs2066323	G	A	Arm fat-free mass right	Neale B	UKBB	2017
rs2066323	G	A	Arm predicted mass left	Neale B	UKBB	2017
rs2066323	G	A	Arm predicted mass right	Neale B	UKBB	2017
rs2066323	G	A	Basal metabolic rate	Neale B	UKBB	2017
rs2066323	G	A	Birth weight	Neale B	UKBB	2017
rs2066323	G	A	Ever smoked	Neale B	UKBB	2017
rs2066323	G	A	Height	Neale B	UKBB	2017
rs2066323	G	A	Leg fat-free mass left	Neale B	UKBB	2017
rs2066323	G	A	Leg fat-free mass right	Neale B	UKBB	2017
rs2066323	G	A	Leg predicted mass left	Neale B	UKBB	2017
rs2066323	G	A	Leg predicted mass right	Neale B	UKBB	2017
rs2066323	G	A	Nervous feelings	Neale B	UKBB	2017
rs2066323	G	A	Past tobacco smoking	Neale B	UKBB	2017
rs2066323	G	A	Trunk fat-free mass	Neale B	UKBB	2017
rs2066323	G	A	Trunk predicted mass	Neale B	UKBB	2017
rs2066323	G	A	Weight	Neale B	UKBB	2017
rs2066323	G	A	Whole body fat-free mass	Neale B	UKBB	2017
rs2066323	G	A	Whole body water mass	Neale B	UKBB	2017
rs2066323	G	A	Worrier or anxious feelings	Neale B	UKBB	2017
rs2066323	G	A	Schizophrenia	PGC	25056061	2014
rs2108753	T	C	Mean platelet volume	Astle W	27863252	2016
rs2108753	T	C	Age at menarche	Neale B	UKBB	2017
rs2108753	T	C	Qualifications: college or university degree	Neale B	UKBB	2017
rs2267812	C	A	Red cell distribution width	Astle W	27863252	2016
rs2267812	C	A	Arm fat percentage left	Neale B	UKBB	2017
rs2267812	C	A	Arm fat percentage right	Neale B	UKBB	2017
rs2267812	C	A	Body mass index	Neale B	UKBB	2017
rs2267812	C	A	Self-reported hypertension	Neale B	UKBB	2017
rs2267812	C	A	Vascular or heart problems diagnosed by doctor: high blood pressure	Neale B	UKBB	2017
rs2267812	C	A	Vascular or heart problems diagnosed by doctor: none of the above	Neale B	UKBB	2017
rs2267812	C	A	Age at menarche	ReproGen	25231870	2014
rs2271758	G	T	Basal metabolic rate	Neale B	UKBB	2017
rs2271758	G	T	Hip circumference	Neale B	UKBB	2017
rs2271758	G	T	Leg fat-free mass left	Neale B	UKBB	2017
rs2271758	G	T	Leg predicted mass left	Neale B	UKBB	2017
rs2271758	G	T	Weight	Neale B	UKBB	2017
rs2271758	G	T	Whole body fat mass	Neale B	UKBB	2017

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rs2295094	A	G	Arm fat-free mass left	Neale B	UKBB	2017
rs2295094	A	G	Arm fat-free mass right	Neale B	UKBB	2017
rs2295094	A	G	Arm predicted mass left	Neale B	UKBB	2017
rs2295094	A	G	Arm predicted mass right	Neale B	UKBB	2017
rs2295094	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs2295094	A	G	Comparative height size at age 10	Neale B	UKBB	2017
rs2295094	A	G	Height	Neale B	UKBB	2017
rs2295094	A	G	Impedance of arm right	Neale B	UKBB	2017
rs2295094	A	G	Impedance of whole body	Neale B	UKBB	2017
rs2295094	A	G	Irritability	Neale B	UKBB	2017
rs2295094	A	G	Leg fat-free mass left	Neale B	UKBB	2017
rs2295094	A	G	Leg fat-free mass right	Neale B	UKBB	2017
rs2295094	A	G	Leg predicted mass left	Neale B	UKBB	2017
rs2295094	A	G	Leg predicted mass right	Neale B	UKBB	2017
rs2295094	A	G	Other malignant neoplasms of skin	Neale B	UKBB	2017
rs2295094	A	G	Sitting height	Neale B	UKBB	2017
rs2295094	A	G	Trunk fat-free mass	Neale B	UKBB	2017
rs2295094	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs2295094	A	G	Weight	Neale B	UKBB	2017
rs2295094	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs2295094	A	G	Whole body water mass	Neale B	UKBB	2017
rs2300922	C	T	Height	GIANT	25282103	2014
rs2300922	C	T	Age at menarche	Neale B	UKBB	2017
rs2300922	C	T	Height	Neale B	UKBB	2017
rs2300922	C	T	Age at menarche	ReproGen	25231870	2014
rs2312205	A	G	Comparative height size at age 10	Neale B	UKBB	2017
rs2312205	A	G	Height	Neale B	UKBB	2017
rs2312205	A	G	Weight	Neale B	UKBB	2017
rs2461794	G	A	Age at menarche	Neale B	UKBB	2017
rs2542420	G	C	Age at menarche	Neale B	UKBB	2017
rs2548458	C	T	Mean platelet volume	Astle W	27863252	2016
rs2548458	C	T	Crohns disease	IBDGC	26192919	2015
rs2548458	C	T	Alkaline phosphatase	Prins B	28887542	2017
rs2659007	G	A	IgG fucosylation	Shen X	28878392	2017
rs2659007	G	A	IgG galactosylation	Shen X	28878392	2017
rs2659007	G	A	IgG monogalactosylation	Shen X	28878392	2017
rs2679894	G	A	Menarche age at onset	Pickrell JK	27182965	2016
rs2679894	G	A	Age at menarche	Neale B	UKBB	2017
rs2724961	C	T	Age at menarche	Neale B	UKBB	2017
rs2724961	C	T	Age at menarche	ReproGen	25231870	2014
rs2787487	G	C	Age at menarche	Neale B	UKBB	2017
rs2787487	G	C	Age at menarche	ReproGen	25231870	2014
rs29941	G	A	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs29941	G	A	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs29941	G	A	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs29941	G	A	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs29941	G	A	Body mass index adjusted for smoking	GIANT	28443625	2017

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rs29941	G	A	Body mass index	Speliotes EK	20935630	2010
rs29941	G	A	Body mass index	GIANT	23754948	2013
rs29941	G	A	Body mass index	GIANT	25673413	2015
rs29941	G	A	Body mass index	GIANT	29273807	2018
rs29941	G	A	Body mass index	GIANT	25673413	2015
rs29941	G	A	Body mass index	GIANT	29273807	2018
rs29941	G	A	Weight	GIANT	23754948	2013
rs29941	G	A	Body mass index	Thorleifsson G	19079260	2008
rs29941	G	A	Body mass index	Speliotes EK	20935630	2010
rs29941	G	A	Body mass index	Guo	23001569	2012
rs29941	G	A	Extreme obesity with early age of onset	Wheeler E	23563609	2013
rs29941	G	A	Weight	Thorleifsson G	19079260	2008
rs29941	G	A	BMI adjusted for smoking behaviour	GIANT	28443625	2017
rs29941	G	A	Body mass index	Thorleifsson G	19079260	2008
rs29941	G	A	Body mass index	Speliotes EK	20935630	2010
rs29941	G	A	Body mass index	GIANT	25673413	2015
rs29941	G	A	Body mass index	Akiyama M	28892062	2017
rs29941	G	A	Body mass index joint analysis main effects and smoking interaction	GIANT	28443625	2017
rs29941	G	A	Weight	Thorleifsson G	19079260	2008
rs29941	G	A	Arm fat-free mass left	Neale B	UKBB	2017
rs29941	G	A	Arm fat-free mass right	Neale B	UKBB	2017
rs29941	G	A	Arm predicted mass left	Neale B	UKBB	2017
rs29941	G	A	Arm predicted mass right	Neale B	UKBB	2017
rs29941	G	A	Basal metabolic rate	Neale B	UKBB	2017
rs29941	G	A	Impedance of arm left	Neale B	UKBB	2017
rs29941	G	A	Impedance of arm right	Neale B	UKBB	2017
rs29941	G	A	Impedance of leg left	Neale B	UKBB	2017
rs29941	G	A	Impedance of leg right	Neale B	UKBB	2017
rs29941	G	A	Impedance of whole body	Neale B	UKBB	2017
rs29941	G	A	Leg fat-free mass left	Neale B	UKBB	2017
rs29941	G	A	Leg fat-free mass right	Neale B	UKBB	2017
rs29941	G	A	Leg predicted mass left	Neale B	UKBB	2017
rs29941	G	A	Leg predicted mass right	Neale B	UKBB	2017
rs29941	G	A	Trunk fat-free mass	Neale B	UKBB	2017
rs29941	G	A	Trunk predicted mass	Neale B	UKBB	2017
rs29941	G	A	Weight	Neale B	UKBB	2017
rs29941	G	A	Whole body fat-free mass	Neale B	UKBB	2017
rs29941	G	A	Whole body water mass	Neale B	UKBB	2017
rs29941	G	A	Body mass index	Thorleifsson G	19079260	2008
rs29941	G	A	Body mass index	Speliotes EK	20935630	2010
rs29941	G	A	Body weight	Thorleifsson G	19079260	2008
rs3113862	A	G	Age at menarche	Neale B	UKBB	2017
rs3113862	A	G	Relative age of first facial hair	Neale B	UKBB	2017
rs35935052	G	T	Arm fat-free mass left	Neale B	UKBB	2017

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rs35935052	G	T	Arm predicted mass left	Neale B	UKBB	2017
rs35935052	G	T	Arm predicted mass right	Neale B	UKBB	2017
rs35935052	G	T	Basal metabolic rate	Neale B	UKBB	2017
rs35935052	G	T	Comparative body size at age 10	Neale B	UKBB	2017
rs35935052	G	T	Leg fat-free mass left	Neale B	UKBB	2017
rs35935052	G	T	Leg fat-free mass right	Neale B	UKBB	2017
rs35935052	G	T	Leg predicted mass left	Neale B	UKBB	2017
rs35935052	G	T	Leg predicted mass right	Neale B	UKBB	2017
rs35935052	G	T	Weight	Neale B	UKBB	2017
rs35935052	G	T	Whole body fat-free mass	Neale B	UKBB	2017
rs35935052	G	T	Whole body water mass	Neale B	UKBB	2017
rs36093651	C	T	Age at menarche	Neale B	UKBB	2017
rs3733632	G	A	Age at menarche	Neale B	UKBB	2017
rs3733632	G	A	Age at menarche	ReproGen	25231870	2014
rs3746619	A	C	Relative age of first facial hair	Neale B	UKBB	2017
rs3764002	C	T	Arm fat percentage left	Neale B	UKBB	2017
rs3764002	C	T	Arm fat percentage right	Neale B	UKBB	2017
rs3764002	C	T	Body fat percentage	Neale B	UKBB	2017
rs3764002	C	T	Impedance of leg left	Neale B	UKBB	2017
rs3764002	C	T	Impedance of leg right	Neale B	UKBB	2017
rs3764002	C	T	Impedance of whole body	Neale B	UKBB	2017
rs3764002	C	T	Leg fat mass left	Neale B	UKBB	2017
rs3764002	C	T	Leg fat mass right	Neale B	UKBB	2017
rs3764002	C	T	Leg fat percentage left	Neale B	UKBB	2017
rs3764002	C	T	Leg fat percentage right	Neale B	UKBB	2017
rs3764002	C	T	Sitting height	Neale B	UKBB	2017
rs3764002	C	T	Trunk fat mass	Neale B	UKBB	2017
rs3764002	C	T	Trunk fat percentage	Neale B	UKBB	2017
rs3764002	C	T	Waist circumference	Neale B	UKBB	2017
rs3764002	C	T	Whole body fat mass	Neale B	UKBB	2017
rs395962	G	T	Standardized difference in height between age 14 years and adult	EGGC	23449627	2013
rs395962	G	T	Tanner stage	EGGC	24770850	2014
rs395962	G	T	Height in females	GIANT	23754948	2013
rs395962	G	T	Height in males	GIANT	23754948	2013
rs395962	G	T	Height tails	GIANT	23563607	2013
rs395962	G	T	Height	GIANT	20881960	2010
rs395962	G	T	Height	GIANT	23754948	2013
rs395962	G	T	Height	GIANT	25282103	2014
rs395962	G	T	Hip circumference adjusted for BMI	GIANT	25673412	2015
rs395962	G	T	Waist circumference adjusted for BMI	GIANT	25673412	2015
rs395962	G	T	Waist circumference in physically active females	GIANT	28448500	2017
rs395962	G	T	Waist circumeference in physically active males	GIANT	28448500	2017
rs395962	G	T	Waist circumference in physically active indivdiuals	GIANT	28448500	2017
rs395962	G	T	Waist circumference in physically active indivdiuals	GIANT	28448500	2017
rs395962	G	T	Waist circumference in male non-smokers	GIANT	28443625	2017
rs395962	G	T	Waist circumference in non-smokers	GIANT	28443625	2017
rs395962	G	T	Waist circumference in non-smokers	GIANT	28443625	2017

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rs395962	G	T	Waist circumference adjusted for physical activity in females	GIANT	28448500	2017
rs395962	G	T	Waist circumeference adjusted for physical activity in males	GIANT	28448500	2017
rs395962	G	T	Waist circumference adjusted for physical activity	GIANT	28448500	2017
rs395962	G	T	Waist circumference adjusted for physical activity	GIANT	28448500	2017
rs395962	G	T	Waist cirumference adjusted for smoking in males	GIANT	28443625	2017
rs395962	G	T	Waist circumference adjusted for smoking	GIANT	28443625	2017
rs395962	G	T	Waist circumference adjusted for smoking	GIANT	28443625	2017
rs395962	G	T	Age at menarche	Perry JR	19448620	2009
rs395962	G	T	Height	GIANT	20881960	2010
rs395962	G	T	Waist circumference adjusted for BMI adjusted for smoking behaviour	GIANT	28443625	2017
rs395962	G	T	Waist circumference adjusted for BMI adjusted for smoking behaviour	GIANT	28443625	2017
rs395962	G	T	Waist circumference adjusted for BMI in active individuals	GIANT	28448500	2017
rs395962	G	T	Waist circumference adjusted for BMI in non smokers	GIANT	28443625	2017
rs395962	G	T	Waist circumference adjusted for BMI in non smokers	GIANT	28443625	2017
rs395962	G	T	Waist circumference adjusted for BMI joint analysis main effects and smoking interaction	GIANT	28443625	2017
rs395962	G	T	Waist circumference adjusted for BMI joint analysis main effects and smoking interaction	GIANT	28443625	2017
rs395962	G	T	Age at menarche	Neale B	UKBB	2017
rs395962	G	T	Basal metabolic rate	Neale B	UKBB	2017
rs395962	G	T	Comparative body size at age 10	Neale B	UKBB	2017
rs395962	G	T	Forced expiratory volume in 1-second, predicted	Neale B	UKBB	2017
rs395962	G	T	Forced vital capacity	Neale B	UKBB	2017
rs395962	G	T	Forced vital capacity, best measure	Neale B	UKBB	2017
rs395962	G	T	Hand grip strength right	Neale B	UKBB	2017
rs395962	G	T	Height	Neale B	UKBB	2017
rs395962	G	T	Impedance of arm left	Neale B	UKBB	2017
rs395962	G	T	Impedance of arm right	Neale B	UKBB	2017
rs395962	G	T	Impedance of leg left	Neale B	UKBB	2017
rs395962	G	T	Impedance of leg right	Neale B	UKBB	2017
rs395962	G	T	Impedance of whole body	Neale B	UKBB	2017
rs395962	G	T	Leg fat-free mass left	Neale B	UKBB	2017
rs395962	G	T	Leg predicted mass left	Neale B	UKBB	2017
rs395962	G	T	Relative age of first facial hair	Neale B	UKBB	2017
rs395962	G	T	Relative age voice broke	Neale B	UKBB	2017
rs395962	G	T	Sitting height	Neale B	UKBB	2017
rs395962	G	T	Trunk fat mass	Neale B	UKBB	2017
rs395962	G	T	Trunk fat-free mass	Neale B	UKBB	2017
rs395962	G	T	Trunk predicted mass	Neale B	UKBB	2017
rs395962	G	T	Weight	Neale B	UKBB	2017
rs395962	G	T	Whole body fat-free mass	Neale B	UKBB	2017
rs395962	G	T	Whole body water mass	Neale B	UKBB	2017
rs395962	G	T	Age at menarche	ReproGen	25231870	2014
rs4340786	A	T	Age at menarche	Neale B	UKBB	2017
rs437836	T	C	Comparative height size at age 10	Neale B	UKBB	2017
rs437836	T	C	Sitting height	Neale B	UKBB	2017
rs4561063	G	T	Age at menarche	Neale B	UKBB	2017

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rs4804025	A	G	Hematocrit	Astle W	27863252	2016
rs4804025	A	G	Hemoglobin concentration	Astle W	27863252	2016
rs4804025	A	G	Red blood cell count	Astle W	27863252	2016
rs4804025	A	G	Arm fat mass left	Neale B	UKBB	2017
rs4804025	A	G	Arm fat mass right	Neale B	UKBB	2017
rs4804025	A	G	Arm fat percentage left	Neale B	UKBB	2017
rs4804025	A	G	Arm fat percentage right	Neale B	UKBB	2017
rs4804025	A	G	Arm fat-free mass left	Neale B	UKBB	2017
rs4804025	A	G	Arm fat-free mass right	Neale B	UKBB	2017
rs4804025	A	G	Arm predicted mass left	Neale B	UKBB	2017
rs4804025	A	G	Arm predicted mass right	Neale B	UKBB	2017
rs4804025	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs4804025	A	G	Body fat percentage	Neale B	UKBB	2017
rs4804025	A	G	Body mass index	Neale B	UKBB	2017
rs4804025	A	G	Comparative body size at age 10	Neale B	UKBB	2017
rs4804025	A	G	Hip circumference	Neale B	UKBB	2017
rs4804025	A	G	Impedance of arm left	Neale B	UKBB	2017
rs4804025	A	G	Impedance of arm right	Neale B	UKBB	2017
rs4804025	A	G	Impedance of leg left	Neale B	UKBB	2017
rs4804025	A	G	Impedance of leg right	Neale B	UKBB	2017
rs4804025	A	G	Impedance of whole body	Neale B	UKBB	2017
rs4804025	A	G	Leg fat mass left	Neale B	UKBB	2017
rs4804025	A	G	Leg fat mass right	Neale B	UKBB	2017
rs4804025	A	G	Leg fat percentage left	Neale B	UKBB	2017
rs4804025	A	G	Leg fat percentage right	Neale B	UKBB	2017
rs4804025	A	G	Leg fat-free mass left	Neale B	UKBB	2017
rs4804025	A	G	Leg fat-free mass right	Neale B	UKBB	2017
rs4804025	A	G	Leg predicted mass left	Neale B	UKBB	2017
rs4804025	A	G	Leg predicted mass right	Neale B	UKBB	2017
rs4804025	A	G	Trunk fat mass	Neale B	UKBB	2017
rs4804025	A	G	Trunk fat percentage	Neale B	UKBB	2017
rs4804025	A	G	Trunk fat-free mass	Neale B	UKBB	2017
rs4804025	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs4804025	A	G	Waist circumference	Neale B	UKBB	2017
rs4804025	A	G	Weight	Neale B	UKBB	2017
rs4804025	A	G	Whole body fat mass	Neale B	UKBB	2017
rs4804025	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs4804025	A	G	Whole body water mass	Neale B	UKBB	2017
rs4836984	C	T	Age at menarche	Neale B	UKBB	2017
rs4886140	A	G	Sleeplessness or insomnia	Neale B	UKBB	2017
rs4897178	G	T	Hematocrit	Astle W	27863252	2016
rs4897178	G	T	Hemoglobin concentration	Astle W	27863252	2016
rs4897178	G	T	Type II diabetes adjusted for BMI	DIAGRAM	28566273	2017
rs4897178	G	T	Type II diabetes	DIAGRAM	28566273	2017
rs4945266	A	G	Age at menarche	Neale B	UKBB	2017
rs4945266	A	G	Impedance of arm left	Neale B	UKBB	2017
rs4945266	A	G	Impedance of arm right	Neale B	UKBB	2017
rs4945266	A	G	Impedance of whole body	Neale B	UKBB	2017

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rs506589	C	T	Body mass index females	Akiyama M	28892062	2017
rs506589	C	T	Body mass index	Akiyama M	28892062	2017
rs506589	C	T	Childhood BMI	EGGC	26604143	2016
rs506589	C	T	Body mass index in physically active females	GIANT	28448500	2017
rs506589	C	T	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs506589	C	T	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs506589	C	T	Body mass index in females greater than 50 years of age	GIANT	26426971	2015
rs506589	C	T	Body mass index in females less than or equal to 50 years of age	GIANT	26426971	2015
rs506589	C	T	Body mass index in females	GIANT	23754948	2013
rs506589	C	T	Body mass index in females	GIANT	25673413	2015
rs506589	C	T	Body mass index in males	GIANT	25673413	2015
rs506589	C	T	Body mass index in female non-smokers	GIANT	28443625	2017
rs506589	C	T	Body mass index in non-smokers	GIANT	28443625	2017
rs506589	C	T	Body mass index in non-smokers	GIANT	28443625	2017
rs506589	C	T	Body mass index tails	GIANT	23563607	2013
rs506589	C	T	Body mass index ajusted for physical activity in females	GIANT	28448500	2017
rs506589	C	T	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs506589	C	T	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs506589	C	T	Body mass index adjusted for smoking in females	GIANT	28443625	2017
rs506589	C	T	Body mass index adjusted for smoking	GIANT	28443625	2017
rs506589	C	T	Body mass index adjusted for smoking	GIANT	28443625	2017
rs506589	C	T	Body mass index	Speliotes EK	20935630	2010
rs506589	C	T	Body mass index	GIANT	23754948	2013
rs506589	C	T	Body mass index	GIANT	25673413	2015
rs506589	C	T	Body mass index	GIANT	25673413	2015
rs506589	C	T	Hip circumference in females	GIANT	25673412	2015
rs506589	C	T	Hip circumference	GIANT	25673412	2015
rs506589	C	T	Hip circumference	GIANT	25673412	2015
rs506589	C	T	Obesity class 1	GIANT	23563607	2013
rs506589	C	T	Obesity class 2	GIANT	23563607	2013
rs506589	C	T	Overweight	GIANT	23563607	2013
rs506589	C	T	Waist circumference in females	GIANT	25673412	2015
rs506589	C	T	Waist circumference	GIANT	23754948	2013
rs506589	C	T	Waist circumference	GIANT	25673412	2015
rs506589	C	T	Waist circumference	GIANT	25673412	2015
rs506589	C	T	Weight in females	GIANT	23754948	2013
rs506589	C	T	Weight	GIANT	23754948	2013
rs506589	C	T	Body mass index	Speliotes EK	20935630	2010
rs506589	C	T	Body mass index	Monda KL	23583978	2013
rs506589	C	T	Age at menarche	Neale B	UKBB	2017
rs506589	C	T	Arm fat mass left	Neale B	UKBB	2017
rs506589	C	T	Arm fat mass right	Neale B	UKBB	2017
rs506589	C	T	Arm fat percentage left	Neale B	UKBB	2017
rs506589	C	T	Arm fat percentage right	Neale B	UKBB	2017
rs506589	C	T	Arm fat-free mass left	Neale B	UKBB	2017
rs506589	C	T	Arm fat-free mass right	Neale B	UKBB	2017

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rs506589	C	T	Arm predicted mass left	Neale B	UKBB	2017
rs506589	C	T	Arm predicted mass right	Neale B	UKBB	2017
rs506589	C	T	Basal metabolic rate	Neale B	UKBB	2017
rs506589	C	T	Body fat percentage	Neale B	UKBB	2017
rs506589	C	T	Body mass index	Neale B	UKBB	2017
rs506589	C	T	Comparative body size at age 10	Neale B	UKBB	2017
rs506589	C	T	Comparative height size at age 10	Neale B	UKBB	2017
rs506589	C	T	Hip circumference	Neale B	UKBB	2017
rs506589	C	T	Impedance of arm left	Neale B	UKBB	2017
rs506589	C	T	Impedance of arm right	Neale B	UKBB	2017
rs506589	C	T	Impedance of leg left	Neale B	UKBB	2017
rs506589	C	T	Impedance of leg right	Neale B	UKBB	2017
rs506589	C	T	Impedance of whole body	Neale B	UKBB	2017
rs506589	C	T	Leg fat mass left	Neale B	UKBB	2017
rs506589	C	T	Leg fat mass right	Neale B	UKBB	2017
rs506589	C	T	Leg fat percentage left	Neale B	UKBB	2017
rs506589	C	T	Leg fat percentage right	Neale B	UKBB	2017
rs506589	C	T	Leg fat-free mass left	Neale B	UKBB	2017
rs506589	C	T	Leg fat-free mass right	Neale B	UKBB	2017
rs506589	C	T	Leg predicted mass left	Neale B	UKBB	2017
rs506589	C	T	Leg predicted mass right	Neale B	UKBB	2017
rs506589	C	T	Trunk fat mass	Neale B	UKBB	2017
rs506589	C	T	Trunk fat percentage	Neale B	UKBB	2017
rs506589	C	T	Trunk fat-free mass	Neale B	UKBB	2017
rs506589	C	T	Trunk predicted mass	Neale B	UKBB	2017
rs506589	C	T	Waist circumference	Neale B	UKBB	2017
rs506589	C	T	Weight	Neale B	UKBB	2017
rs506589	C	T	Whole body fat mass	Neale B	UKBB	2017
rs506589	C	T	Whole body fat-free mass	Neale B	UKBB	2017
rs506589	C	T	Whole body water mass	Neale B	UKBB	2017
rs506589	C	T	Age at menarche	ReproGen	25231870	2014
rs552491	G	A	Age at menarche	Neale B	UKBB	2017
rs55680968	A	G	Diastolic blood pressure	Neale B	UKBB	2017
rs55680968	A	G	Heel bone mineral density	Neale B	UKBB	2017
rs55680968	A	G	Self-reported hypertension	Neale B	UKBB	2017
rs55680968	A	G	Vascular or heart problems diagnosed by doctor: high blood pressure	Neale B	UKBB	2017
rs55680968	A	G	Vascular or heart problems diagnosed by doctor: none of the above	Neale B	UKBB	2017
rs56409371	A	G	Age at menarche	Neale B	UKBB	2017
rs582780	A	G	Height in males	GIANT	23754948	2013
rs582780	A	G	Height tails	GIANT	23563607	2013
rs582780	A	G	Height	GIANT	20881960	2010
rs582780	A	G	Height	GIANT	23754948	2013
rs582780	A	G	Height	GIANT	25282103	2014
rs582780	A	G	Weight	GIANT	23754948	2013
rs582780	A	G	Height	GIANT	20881960	2010
rs582780	A	G	Arm fat-free mass left	Neale B	UKBB	2017
rs582780	A	G	Arm fat-free mass right	Neale B	UKBB	2017

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rs582780	A	G	Arm predicted mass left	Neale B	UKBB	2017
rs582780	A	G	Arm predicted mass right	Neale B	UKBB	2017
rs582780	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs582780	A	G	Comparative height size at age 10	Neale B	UKBB	2017
rs582780	A	G	Forced expiratory volume in 1-second	Neale B	UKBB	2017
rs582780	A	G	Forced vital capacity	Neale B	UKBB	2017
rs582780	A	G	Forced vital capacity, best measure	Neale B	UKBB	2017
rs582780	A	G	Height	Neale B	UKBB	2017
rs582780	A	G	Leg fat-free mass left	Neale B	UKBB	2017
rs582780	A	G	Leg fat-free mass right	Neale B	UKBB	2017
rs582780	A	G	Leg predicted mass left	Neale B	UKBB	2017
rs582780	A	G	Leg predicted mass right	Neale B	UKBB	2017
rs582780	A	G	Pulse rate	Neale B	UKBB	2017
rs582780	A	G	Sitting height	Neale B	UKBB	2017
rs582780	A	G	Trunk fat-free mass	Neale B	UKBB	2017
rs582780	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs582780	A	G	Weight	Neale B	UKBB	2017
rs582780	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs582780	A	G	Whole body water mass	Neale B	UKBB	2017
rs6185	G	C	Length of menstrual cycle	Neale B	UKBB	2017
rs62104180	A	G	Age at menarche	Neale B	UKBB	2017
rs62104180	A	G	Arm fat mass left	Neale B	UKBB	2017
rs62104180	A	G	Arm fat mass right	Neale B	UKBB	2017
rs62104180	A	G	Arm fat percentage left	Neale B	UKBB	2017
rs62104180	A	G	Arm fat percentage right	Neale B	UKBB	2017
rs62104180	A	G	Arm fat-free mass left	Neale B	UKBB	2017
rs62104180	A	G	Arm fat-free mass right	Neale B	UKBB	2017
rs62104180	A	G	Arm predicted mass left	Neale B	UKBB	2017
rs62104180	A	G	Arm predicted mass right	Neale B	UKBB	2017
rs62104180	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs62104180	A	G	Body fat percentage	Neale B	UKBB	2017
rs62104180	A	G	Body mass index	Neale B	UKBB	2017
rs62104180	A	G	Comparative body size at age 10	Neale B	UKBB	2017
rs62104180	A	G	Comparative height size at age 10	Neale B	UKBB	2017
rs62104180	A	G	Hip circumference	Neale B	UKBB	2017
rs62104180	A	G	Impedance of arm left	Neale B	UKBB	2017
rs62104180	A	G	Impedance of arm right	Neale B	UKBB	2017
rs62104180	A	G	Impedance of leg left	Neale B	UKBB	2017
rs62104180	A	G	Impedance of leg right	Neale B	UKBB	2017
rs62104180	A	G	Impedance of whole body	Neale B	UKBB	2017
rs62104180	A	G	Leg fat mass left	Neale B	UKBB	2017
rs62104180	A	G	Leg fat mass right	Neale B	UKBB	2017
rs62104180	A	G	Leg fat percentage left	Neale B	UKBB	2017
rs62104180	A	G	Leg fat percentage right	Neale B	UKBB	2017
rs62104180	A	G	Leg fat-free mass left	Neale B	UKBB	2017
rs62104180	A	G	Leg fat-free mass right	Neale B	UKBB	2017
rs62104180	A	G	Leg predicted mass left	Neale B	UKBB	2017
rs62104180	A	G	Leg predicted mass right	Neale B	UKBB	2017

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rs62104180	A	G	Trunk fat mass	Neale B	UKBB	2017
rs62104180	A	G	Trunk fat percentage	Neale B	UKBB	2017
rs62104180	A	G	Trunk fat-free mass	Neale B	UKBB	2017
rs62104180	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs62104180	A	G	Waist circumference	Neale B	UKBB	2017
rs62104180	A	G	Weight	Neale B	UKBB	2017
rs62104180	A	G	Whole body fat mass	Neale B	UKBB	2017
rs62104180	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs62104180	A	G	Whole body water mass	Neale B	UKBB	2017
rs62379978	G	T	Age at menarche	Neale B	UKBB	2017
rs62379978	G	T	Height	Neale B	UKBB	2017
rs62379978	G	T	Relative age of first facial hair	Neale B	UKBB	2017
rs62379978	G	T	Relative age voice broke	Neale B	UKBB	2017
rs643428	C	T	Comparative body size at age 10	Neale B	UKBB	2017
rs654354	T	A	Eosinophil count	Astle W	27863252	2016
rs654354	T	A	Eosinophil percentage of granulocytes	Astle W	27863252	2016
rs654354	T	A	Eosinophil percentage of white cells	Astle W	27863252	2016
rs654354	T	A	Neutrophil percentage of granulocytes	Astle W	27863252	2016
rs654354	T	A	Sum eosinophil basophil counts	Astle W	27863252	2016
rs654354	T	A	Allergic disease	Ferreira M	29083406	2017
rs654354	T	A	Asthma	Neale B	UKBB	2017
rs654354	T	A	Doctor diagnosed hayfever or allergic rhinitis	Neale B	UKBB	2017
rs654354	T	A	Hayfever, allergic rhinitis or eczema	Neale B	UKBB	2017
rs654354	T	A	No blood clot, bronchitis, emphysema, asthma, rhinitis, eczema or allergy diagnosed by doctor	Neale B	UKBB	2017
rs654354	T	A	Self-reported asthma	Neale B	UKBB	2017
rs654354	T	A	Self-reported hayfever or allergic rhinitis	Neale B	UKBB	2017
rs6590889	C	T	Age at menarche	Neale B	UKBB	2017
rs6678140	C	T	Eosinophil percentage of white cells	Astle W	27863252	2016
rs6678140	C	T	Allergic disease	Ferreira M	29083406	2017
rs6678140	C	T	Femoral neck bone mineral density	GEFOS	22504420	2012
rs6678140	C	T	Body fat percentage	Neale B	UKBB	2017
rs6678140	C	T	Diastolic blood pressure	Neale B	UKBB	2017
rs6678140	C	T	Hayfever, allergic rhinitis or eczema	Neale B	UKBB	2017
rs6678140	C	T	Heel bone mineral density	Neale B	UKBB	2017
rs6678140	C	T	Heel bone mineral density left	Neale B	UKBB	2017
rs6678140	C	T	Heel bone mineral density right	Neale B	UKBB	2017
rs6678140	C	T	No blood clot, bronchitis, emphysema, asthma, rhinitis, eczema or allergy diagnosed by doctor	Neale B	UKBB	2017
rs6678140	C	T	Systolic blood pressure	Neale B	UKBB	2017
rs6678140	C	T	Trunk fat percentage	Neale B	UKBB	2017
rs6678140	C	T	Schizophrenia	PGC	25056061	2014
rs6735626	A	G	Body mass index	Neale B	UKBB	2017
rs6735626	A	G	Impedance of arm left	Neale B	UKBB	2017
rs6735626	A	G	Impedance of arm right	Neale B	UKBB	2017
rs6735626	A	G	Impedance of whole body	Neale B	UKBB	2017
rs6864818	C	T	Age at menarche	ReproGen	25231870	2014
rs6931884	C	T	Age at menarche	Neale B	UKBB	2017
rs6931884	C	T	Age at menarche	ReproGen	25231870	2014

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rs6933660	A	C	Menarche age at onset	ReproGen	25231870	2014
rs6933660	A	C	Age at menarche	Neale B	UKBB	2017
rs6933660	A	C	Heel bone mineral density	Neale B	UKBB	2017
rs6933660	A	C	Heel bone mineral density left	Neale B	UKBB	2017
rs6933660	A	C	Heel bone mineral density right	Neale B	UKBB	2017
rs6933660	A	C	Age at menarche	ReproGen	25231870	2014
rs7077302	C	G	Heel bone mineral density right	Neale B	UKBB	2017
rs7114175	A	T	Age at menarche	Neale B	UKBB	2017
rs7114175	A	T	Height	Neale B	UKBB	2017
rs7114175	A	T	Relative age of first facial hair	Neale B	UKBB	2017
rs7114175	A	T	Relative age voice broke	Neale B	UKBB	2017
rs7132908	A	G	Childhood BMI	EGGC	26604143	2016
rs7132908	A	G	Childhood obesity	EGGC	22484627	2012
rs7132908	A	G	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs7132908	A	G	Body mass index in females greater than 50 years of age	GIANT	26426971	2015
rs7132908	A	G	Body mass index in females less than or equal to 50 years of age	GIANT	26426971	2015
rs7132908	A	G	Body mass index in females	GIANT	25673413	2015
rs7132908	A	G	Body mass index in males	GIANT	25673413	2015
rs7132908	A	G	Body mass index in non-smokers	GIANT	28443625	2017
rs7132908	A	G	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs7132908	A	G	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs7132908	A	G	Body mass index adjusted for smoking in females	GIANT	28443625	2017
rs7132908	A	G	Body mass index adjusted for smoking	GIANT	28443625	2017
rs7132908	A	G	Body mass index adjusted for smoking	GIANT	28443625	2017
rs7132908	A	G	Body mass index	Speliotes EK	20935630	2010
rs7132908	A	G	Body mass index	GIANT	23754948	2013
rs7132908	A	G	Body mass index	GIANT	25673413	2015
rs7132908	A	G	Body mass index	GIANT	29273807	2018
rs7132908	A	G	Body mass index	GIANT	25673413	2015
rs7132908	A	G	Body mass index	GIANT	29273807	2018
rs7132908	A	G	Obesity class 1	GIANT	23563607	2013
rs7132908	A	G	Waist circumference	GIANT	25673412	2015
rs7132908	A	G	Waist circumference	GIANT	25673412	2015
rs7132908	A	G	Weight	GIANT	23754948	2013
rs7132908	A	G	Body mass index	Speliotes EK	20935630	2010
rs7132908	A	G	Body mass index	Paternoster L	21935397	2011
rs7132908	A	G	Body mass index 25 kgm2	GIANT	23563607	2013
rs7132908	A	G	Body mass index 30 kgm2	GIANT	23563607	2013
rs7132908	A	G	Body mass index 35 kgm2	GIANT	23563607	2013
rs7132908	A	G	Obesity body mass index	Paternoster L	21935397	2011
rs7132908	A	G	Obesity with early age of onset age 2	EGGC	22484627	2012
rs7132908	A	G	Childhood body mass index	EGGC	26604143	2016
rs7132908	A	G	Arm fat mass left	Neale B	UKBB	2017
rs7132908	A	G	Arm fat mass right	Neale B	UKBB	2017
rs7132908	A	G	Arm fat percentage left	Neale B	UKBB	2017
rs7132908	A	G	Arm fat percentage right	Neale B	UKBB	2017

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rs7132908	A	G	Arm fat-free mass left	Neale B	UKBB	2017
rs7132908	A	G	Arm fat-free mass right	Neale B	UKBB	2017
rs7132908	A	G	Arm predicted mass left	Neale B	UKBB	2017
rs7132908	A	G	Arm predicted mass right	Neale B	UKBB	2017
rs7132908	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs7132908	A	G	Body fat percentage	Neale B	UKBB	2017
rs7132908	A	G	Body mass index	Neale B	UKBB	2017
rs7132908	A	G	Comparative body size at age 10	Neale B	UKBB	2017
rs7132908	A	G	Comparative height size at age 10	Neale B	UKBB	2017
rs7132908	A	G	Hip circumference	Neale B	UKBB	2017
rs7132908	A	G	Impedance of arm left	Neale B	UKBB	2017
rs7132908	A	G	Impedance of arm right	Neale B	UKBB	2017
rs7132908	A	G	Impedance of leg left	Neale B	UKBB	2017
rs7132908	A	G	Impedance of leg right	Neale B	UKBB	2017
rs7132908	A	G	Impedance of whole body	Neale B	UKBB	2017
rs7132908	A	G	Leg fat mass left	Neale B	UKBB	2017
rs7132908	A	G	Leg fat mass right	Neale B	UKBB	2017
rs7132908	A	G	Leg fat percentage left	Neale B	UKBB	2017
rs7132908	A	G	Leg fat percentage right	Neale B	UKBB	2017
rs7132908	A	G	Leg fat-free mass left	Neale B	UKBB	2017
rs7132908	A	G	Leg fat-free mass right	Neale B	UKBB	2017
rs7132908	A	G	Leg predicted mass left	Neale B	UKBB	2017
rs7132908	A	G	Leg predicted mass right	Neale B	UKBB	2017
rs7132908	A	G	Trunk fat mass	Neale B	UKBB	2017
rs7132908	A	G	Trunk fat percentage	Neale B	UKBB	2017
rs7132908	A	G	Trunk fat-free mass	Neale B	UKBB	2017
rs7132908	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs7132908	A	G	Waist circumference	Neale B	UKBB	2017
rs7132908	A	G	Weight	Neale B	UKBB	2017
rs7132908	A	G	Whole body fat mass	Neale B	UKBB	2017
rs7132908	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs7132908	A	G	Whole body water mass	Neale B	UKBB	2017
rs7178532	A	G	Age at menarche	Neale B	UKBB	2017
rs72787511	C	G	Hair or balding pattern: pattern 4	Neale B	UKBB	2017
rs72787511	C	G	Relative age of first facial hair	Neale B	UKBB	2017
rs7359336	A	G	Body mass index in non-smokers	GIANT	28443625	2017
rs7359336	A	G	Height	GIANT	25282103	2014
rs7359336	A	G	Age at menarche	Neale B	UKBB	2017
rs7359336	A	G	Arm fat mass left	Neale B	UKBB	2017
rs7359336	A	G	Arm fat mass right	Neale B	UKBB	2017
rs7359336	A	G	Arm fat percentage left	Neale B	UKBB	2017
rs7359336	A	G	Arm fat percentage right	Neale B	UKBB	2017
rs7359336	A	G	Body fat percentage	Neale B	UKBB	2017
rs7359336	A	G	Body mass index	Neale B	UKBB	2017
rs7359336	A	G	Diabetes diagnosed by doctor	Neale B	UKBB	2017
rs7359336	A	G	Forced expiratory volume in 1-second	Neale B	UKBB	2017
rs7359336	A	G	Forced expiratory volume in 1-second, best measure	Neale B	UKBB	2017

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rs7359336	A	G	Forced vital capacity	Neale B	UKBB	2017
rs7359336	A	G	Forced vital capacity, best measure	Neale B	UKBB	2017
rs7359336	A	G	Hand grip strength left	Neale B	UKBB	2017
rs7359336	A	G	Height	Neale B	UKBB	2017
rs7359336	A	G	Hip circumference	Neale B	UKBB	2017
rs7359336	A	G	Impedance of leg left	Neale B	UKBB	2017
rs7359336	A	G	Impedance of leg right	Neale B	UKBB	2017
rs7359336	A	G	Leg fat mass left	Neale B	UKBB	2017
rs7359336	A	G	Leg fat mass right	Neale B	UKBB	2017
rs7359336	A	G	Leg fat percentage left	Neale B	UKBB	2017
rs7359336	A	G	Leg fat percentage right	Neale B	UKBB	2017
rs7359336	A	G	Self-reported diabetes	Neale B	UKBB	2017
rs7359336	A	G	Sitting height	Neale B	UKBB	2017
rs7359336	A	G	Trunk fat mass	Neale B	UKBB	2017
rs7359336	A	G	Trunk fat percentage	Neale B	UKBB	2017
rs7359336	A	G	Waist circumference	Neale B	UKBB	2017
rs7359336	A	G	Whole body fat mass	Neale B	UKBB	2017
rs7359336	A	G	Age at menarche	ReproGen	25231870	2014
rs7516763	A	C	Comparative body size at age 10	Neale B	UKBB	2017
rs7517629	A	G	Years of educational attainment	SSGAC	27225129	2016
rs7576624	C	T	Body mass index females	Akiyama M	28892062	2017
rs7576624	C	T	Body mass index males	Akiyama M	28892062	2017
rs7576624	C	T	Body mass index	Akiyama M	28892062	2017
rs7576624	C	T	Childhood BMI	EGGC	26604143	2016
rs7576624	C	T	Childhood obesity	EGGC	22484627	2012
rs7576624	C	T	Body mass index in physically active females	GIANT	28448500	2017
rs7576624	C	T	Body mass index in physically active males	GIANT	28448500	2017
rs7576624	C	T	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs7576624	C	T	Body mass index in physically active indivdiuals	GIANT	28448500	2017
rs7576624	C	T	Body mass index in females greater than 50 years of age	GIANT	26426971	2015
rs7576624	C	T	Body mass index in females less than or equal to 50 years of age	GIANT	26426971	2015
rs7576624	C	T	Body mass index in females	GIANT	23754948	2013
rs7576624	C	T	Body mass index in females	GIANT	25673413	2015
rs7576624	C	T	Body mass index in physically inactive females	GIANT	28448500	2017
rs7576624	C	T	Body mass index in physically inactive indivdiuals	GIANT	28448500	2017
rs7576624	C	T	Body mass index in physically inactive indivdiuals	GIANT	28448500	2017
rs7576624	C	T	Body mass index in males greater than 50 years of age	GIANT	26426971	2015
rs7576624	C	T	Body mass index in males less than or equal to 50 years of age	GIANT	26426971	2015
rs7576624	C	T	Body mass index in males	GIANT	23754948	2013
rs7576624	C	T	Body mass index in males	GIANT	25673413	2015
rs7576624	C	T	Body mass index in female non-smokers	GIANT	28443625	2017
rs7576624	C	T	Body mass index in male non-smokers	GIANT	28443625	2017
rs7576624	C	T	Body mass index in non-smokers	GIANT	28443625	2017
rs7576624	C	T	Body mass index in non-smokers	GIANT	28443625	2017
rs7576624	C	T	Body mass index in smokers	GIANT	28443625	2017
rs7576624	C	T	Body mass index in smokers	GIANT	28443625	2017

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rs7576624	C	T	Body mass index tails	GIANT	23563607	2013
rs7576624	C	T	Body mass index ajusted for physical activity in females	GIANT	28448500	2017
rs7576624	C	T	Body mass index adjsuted for physical activity in males	GIANT	28448500	2017
rs7576624	C	T	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs7576624	C	T	Body mass index adjusted for physical activity	GIANT	28448500	2017
rs7576624	C	T	Body mass index adjusted for smoking in females	GIANT	28443625	2017
rs7576624	C	T	Body mass index adjusted for smoking in males	GIANT	28443625	2017
rs7576624	C	T	Body mass index adjusted for smoking	GIANT	28443625	2017
rs7576624	C	T	Body mass index adjusted for smoking	GIANT	28443625	2017
rs7576624	C	T	Body mass index	Speliotes EK	20935630	2010
rs7576624	C	T	Body mass index	GIANT	23754948	2013
rs7576624	C	T	Body mass index	GIANT	25673413	2015
rs7576624	C	T	Body mass index	GIANT	25673413	2015
rs7576624	C	T	Hip circumference in females	GIANT	25673412	2015
rs7576624	C	T	Hip circumference in males	GIANT	25673412	2015
rs7576624	C	T	Hip circumference	GIANT	25673412	2015
rs7576624	C	T	Hip circumference	GIANT	25673412	2015
rs7576624	C	T	Obesity class 1	GIANT	23563607	2013
rs7576624	C	T	Obesity class 2	GIANT	23563607	2013
rs7576624	C	T	Overweight	GIANT	23563607	2013
rs7576624	C	T	Waist circumference in females	GIANT	25673412	2015
rs7576624	C	T	Waist circumference in males	GIANT	25673412	2015
rs7576624	C	T	Waist circumference	GIANT	23754948	2013
rs7576624	C	T	Waist circumference	GIANT	25673412	2015
rs7576624	C	T	Waist circumference	GIANT	25673412	2015
rs7576624	C	T	Weight in females	GIANT	23754948	2013
rs7576624	C	T	Weight in males	GIANT	23754948	2013
rs7576624	C	T	Weight	GIANT	23754948	2013
rs7576624	C	T	Body mass index	Speliotes EK	20935630	2010
rs7576624	C	T	Obesity with early age of onset age 2	EGGC	22484627	2012
rs7576624	C	T	Body fat percentage	Lu Y	26833246	2016
rs7576624	C	T	Age at menarche	Neale B	UKBB	2017
rs7576624	C	T	Arm fat mass left	Neale B	UKBB	2017
rs7576624	C	T	Arm fat mass right	Neale B	UKBB	2017
rs7576624	C	T	Arm fat percentage left	Neale B	UKBB	2017
rs7576624	C	T	Arm fat percentage right	Neale B	UKBB	2017
rs7576624	C	T	Arm fat-free mass left	Neale B	UKBB	2017
rs7576624	C	T	Arm fat-free mass right	Neale B	UKBB	2017
rs7576624	C	T	Arm predicted mass left	Neale B	UKBB	2017
rs7576624	C	T	Arm predicted mass right	Neale B	UKBB	2017
rs7576624	C	T	Basal metabolic rate	Neale B	UKBB	2017
rs7576624	C	T	Body fat percentage	Neale B	UKBB	2017
rs7576624	C	T	Body mass index	Neale B	UKBB	2017
rs7576624	C	T	Comparative body size at age 10	Neale B	UKBB	2017
rs7576624	C	T	Comparative height size at age 10	Neale B	UKBB	2017
rs7576624	C	T	Hip circumference	Neale B	UKBB	2017

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rs7576624	C	T	Impedance of arm left	Neale B	UKBB	2017
rs7576624	C	T	Impedance of arm right	Neale B	UKBB	2017
rs7576624	C	T	Impedance of leg left	Neale B	UKBB	2017
rs7576624	C	T	Impedance of leg right	Neale B	UKBB	2017
rs7576624	C	T	Impedance of whole body	Neale B	UKBB	2017
rs7576624	C	T	Leg fat mass left	Neale B	UKBB	2017
rs7576624	C	T	Leg fat mass right	Neale B	UKBB	2017
rs7576624	C	T	Leg fat percentage left	Neale B	UKBB	2017
rs7576624	C	T	Leg fat percentage right	Neale B	UKBB	2017
rs7576624	C	T	Leg fat-free mass left	Neale B	UKBB	2017
rs7576624	C	T	Leg fat-free mass right	Neale B	UKBB	2017
rs7576624	C	T	Leg predicted mass left	Neale B	UKBB	2017
rs7576624	C	T	Leg predicted mass right	Neale B	UKBB	2017
rs7576624	C	T	Trunk fat mass	Neale B	UKBB	2017
rs7576624	C	T	Trunk fat percentage	Neale B	UKBB	2017
rs7576624	C	T	Trunk fat-free mass	Neale B	UKBB	2017
rs7576624	C	T	Trunk predicted mass	Neale B	UKBB	2017
rs7576624	C	T	Waist circumference	Neale B	UKBB	2017
rs7576624	C	T	Weight	Neale B	UKBB	2017
rs7576624	C	T	Whole body fat mass	Neale B	UKBB	2017
rs7576624	C	T	Whole body fat-free mass	Neale B	UKBB	2017
rs7576624	C	T	Whole body water mass	Neale B	UKBB	2017
rs7576624	C	T	Age at menarche	ReproGen	25231870	2014
rs758747	C	T	Body mass index	GIANT	25673413	2015
rs758747	C	T	Body mass index	GIANT	25673413	2015
rs758747	C	T	Body mass index	GIANT	25673413	2015
rs758747	C	T	Body mass index	GIANT	25673413	2015
rs758747	C	T	Forced vital capacity	Neale B	UKBB	2017
rs758747	C	T	Forced vital capacity, best measure	Neale B	UKBB	2017
rs7852169	C	G	Age at menarche	Neale B	UKBB	2017
rs7852169	C	G	Relative age of first facial hair	Neale B	UKBB	2017
rs7853970	C	T	Menarche age at onset	ReproGen	25231870	2014
rs7853970	C	T	Age at menarche	Neale B	UKBB	2017
rs7853970	C	T	Age at menarche	ReproGen	25231870	2014
rs7907759	A	G	Age at menarche	Neale B	UKBB	2017
rs8051833	A	G	Alcohol intake frequency	Neale B	UKBB	2017
rs8051833	A	G	Arm fat mass right	Neale B	UKBB	2017
rs8051833	A	G	Arm fat-free mass left	Neale B	UKBB	2017
rs8051833	A	G	Arm fat-free mass right	Neale B	UKBB	2017
rs8051833	A	G	Arm predicted mass left	Neale B	UKBB	2017
rs8051833	A	G	Arm predicted mass right	Neale B	UKBB	2017
rs8051833	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs8051833	A	G	Impedance of leg right	Neale B	UKBB	2017
rs8051833	A	G	Leg fat-free mass left	Neale B	UKBB	2017
rs8051833	A	G	Leg fat-free mass right	Neale B	UKBB	2017
rs8051833	A	G	Leg predicted mass left	Neale B	UKBB	2017
rs8051833	A	G	Leg predicted mass right	Neale B	UKBB	2017
rs8051833	A	G	Trunk fat-free mass	Neale B	UKBB	2017

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rs8051833	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs8051833	A	G	Waist circumference	Neale B	UKBB	2017
rs8051833	A	G	Weight	Neale B	UKBB	2017
rs8051833	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs8051833	A	G	Whole body water mass	Neale B	UKBB	2017
rs813301	C	T	Impedance of arm left	Neale B	UKBB	2017
rs813301	C	T	Impedance of arm right	Neale B	UKBB	2017
rs813301	C	T	Impedance of leg left	Neale B	UKBB	2017
rs813301	C	T	Impedance of leg right	Neale B	UKBB	2017
rs813301	C	T	Impedance of whole body	Neale B	UKBB	2017
rs913588	A	G	Menarche age at onset	ReproGen	25231870	2014
rs913588	A	G	Age at menarche	Neale B	UKBB	2017
rs913588	A	G	Age at menarche	ReproGen	25231870	2014
rs9349203	A	G	Granulocyte percentage of myeloid white cells	Astle W	27863252	2016
rs9349203	A	G	Mean corpuscular hemoglobin	Astle W	27863252	2016
rs9349203	A	G	Mean corpuscular volume	Astle W	27863252	2016
rs9349203	A	G	Monocyte count	Astle W	27863252	2016
rs9349203	A	G	Monocyte percentage of white cells	Astle W	27863252	2016
rs9349203	A	G	Red blood cell count	Astle W	27863252	2016
rs9349203	A	G	Red cell distribution width	Astle W	27863252	2016
rs9349203	A	G	Menarche age at onset	Pickrell JK	27182965	2016
rs9349203	A	G	Age at menarche	Neale B	UKBB	2017
rs9349203	A	G	Arm fat-free mass left	Neale B	UKBB	2017
rs9349203	A	G	Arm fat-free mass right	Neale B	UKBB	2017
rs9349203	A	G	Arm predicted mass left	Neale B	UKBB	2017
rs9349203	A	G	Arm predicted mass right	Neale B	UKBB	2017
rs9349203	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs9349203	A	G	Height	Neale B	UKBB	2017
rs9349203	A	G	Hip circumference	Neale B	UKBB	2017
rs9349203	A	G	Leg fat-free mass left	Neale B	UKBB	2017
rs9349203	A	G	Leg fat-free mass right	Neale B	UKBB	2017
rs9349203	A	G	Leg predicted mass left	Neale B	UKBB	2017
rs9349203	A	G	Leg predicted mass right	Neale B	UKBB	2017
rs9349203	A	G	Relative age of first facial hair	Neale B	UKBB	2017
rs9349203	A	G	Sitting height	Neale B	UKBB	2017
rs9349203	A	G	Trunk fat-free mass	Neale B	UKBB	2017
rs9349203	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs9349203	A	G	Weight	Neale B	UKBB	2017
rs9349203	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs9349203	A	G	Whole body water mass	Neale B	UKBB	2017
rs9382676	C	T	Age at menarche	Neale B	UKBB	2017
rs9474996	A	T	Age at menarche	ReproGen	25231870	2014
rs9522262	C	G	Arm fat mass left	Neale B	UKBB	2017
rs9522262	C	G	Arm fat percentage left	Neale B	UKBB	2017
rs9522262	C	G	Body fat percentage	Neale B	UKBB	2017
rs9522262	C	G	Body mass index	Neale B	UKBB	2017
rs9522262	C	G	Leg fat mass left	Neale B	UKBB	2017
rs9522262	C	G	Leg fat mass right	Neale B	UKBB	2017

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rs9522262	C	G	Leg fat percentage left	Neale B	UKBB	2017
rs9522262	C	G	Leg fat percentage right	Neale B	UKBB	2017
rs9522262	C	G	Pack years adult smoking as proportion of life span exposed to smoking	Neale B	UKBB	2017
rs9522262	C	G	Pack years of smoking preview only	Neale B	UKBB	2017
rs9522262	C	G	Trunk fat mass	Neale B	UKBB	2017
rs9522262	C	G	Trunk fat percentage	Neale B	UKBB	2017
rs9522262	C	G	Waist circumference	Neale B	UKBB	2017
rs9522262	C	G	Whole body fat mass	Neale B	UKBB	2017
rs9522262	C	G	Age at menarche	ReproGen	25231870	2014
rs953230	A	G	Height	Neale B	UKBB	2017
rs953230	A	G	Sitting height	Neale B	UKBB	2017
rs953230	A	G	Age at menarche	ReproGen	25231870	2014
rs9548873	C	T	Eosinophil count	Astle W	27863252	2016
rs9548873	C	T	Eosinophil percentage of granulocytes	Astle W	27863252	2016
rs9548873	C	T	Eosinophil percentage of white cells	Astle W	27863252	2016
rs9548873	C	T	Neutrophil percentage of granulocytes	Astle W	27863252	2016
rs9548873	C	T	Sum eosinophil basophil counts	Astle W	27863252	2016
rs9548873	C	T	Rheumatoid arthritis	Okada Y	24390342	2014
rs9548873	C	T	Rheumatoid arthritis	Okada Y	24390342	2014
rs9548873	C	T	Age at menarche	ReproGen	25231870	2014
rs9548873	C	T	Eosinophil count	Astle W	27863252	2016
rs9548873	C	T	Eosinophil percentage of granulocytes	Astle W	27863252	2016
rs9548873	C	T	Eosinophil percentage of white cells	Astle W	27863252	2016
rs9548873	C	T	Neutrophil percentage of granulocytes	Astle W	27863252	2016
rs9548873	C	T	Sum eosinophil basophil counts	Astle W	27863252	2016
rs9548873	C	T	Rheumatoid arthritis	Okada Y	24390342	2014
rs9548873	C	T	Rheumatoid arthritis	Okada Y	24390342	2014
rs9548873	C	T	Age at menarche	ReproGen	25231870	2014
rs9635759	A	G	Age at menarche	Elks CE	21102462	2010
rs9635759	A	G	Menarche age at onset	Elks CE	21102462	2010
rs9635759	A	G	Menarche age at onset	ReproGen	25231870	2014
rs9635759	A	G	Menarche age at onset	Pickrell JK	27182965	2016
rs9635759	A	G	Age at menarche	Neale B	UKBB	2017
rs9635759	A	G	Age at menarche	ReproGen	25231870	2014
rs9635759	A	G	Menarche	Elks CE	21102462	2010
rs9647570	G	T	Menarche age at onset	ReproGen	25231870	2014
rs9647570	G	T	Age at menarche	ReproGen	25231870	2014
rs9758500	A	G	Age at menarche	Neale B	UKBB	2017
rs9758500	A	G	Comparative height size at age 10	Neale B	UKBB	2017
rs9972653	G	T	Body mass index females	Akiyama M	28892062	2017
rs9972653	G	T	Body mass index males	Akiyama M	28892062	2017
rs9972653	G	T	Body mass index	Akiyama M	28892062	2017
rs9972653	G	T	Type II diabetes	DIAGRAM	26551672	2015
rs9972653	G	T	Type II diabetes	DIAGRAM	28566273	2017
rs9972653	G	T	Age at menarche	Neale B	UKBB	2017
rs9972653	G	T	Alcohol intake frequency	Neale B	UKBB	2017
rs9972653	G	T	Arm fat mass left	Neale B	UKBB	2017

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rs9972653	G	T	Arm fat mass right	Neale B	UKBB	2017
rs9972653	G	T	Arm fat percentage left	Neale B	UKBB	2017
rs9972653	G	T	Arm fat percentage right	Neale B	UKBB	2017
rs9972653	G	T	Arm fat-free mass left	Neale B	UKBB	2017
rs9972653	G	T	Arm fat-free mass right	Neale B	UKBB	2017
rs9972653	G	T	Arm predicted mass left	Neale B	UKBB	2017
rs9972653	G	T	Arm predicted mass right	Neale B	UKBB	2017
rs9972653	G	T	Average weekly beer plus cider intake	Neale B	UKBB	2017
rs9972653	G	T	Average weekly red wine intake	Neale B	UKBB	2017
rs9972653	G	T	Basal metabolic rate	Neale B	UKBB	2017
rs9972653	G	T	Body fat percentage	Neale B	UKBB	2017
rs9972653	G	T	Body mass index	Neale B	UKBB	2017
rs9972653	G	T	Comparative body size at age 10	Neale B	UKBB	2017
rs9972653	G	T	Diabetes diagnosed by doctor	Neale B	UKBB	2017
rs9972653	G	T	Getting up in morning	Neale B	UKBB	2017
rs9972653	G	T	Heel bone mineral density	Neale B	UKBB	2017
rs9972653	G	T	Hip circumference	Neale B	UKBB	2017
rs9972653	G	T	Illnesses of father: diabetes	Neale B	UKBB	2017
rs9972653	G	T	Impedance of arm left	Neale B	UKBB	2017
rs9972653	G	T	Impedance of arm right	Neale B	UKBB	2017
rs9972653	G	T	Impedance of leg left	Neale B	UKBB	2017
rs9972653	G	T	Impedance of leg right	Neale B	UKBB	2017
rs9972653	G	T	Impedance of whole body	Neale B	UKBB	2017
rs9972653	G	T	Leg fat mass left	Neale B	UKBB	2017
rs9972653	G	T	Leg fat mass right	Neale B	UKBB	2017
rs9972653	G	T	Leg fat percentage left	Neale B	UKBB	2017
rs9972653	G	T	Leg fat percentage right	Neale B	UKBB	2017
rs9972653	G	T	Leg fat-free mass left	Neale B	UKBB	2017
rs9972653	G	T	Leg fat-free mass right	Neale B	UKBB	2017
rs9972653	G	T	Leg predicted mass left	Neale B	UKBB	2017
rs9972653	G	T	Leg predicted mass right	Neale B	UKBB	2017
rs9972653	G	T	Medication for cholesterol, blood pressure or diabetes: none of the above	Neale B	UKBB	2017
rs9972653	G	T	Morning or evening person	Neale B	UKBB	2017
rs9972653	G	T	Self-reported breast cancer	Neale B	UKBB	2017
rs9972653	G	T	Self-reported diabetes	Neale B	UKBB	2017
rs9972653	G	T	Self-reported hypertension	Neale B	UKBB	2017
rs9972653	G	T	Sleep duration	Neale B	UKBB	2017
rs9972653	G	T	Snoring	Neale B	UKBB	2017
rs9972653	G	T	Sodium in urine	Neale B	UKBB	2017
rs9972653	G	T	Treatment with blood pressure medication	Neale B	UKBB	2017
rs9972653	G	T	Treatment with metformin	Neale B	UKBB	2017
rs9972653	G	T	Trunk fat mass	Neale B	UKBB	2017
rs9972653	G	T	Trunk fat percentage	Neale B	UKBB	2017
rs9972653	G	T	Trunk fat-free mass	Neale B	UKBB	2017
rs9972653	G	T	Trunk predicted mass	Neale B	UKBB	2017
rs9972653	G	T	Usual walking pace	Neale B	UKBB	2017
rs9972653	G	T	Vascular or heart problems diagnosed by doctor: high blood pressure	Neale B	UKBB	2017

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rs9972653	G	T	Vascular or heart problems diagnosed by doctor: none of the above	Neale B	UKBB	2017
rs9972653	G	T	Waist circumference	Neale B	UKBB	2017
rs9972653	G	T	Weight	Neale B	UKBB	2017
rs9972653	G	T	Whole body fat mass	Neale B	UKBB	2017
rs9972653	G	T	Whole body fat-free mass	Neale B	UKBB	2017
rs9972653	G	T	Whole body water mass	Neale B	UKBB	2017
rs999885	G	A	Pulse rate	Neale B	UKBB	2017

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Table S11 – Phenotype associations at genome-wide significance level ($p<5x10^{-8}$) of instrumental variants for age at menopause on PhenoScanner. SNP= single-nucleotide polymorphism, PMID = PubMed ID.

SNP	Alllele 1	Allele 2	Trait	Study	PMID/Source	Year
rs10255049	A	G	Height	Neale B	UKBB	2017
rs1044595	T	C	Ever used hormone-replacement therapy	Neale B	UKBB	2017
rs10477172	C	T	Self-reported testicular cancer	Neale B	UKBB	2017
rs10743724	C	T	Forced expiratory volume in 1-second	Neale B	UKBB	2017
rs10743724	C	T	Forced expiratory volume in 1-second, best measure	Neale B	UKBB	2017
rs10743724	C	T	Forced vital capacity	Neale B	UKBB	2017
rs10743724	C	T	Forced vital capacity, best measure	Neale B	UKBB	2017
rs10769315	C	T	Diastolic blood pressure	Neale B	UKBB	2017
rs10769315	C	T	Height	GIANT	25282103	2014
rs10769315	C	T	Height	Neale B	UKBB	2017
rs10769315	C	T	Medication for cholesterol, blood pressure or diabetes: blood pressure medication	Neale B	UKBB	2017
rs10769315	C	T	Self-reported hypertension	Neale B	UKBB	2017
rs10769315	C	T	Systolic blood pressure	Neale B	UKBB	2017
rs10769315	C	T	Vascular or heart problems diagnosed by doctor: high blood pressure	Neale B	UKBB	2017
rs10769315	C	T	Vascular or heart problems diagnosed by doctor: none of the above	Neale B	UKBB	2017
rs10823203	C	G	Arm fat-free mass left	Neale B	UKBB	2017
rs10823203	C	G	Arm fat-free mass right	Neale B	UKBB	2017
rs10823203	C	G	Arm predicted mass right	Neale B	UKBB	2017
rs10823203	C	G	Basal metabolic rate	Neale B	UKBB	2017
rs10823203	C	G	Comparative height size at age 10	Neale B	UKBB	2017
rs10823203	C	G	Height	Neale B	UKBB	2017
rs10823203	C	G	Leg fat-free mass left	Neale B	UKBB	2017
rs10823203	C	G	Leg fat-free mass right	Neale B	UKBB	2017
rs10823203	C	G	Leg predicted mass left	Neale B	UKBB	2017
rs10823203	C	G	Leg predicted mass right	Neale B	UKBB	2017
rs10823203	C	G	Sitting height	Neale B	UKBB	2017
rs10823203	C	G	Trunk fat-free mass	Neale B	UKBB	2017
rs10823203	C	G	Trunk predicted mass	Neale B	UKBB	2017
rs10823203	C	G	Whole body fat-free mass	Neale B	UKBB	2017
rs10823203	C	G	Whole body water mass	Neale B	UKBB	2017
rs10899493	C	T	Impedance of arm left	Neale B	UKBB	2017
rs10899493	C	T	Impedance of arm right	Neale B	UKBB	2017
rs10899493	C	T	Impedance of whole body	Neale B	UKBB	2017
rs11031006	A	G	Bilateral oophorectomy	Neale B	UKBB	2017
rs11031006	A	G	Excessive, frequent and irregular menstruation	Neale B	UKBB	2017

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rs11031006	A	G	Length of menstrual cycle	Neale B	UKBB	2017
rs11031006	A	G	Luteinizing hormone levels in polycystic ovary syndrome	Hayes MG	26284813	2015
rs11031006	A	G	Polycystic ovary syndrome	Hayes MG	26284813	2015
rs11031006	A	G	Polycystic ovary syndrome	Day FR	26416764	2015
rs11031006	A	G	Spontaneous dizygotic twinning	Mbarek H	27132594	2016
rs11031006	A	G	Years since last cervical smear test	Neale B	UKBB	2017
rs11571815	A	G	Home area population density: Scotland large urban area	Neale B	UKBB	2017
rs11571815	A	G	Illnesses of father: lung cancer	Neale B	UKBB	2017
rs11668344	A	G	Ever used hormone-replacement therapy	Neale B	UKBB	2017
rs11668344	A	G	Had menopause	Neale B	UKBB	2017
rs11668344	A	G	Primary ovarian insufficient menopause 40	Perry JR	23307926	2013
rs11699793	C	T	Arm fat-free mass left	Neale B	UKBB	2017
rs11699793	C	T	Arm fat-free mass right	Neale B	UKBB	2017
rs11699793	C	T	Arm predicted mass left	Neale B	UKBB	2017
rs11699793	C	T	Arm predicted mass right	Neale B	UKBB	2017
rs11699793	C	T	Basal metabolic rate	Neale B	UKBB	2017
rs11699793	C	T	Comparative height size at age 10	Neale B	UKBB	2017
rs11699793	C	T	Height	Neale B	UKBB	2017
rs11699793	C	T	Impedance of leg left	Neale B	UKBB	2017
rs11699793	C	T	Impedance of leg right	Neale B	UKBB	2017
rs11699793	C	T	Impedance of whole body	Neale B	UKBB	2017
rs11699793	C	T	Leg fat-free mass left	Neale B	UKBB	2017
rs11699793	C	T	Leg fat-free mass right	Neale B	UKBB	2017
rs11699793	C	T	Leg predicted mass left	Neale B	UKBB	2017
rs11699793	C	T	Leg predicted mass right	Neale B	UKBB	2017
rs11699793	C	T	Sitting height	Neale B	UKBB	2017
rs11699793	C	T	Trunk fat-free mass	Neale B	UKBB	2017
rs11699793	C	T	Trunk predicted mass	Neale B	UKBB	2017
rs11699793	C	T	Weight	Neale B	UKBB	2017
rs11699793	C	T	Whole body fat-free mass	Neale B	UKBB	2017
rs11699793	C	T	Whole body water mass	Neale B	UKBB	2017
rs11767307	C	G	Arm fat-free mass left	Neale B	UKBB	2017
rs11767307	C	G	Arm fat-free mass right	Neale B	UKBB	2017
rs11767307	C	G	Arm predicted mass left	Neale B	UKBB	2017
rs11767307	C	G	Arm predicted mass right	Neale B	UKBB	2017
rs11767307	C	G	Basal metabolic rate	Neale B	UKBB	2017
rs11767307	C	G	Birth weight	Neale B	UKBB	2017
rs11767307	C	G	Comparative height size at age 10	Neale B	UKBB	2017
rs11767307	C	G	Forced expiratory volume in 1-second	Neale B	UKBB	2017
rs11767307	C	G	Forced expiratory volume in 1-second, best measure	Neale B	UKBB	2017
rs11767307	C	G	Forced vital capacity	Neale B	UKBB	2017

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rs11767307	C	G	Forced vital capacity, best measure	Neale B	UKBB	2017
rs11767307	C	G	Height	GIANT	25282103	2014
rs11767307	C	G	Height	Neale B	UKBB	2017
rs11767307	C	G	Leg fat-free mass left	Neale B	UKBB	2017
rs11767307	C	G	Leg fat-free mass right	Neale B	UKBB	2017
rs11767307	C	G	Leg predicted mass left	Neale B	UKBB	2017
rs11767307	C	G	Leg predicted mass right	Neale B	UKBB	2017
rs11767307	C	G	Sitting height	Neale B	UKBB	2017
rs11767307	C	G	Trunk fat-free mass	Neale B	UKBB	2017
rs11767307	C	G	Trunk predicted mass	Neale B	UKBB	2017
rs11767307	C	G	Whole body fat-free mass	Neale B	UKBB	2017
rs11767307	C	G	Whole body water mass	Neale B	UKBB	2017
rs12053063	A	G	Impedance of arm left	Neale B	UKBB	2017
rs12605881	A	T	Hair or balding pattern: pattern 4	Neale B	UKBB	2017
rs1264191	C	T	Height	Neale B	UKBB	2017
rs1264191	C	T	High light scatter percentage of red cells	Astle W	27863252	2016
rs1264191	C	T	High light scatter reticulocyte count	Astle W	27863252	2016
rs1264191	C	T	Pulse rate	Neale B	UKBB	2017
rs1264191	C	T	Reticulocyte count	Astle W	27863252	2016
rs1264191	C	T	Reticulocyte fraction of red cells	Astle W	27863252	2016
rs1264191	C	T	Sitting height	Neale B	UKBB	2017
rs12825762	A	G	Basal metabolic rate	Neale B	UKBB	2017
rs12825762	A	G	Height	Neale B	UKBB	2017
rs12825762	A	G	Leg fat-free mass left	Neale B	UKBB	2017
rs12825762	A	G	Leg fat-free mass right	Neale B	UKBB	2017
rs12825762	A	G	Leg predicted mass left	Neale B	UKBB	2017
rs12825762	A	G	Leg predicted mass right	Neale B	UKBB	2017
rs12825762	A	G	Mean platelet volume	Astle W	27863252	2016
rs12825762	A	G	Weight	Neale B	UKBB	2017
rs12879626	G	T	Impedance of leg right	Neale B	UKBB	2017
rs12879626	G	T	Leg fat-free mass left	Neale B	UKBB	2017
rs12879626	G	T	Leg fat-free mass right	Neale B	UKBB	2017
rs12879626	G	T	Leg predicted mass left	Neale B	UKBB	2017
rs12879626	G	T	Leg predicted mass right	Neale B	UKBB	2017
rs12898357	A	G	Height	GIANT	25282103	2014
rs138430	C	T	Pulse rate	Neale B	UKBB	2017
rs1467044	A	G	Height	Neale B	UKBB	2017
rs1467044	A	G	Sitting height	Neale B	UKBB	2017
rs1565920	G	A	Allergic disease	Ferreira M	29083406	2017
rs1565920	G	A	Asthma	Neale B	UKBB	2017
rs1565920	G	A	Basophil count	Astle W	27863252	2016
rs1565920	G	A	Doctor diagnosed asthma	Neale B	UKBB	2017

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rs1565920	G	A	Forced expiratory volume in 1-second, predicted percentage	Neale B	UKBB	2017
rs1565920	G	A	Granulocyte count	Astle W	27863252	2016
rs1565920	G	A	Granulocyte percentage of myeloid white cells	Astle W	27863252	2016
rs1565920	G	A	Inflammatory bowel disease	IBDGC	26192919	2015
rs1565920	G	A	Monocyte percentage of white cells	Astle W	27863252	2016
rs1565920	G	A	Myeloid white cell count	Astle W	27863252	2016
rs1565920	G	A	Neutrophil count	Astle W	27863252	2016
rs1565920	G	A	No blood clot, bronchitis, emphysema, asthma, rhinitis, eczema or allergy diagnosed by doctor	Neale B	UKBB	2017
rs1565920	G	A	Rheumatoid arthritis	Okada Y	24390342	2014
rs1565920	G	A	Self-reported asthma	Neale B	UKBB	2017
rs1565920	G	A	Sum basophil neutrophil counts	Astle W	27863252	2016
rs1565920	G	A	Sum neutrophil eosinophil counts	Astle W	27863252	2016
rs1565920	G	A	White blood cell count	Astle W	27863252	2016
rs16991615	A	G	Breast cancer	Michailidou K	29059683	2017
rs16991615	A	G	Ever used hormone-replacement therapy	Neale B	UKBB	2017
rs16991615	A	G	Had menopause	Neale B	UKBB	2017
rs16991615	A	G	Menarche	He C	19448621	2009
rs17680522	A	G	Forced expiratory volume in 1-second, predicted	Neale B	UKBB	2017
rs17680522	A	G	Height	Neale B	UKBB	2017
rs17680522	A	G	Sitting height	Neale B	UKBB	2017
rs1991401	A	G	Heel bone mineral density	Neale B	UKBB	2017
rs200293726	A	T	Plateletcrit	Astle W	27863252	2016
rs200448	C	T	Heel bone mineral density	Neale B	UKBB	2017
rs2056726	A	G	Platelet distribution width	Astle W	27863252	2016
rs2277339	G	T	Arm fat-free mass left	Neale B	UKBB	2017
rs2277339	G	T	Arm fat-free mass right	Neale B	UKBB	2017
rs2277339	G	T	Arm predicted mass left	Neale B	UKBB	2017
rs2277339	G	T	Arm predicted mass right	Neale B	UKBB	2017
rs2277339	G	T	Basal metabolic rate	Neale B	UKBB	2017
rs2277339	G	T	Comparative height size at age 10	Neale B	UKBB	2017
rs2277339	G	T	Had menopause	Neale B	UKBB	2017
rs2277339	G	T	Height	GIANT	28146470	2017
rs2277339	G	T	Height	GIANT	28146470	2017
rs2277339	G	T	Height	Neale B	UKBB	2017
rs2277339	G	T	Impedance of arm left	Neale B	UKBB	2017
rs2277339	G	T	Impedance of whole body	Neale B	UKBB	2017
rs2277339	G	T	Leg fat-free mass left	Neale B	UKBB	2017
rs2277339	G	T	Leg fat-free mass right	Neale B	UKBB	2017
rs2277339	G	T	Leg predicted mass left	Neale B	UKBB	2017
rs2277339	G	T	Leg predicted mass right	Neale B	UKBB	2017

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rs2277339	G	T	Mean corpuscular volume	Astle W	27863252	2016
rs2277339	G	T	Mean corpuscular volume	Astle W	27863252	2016
rs2277339	G	T	Plateletcrit	Astle W	27863252	2016
rs2277339	G	T	Plateletcrit	Astle W	27863252	2016
rs2277339	G	T	Trunk fat-free mass	Neale B	UKBB	2017
rs2277339	G	T	Trunk predicted mass	Neale B	UKBB	2017
rs2277339	G	T	Whole body fat-free mass	Neale B	UKBB	2017
rs2277339	G	T	Whole body water mass	Neale B	UKBB	2017
rs28416520	A	G	Had menopause	Neale B	UKBB	2017
rs2844466	T	C	Arm fat-free mass left	Neale B	UKBB	2017
rs2844466	T	C	Arm fat-free mass right	Neale B	UKBB	2017
rs2844466	T	C	Arm predicted mass left	Neale B	UKBB	2017
rs2844466	T	C	Arm predicted mass right	Neale B	UKBB	2017
rs2844466	T	C	Basal metabolic rate	Neale B	UKBB	2017
rs2844466	T	C	Comparative body size at age 10	Neale B	UKBB	2017
rs2844466	T	C	Comparative height size at age 10	Neale B	UKBB	2017
rs2844466	T	C	Forced expiratory volume in 1-second, predicted percentage	Neale B	UKBB	2017
rs2844466	T	C	Granulocyte count	Astle W	27863252	2016
rs2844466	T	C	Height	Neale B	UKBB	2017
rs2844466	T	C	IgA deficiency	Bronson P	27723758	2016
rs2844466	T	C	Illnesses of siblings: diabetes	Neale B	UKBB	2017
rs2844466	T	C	Insulin-dependent diabetes mellitus	Neale B	UKBB	2017
rs2844466	T	C	Intestinal malabsorption	Neale B	UKBB	2017
rs2844466	T	C	Leg fat-free mass left	Neale B	UKBB	2017
rs2844466	T	C	Leg fat-free mass right	Neale B	UKBB	2017
rs2844466	T	C	Leg predicted mass left	Neale B	UKBB	2017
rs2844466	T	C	Leg predicted mass right	Neale B	UKBB	2017
rs2844466	T	C	Lymphocyte count	Astle W	27863252	2016
rs2844466	T	C	Medication for cholesterol, blood pressure or diabetes: insulin	Neale B	UKBB	2017
rs2844466	T	C	Medication for pain relief, constipation, heartburn: none of the above	Neale B	UKBB	2017
rs2844466	T	C	Medication for pain relief, constipation, heartburn: paracetamol	Neale B	UKBB	2017
rs2844466	T	C	Monocyte count	Astle W	27863252	2016
rs2844466	T	C	Myeloid white cell count	Astle W	27863252	2016
rs2844466	T	C	Nervous feelings	Neale B	UKBB	2017
rs2844466	T	C	Neutrophil count	Astle W	27863252	2016
rs2844466	T	C	Primary sclerosing cholangitis	Ji S	27992413	2017
rs2844466	T	C	Red cell distribution width	Astle W	27863252	2016
rs2844466	T	C	Reticulocyte count	Astle W	27863252	2016
rs2844466	T	C	Schizophrenia	PGC	25056061	2014
rs2844466	T	C	Self-reported hyperthyroidism or thyrotoxicosis	Neale B	UKBB	2017

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rs2844466	T	C	Self-reported hypothyroidism or myxoedema	Neale B	UKBB	2017
rs2844466	T	C	Self-reported malabsorption or coeliac disease	Neale B	UKBB	2017
rs2844466	T	C	Self-reported type 1 diabetes	Neale B	UKBB	2017
rs2844466	T	C	Sitting height	Neale B	UKBB	2017
rs2844466	T	C	Started insulin within one year diagnosis of diabetes	Neale B	UKBB	2017
rs2844466	T	C	Sum basophil neutrophil counts	Astle W	27863252	2016
rs2844466	T	C	Sum neutrophil eosinophil counts	Astle W	27863252	2016
rs2844466	T	C	Treatment with insulin	Neale B	UKBB	2017
rs2844466	T	C	Treatment with insulin product	Neale B	UKBB	2017
rs2844466	T	C	Treatment with levothyroxine sodium	Neale B	UKBB	2017
rs2844466	T	C	Trunk fat-free mass	Neale B	UKBB	2017
rs2844466	T	C	Trunk predicted mass	Neale B	UKBB	2017
rs2844466	T	C	Weight	Neale B	UKBB	2017
rs2844466	T	C	White blood cell count	Astle W	27863252	2016
rs2844466	T	C	Whole body fat-free mass	Neale B	UKBB	2017
rs2844466	T	C	Whole body water mass	Neale B	UKBB	2017
rs35067339	A	T	Lymphocyte count	Astle W	27863252	2016
rs35067339	A	T	Lymphocyte percentage of white cells	Astle W	27863252	2016
rs35067339	A	T	Neutrophil percentage of white cells	Astle W	27863252	2016
rs35067339	A	T	Platelet count	Astle W	27863252	2016
rs35067339	A	T	Plateletcrit	Astle W	27863252	2016
rs35067339	A	T	Years of educational attainment	SSGAC	27225129	2016
rs35067339	A	T	Years of educational attainment in females	SSGAC	27225129	2016
rs353478	C	T	Had menopause	Neale B	UKBB	2017
rs3750243	C	G	Had menopause	Neale B	UKBB	2017
rs3796624	G	C	Arm fat-free mass left	Neale B	UKBB	2017
rs3796624	G	C	Arm fat-free mass right	Neale B	UKBB	2017
rs3796624	G	C	Arm predicted mass left	Neale B	UKBB	2017
rs3796624	G	C	Arm predicted mass right	Neale B	UKBB	2017
rs3796624	G	C	Basal metabolic rate	Neale B	UKBB	2017
rs3796624	G	C	Height	Neale B	UKBB	2017
rs3796624	G	C	Leg fat-free mass left	Neale B	UKBB	2017
rs3796624	G	C	Leg fat-free mass right	Neale B	UKBB	2017
rs3796624	G	C	Leg predicted mass left	Neale B	UKBB	2017
rs3796624	G	C	Leg predicted mass right	Neale B	UKBB	2017
rs3796624	G	C	Trunk fat-free mass	Neale B	UKBB	2017
rs3796624	G	C	Trunk predicted mass	Neale B	UKBB	2017
rs3796624	G	C	Whole body fat-free mass	Neale B	UKBB	2017
rs3796624	G	C	Whole body water mass	Neale B	UKBB	2017
rs4668354	C	G	Comparative height size at age 10	Neale B	UKBB	2017
rs4668354	C	G	Height	Neale B	UKBB	2017

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rs4668354	C	G	Sitting height	Neale B	UKBB	2017
rs4716056	A	G	Hemoglobin concentration	Astle W	27863252	2016
rs4716056	A	G	High light scatter percentage of red cells	Astle W	27863252	2016
rs4716056	A	G	High light scatter reticulocyte count	Astle W	27863252	2016
rs4716056	A	G	Mean corpuscular hemoglobin	Astle W	27863252	2016
rs4716056	A	G	Mean corpuscular hemoglobin concentration	Astle W	27863252	2016
rs4716056	A	G	Mean corpuscular hemoglobin concentration	van der Harst P	23222517	2012
rs4716056	A	G	Mean corpuscular volume	Astle W	27863252	2016
rs4716056	A	G	Reticulocyte fraction of red cells	Astle W	27863252	2016
rs5030755	A	G	Mean corpuscular hemoglobin	Astle W	27863252	2016
rs5030755	A	G	Mean corpuscular volume	Astle W	27863252	2016
rs5030755	A	G	Mean corpuscular volume	Astle W	27863252	2016
rs55873183	A	G	Testicular germ cell tumor	Wang Z	28604732	2017
rs606920	A	G	Height	Neale B	UKBB	2017
rs62156756	A	G	Hair or balding pattern: pattern 4	Neale B	UKBB	2017
rs62244773	A	T	Hair or balding pattern: pattern 4	Neale B	UKBB	2017
rs62356073	A	G	Trunk fat-free mass	Neale B	UKBB	2017
rs62356073	A	G	Trunk predicted mass	Neale B	UKBB	2017
rs62356073	A	G	Whole body fat-free mass	Neale B	UKBB	2017
rs62356073	A	G	Whole body water mass	Neale B	UKBB	2017
rs6430545	A	T	Forced vital capacity	Neale B	UKBB	2017
rs6430545	A	T	Hand grip strength left	Neale B	UKBB	2017
rs6430545	A	T	Hand grip strength right	Neale B	UKBB	2017
rs6430545	A	T	Trunk fat percentage	Neale B	UKBB	2017
rs6569648	C	T	Arm fat mass left	Neale B	UKBB	2017
rs6569648	C	T	Arm fat mass right	Neale B	UKBB	2017
rs6569648	C	T	Arm fat-free mass left	Neale B	UKBB	2017
rs6569648	C	T	Arm fat-free mass right	Neale B	UKBB	2017
rs6569648	C	T	Arm predicted mass left	Neale B	UKBB	2017
rs6569648	C	T	Arm predicted mass right	Neale B	UKBB	2017
rs6569648	C	T	Basal metabolic rate	Neale B	UKBB	2017
rs6569648	C	T	Body mass index	GIANT	29273807	2018
rs6569648	C	T	Breast cancer	Milne RL	29058716	2017
rs6569648	C	T	Breast cancer	Michailidou K	29059683	2017
rs6569648	C	T	Breast cancer estrogen receptor negative	Milne RL	29058716	2017
rs6569648	C	T	Comparative height size at age 10	Neale B	UKBB	2017
rs6569648	C	T	Forced expiratory volume in 1-second	Neale B	UKBB	2017
rs6569648	C	T	Forced expiratory volume in 1-second, best measure	Neale B	UKBB	2017
rs6569648	C	T	Forced expiratory volume in 1-second, predicted	Neale B	UKBB	2017
rs6569648	C	T	Forced vital capacity	Neale B	UKBB	2017
rs6569648	C	T	Forced vital capacity, best measure	Neale B	UKBB	2017

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rs6569648	C	T	Hand grip strength left	Neale B	UKBB	2017
rs6569648	C	T	Hand grip strength right	Neale B	UKBB	2017
rs6569648	C	T	Heel bone mineral density	Neale B	UKBB	2017
rs6569648	C	T	Height	GIANT	20881960	2010
rs6569648	C	T	Height	GIANT	23754948	2013
rs6569648	C	T	Height	GIANT	25282103	2014
rs6569648	C	T	Height	GIANT	28146470	2017
rs6569648	C	T	Height	GIANT	28146470	2017
rs6569648	C	T	Height	GIANT	20881960	2010
rs6569648	C	T	Height	Soler Artigas M	21946350	2011
rs6569648	C	T	Height	Fatemifar G	23704328	2013
rs6569648	C	T	Height	GIANT	20881960	2010
rs6569648	C	T	Height	Neale B	UKBB	2017
rs6569648	C	T	Height in males	GIANT	23754948	2013
rs6569648	C	T	Hip circumference	GIANT	25673412	2015
rs6569648	C	T	Hip circumference	GIANT	25673412	2015
rs6569648	C	T	Hip circumference	Neale B	UKBB	2017
rs6569648	C	T	Hip circumference adjusted for BMI	GIANT	25673412	2015
rs6569648	C	T	Hip circumference in males	GIANT	25673412	2015
rs6569648	C	T	Impedance of arm left	Neale B	UKBB	2017
rs6569648	C	T	Impedance of arm right	Neale B	UKBB	2017
rs6569648	C	T	Impedance of whole body	Neale B	UKBB	2017
rs6569648	C	T	Leg fat mass left	Neale B	UKBB	2017
rs6569648	C	T	Leg fat mass right	Neale B	UKBB	2017
rs6569648	C	T	Leg fat-free mass left	Neale B	UKBB	2017
rs6569648	C	T	Leg fat-free mass right	Neale B	UKBB	2017
rs6569648	C	T	Leg predicted mass left	Neale B	UKBB	2017
rs6569648	C	T	Leg predicted mass right	Neale B	UKBB	2017
rs6569648	C	T	Lymphocyte count	Astle W	27863252	2016
rs6569648	C	T	Lymphocyte counts	Astle W	27863252	2016
rs6569648	C	T	Maternal effects on offspring birthweight	EGGC	29309628	2018
rs6569648	C	T	Sitting height	Neale B	UKBB	2017
rs6569648	C	T	Trunk fat mass	Neale B	UKBB	2017
rs6569648	C	T	Trunk fat-free mass	Neale B	UKBB	2017
rs6569648	C	T	Trunk predicted mass	Neale B	UKBB	2017
rs6569648	C	T	Weight	GIANT	23754948	2013
rs6569648	C	T	Weight	Neale B	UKBB	2017
rs6569648	C	T	Whole body fat mass	Neale B	UKBB	2017
rs6569648	C	T	Whole body fat-free mass	Neale B	UKBB	2017
rs6569648	C	T	Whole body water mass	Neale B	UKBB	2017
rs6578283	A	G	Impedance of leg left	Neale B	UKBB	2017
rs6578283	A	G	Impedance of leg right	Neale B	UKBB	2017

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rs6578283	A	G	Impedance of whole body	Neale B	UKBB	2017
rs6793835	A	G	Body mass index	Neale B	UKBB	2017
rs6793835	A	G	Comparative height size at age 10	Neale B	UKBB	2017
rs6793835	A	G	Height	GIANT	23754948	2013
rs6793835	A	G	Height	GIANT	25282103	2014
rs6793835	A	G	Height	Neale B	UKBB	2017
rs6793835	A	G	Impedance of arm left	Neale B	UKBB	2017
rs6793835	A	G	Impedance of arm right	Neale B	UKBB	2017
rs6793835	A	G	Impedance of whole body	Neale B	UKBB	2017
rs6793835	A	G	Worrier or anxious feelings	Neale B	UKBB	2017
rs6930435	A	G	Asthma	Neale B	UKBB	2017
rs6930435	A	G	Basophil count	Astle W	27863252	2016
rs6930435	A	G	Eosinophil count	Astle W	27863252	2016
rs6930435	A	G	Forced expiratory volume in 1-second	Neale B	UKBB	2017
rs6930435	A	G	Forced expiratory volume in 1-second, best measure	Neale B	UKBB	2017
rs6930435	A	G	Forced expiratory volume in 1-second, predicted percentage	Neale B	UKBB	2017
rs6930435	A	G	Granulocyte count	Astle W	27863252	2016
rs6930435	A	G	Heel bone mineral density	Neale B	UKBB	2017
rs6930435	A	G	IgA deficiency	Bronson P	27723758	2016
rs6930435	A	G	IgA deficiency	Bronson P	27723758	2016
rs6930435	A	G	Intestinal malabsorption	Neale B	UKBB	2017
rs6930435	A	G	Lymphocyte count	Astle W	27863252	2016
rs6930435	A	G	Monocyte count	Astle W	27863252	2016
rs6930435	A	G	Myeloid white cell count	Astle W	27863252	2016
rs6930435	A	G	Neutrophil count	Astle W	27863252	2016
rs6930435	A	G	Peak expiratory flow	Neale B	UKBB	2017
rs6930435	A	G	Potassium in urine	Neale B	UKBB	2017
rs6930435	A	G	Primary sclerosing cholangitis	Ji S	27992413	2017
rs6930435	A	G	Schizophrenia	PGC	25056061	2014
rs6930435	A	G	Self-reported asthma	Neale B	UKBB	2017
rs6930435	A	G	Self-reported hyperthyroidism or thyrotoxicosis	Neale B	UKBB	2017
rs6930435	A	G	Self-reported malabsorption or coeliac disease	Neale B	UKBB	2017
rs6930435	A	G	Self-reported psoriasis	Neale B	UKBB	2017
rs6930435	A	G	Sum basophil neutrophil counts	Astle W	27863252	2016
rs6930435	A	G	Sum eosinophil basophil counts	Astle W	27863252	2016
rs6930435	A	G	Sum neutrophil eosinophil counts	Astle W	27863252	2016
rs6930435	A	G	White blood cell count	Astle W	27863252	2016
rs7091889	A	G	High light scatter percentage of red cells	Astle W	27863252	2016
rs7091889	A	G	High light scatter reticulocyte count	Astle W	27863252	2016
rs7091889	A	G	Past tobacco smoking	Neale B	UKBB	2017
rs7091889	A	G	Reticulocyte count	Astle W	27863252	2016

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rs7091889	A	G	Reticulocyte fraction of red cells	Astle W	27863252	2016
rs72934556	G	T	Chronic ischaemic heart disease	Neale B	UKBB	2017
rs72934556	G	T	Coronary artery disease	CARDIoGRAMplusC4D	26343387	2015
rs72934556	G	T	Coronary artery disease	Nelson CP	28714975	2017
rs72934556	G	T	Coronary artery disease	van der Harst P	29212778	2018
rs72934556	G	T	Coronary artery disease	van der Harst P	29212778	2018
rs72934556	G	T	Myocardial infarction	CARDIoGRAMplusC4D	26343387	2015
rs72934556	G	T	Sitting height	Neale B	UKBB	2017
rs7414807	A	G	Hematocrit	Astle W	27863252	2016
rs7414807	A	G	Hemoglobin concentration	Astle W	27863252	2016
rs746748	C	T	Pulse rate	Neale B	UKBB	2017
rs75770066	A	G	Had menopause	Neale B	UKBB	2017
rs76928871	A	G	Age at menarche	Neale B	UKBB	2017
rs780088	C	T	Alcohol intake frequency	Neale B	UKBB	2017
rs780088	C	T	Granulocyte percentage of myeloid white cells	Astle W	27863252	2016
rs780088	C	T	Had menopause	Neale B	UKBB	2017
rs780088	C	T	Height	Neale B	UKBB	2017
rs780088	C	T	Monocyte percentage of white cells	Astle W	27863252	2016
rs780088	C	T	Platelet count	Astle W	27863252	2016
rs780088	C	T	Plateletcrit	Astle W	27863252	2016
rs780088	C	T	Self-reported gout	Neale B	UKBB	2017
rs780088	C	T	Self-reported high cholesterol	Neale B	UKBB	2017
rs9796	T	A	Diastolic blood pressure	Neale B	UKBB	2017
rs9796	T	A	Height	GIANT	25282103	2014
rs9796	T	A	Height	Neale B	UKBB	2017
rs9968117	C	T	Height	Neale B	UKBB	2017
rs9968117	C	T	Pulse rate	Neale B	UKBB	2017
rs9968117	C	T	Sitting height	Neale B	UKBB	2017
rs9968117	C	T	Trunk fat-free mass	Neale B	UKBB	2017
rs9968117	C	T	Trunk predicted mass	Neale B	UKBB	2017
rs9968117	C	T	Whole body fat-free mass	Neale B	UKBB	2017
rs9968117	C	T	Whole body water mass	Neale B	UKBB	2017

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