

Evaluation of Associations between Genetically Predicted Circulating Protein Biomarkers and Breast Cancer Risk

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Abbreviations:

OR

Odds ratio

CI

Confidence interval

BH-FDR

The Benjamini-Hochberg false discovery rate

BCAC

Breast Cancer Association Consortium

iCOGS

The Collaborative Oncological Gene-environment Study

GWAS

Genome-wide association study

pQTL

Protein quantitative trait loci

Estrogen receptor-positive/-negative

ER+/-

CRP

C-reactive protein

IGF1
Insulin-like growth factor 1

ISLR2
Leucine-rich repeat protein 2

IR
Insulin receptor

MET
Hepatocyte growth factor receptor

NOTCH1
Neurogenic locus notch homolog protein 1

VEGFR2
Vascular endothelial growth factor receptor 2

B3GNT2
Beta-1,3-N-Acetylglucosaminyltransferase 2

RSPO3
R-spondin 3

VCAM1
Vascular cell adhesion protein 1

Category: Research Articles

Novelty and Impact

The study identified 56 circulating proteins, for which their genetically predicted levels were associated with breast cancer risk. These proteins are involved in estrogen receptor signaling, insulin resistance, and other important biological processes, and may serve as candidate biomarkers for further investigations.

Abstract

A small number of circulating proteins have been reported to be associated with breast cancer risk, with inconsistent results. Herein, we attempted to identify novel protein biomarkers for breast cancer via the integration of genomics and proteomics data. In the Breast Cancer Association Consortium (BCAC), with 122,977 cases and 105,974 controls of European descendants, we evaluated the associations of the genetically predicted concentrations of >1,400 circulating proteins with breast cancer risk. We used data from a large-scale protein quantitative trait loci (pQTL) analysis as our study instrument. Summary statistics for these pQTL variants related to breast cancer risk were obtained from the BCAC and used to estimate odds ratios (OR) for each protein using the inverse-variance weighted method. We identified 56 proteins significantly associated with breast cancer risk by instrumental analysis (false discovery rate < 0.05). Of these, the concentrations of 32 were influenced by variants close to a breast cancer susceptibility locus (*ABO*, 9q34.2). Many of these proteins, such as insulin receptor, insulin-like growth factor receptor 1 and other membrane receptors (OR: 0.82 to 1.18, *P* values: 6.96×10^{-4} to 3.28×10^{-8}), are linked to insulin resistance and estrogen receptor signaling pathways. Proteins identified at other loci include those involved in biological processes such as alcohol and lipid metabolism, proteolysis, apoptosis, immune regulation, and cell motility and proliferation. Consistent associations were observed for 22 proteins in the UK Biobank data (*P* < 0.05). The study identifies potential novel biomarkers for breast cancer, but further investigation is needed to replicate our findings.

Introduction

Breast cancer is the most common malignancy diagnosed among women in many countries¹. Established risk factors for breast cancer include certain menstrual and reproductive factors, postmenopausal obesity, the use of hormone replacement therapy, family history of the disease, and the carrying of high-penetrance mutations^{2,3}. Circulating protein biomarkers have an important utility in cancer screening and risk assessment⁴. Several circulating protein biomarkers of breast cancer risk have been reported in observational studies. Some examples of these are C-reactive proteins (CRP), insulin-like growth factor 1 (IGF1), and leptin⁵⁻⁸. However, conventional observational studies may be influenced by reverse causation, confounding, selection biases, or small sample sizes. Therefore, results from previous studies have been inconsistent.

There is compelling evidence that the concentration of many circulating proteins may be determined by genetic variants^{9,10}. A twin study measured 342 proteins in plasma and estimated that the mean heritability was ~14%¹¹. Since genetic alleles are randomly distributed during gamete formation, the variations in protein concentration determined by genetic variants should not be affected by environmental exposures or lifestyle factors. Therefore, the use of genetic variants as instruments to investigate circulating proteins in relation to cancer risk can reduce confounding effects, selection biases, and circumvent reverse causation, all of which are frequently encountered in epidemiological studies¹². Importantly, the genetically determined protein concentrations represent a long-term exposure since birth. Recently, Sun et al. identified 1,927 genome-wide significant protein quantitative trait loci (pQTL) in individuals of European ancestry¹⁰. Herein, we have utilized these pQTL variants as instruments to evaluate the genetically predicted concentration of each of the 1,469 proteins in relation to breast cancer risk

in the Breast Cancer Association Consortium (BCAC). The identified associations were further assessed using UK Biobank data.

Material and Methods

An inverse-variance weighted method¹³ was used to evaluate the associations of predicted circulating protein concentrations with breast cancer risk using summary statistics data from two sources. The first was beta coefficients of the associations between genetic variants and circulating protein concentrations. These were obtained from a recent genome-wide association study (GWAS) to identify protein quantitative trait loci (pQTL) that evaluated 2,994 circulating proteins in 3,301 healthy subjects of European descent¹⁰. The proteins were quantified using SOMAscan platform. A total of 1,927 associations were identified for 1,478 circulating proteins with a $P < 1.5 \times 10^{-11}$. The second source of summary statistics for each of these pQTL variants came from the GWAS of breast cancer risk in the BCAC studies that comprised three datasets: 11 individual breast cancer GWAS combined (14,910 cases and 17,588 controls), the Collaborative Oncological Gene-environment Study (iCOGS) (46,785 cases and 42,892 controls), and the OncoArray study (61,282 cases and 45,494 controls)¹⁴⁻¹⁶. Summary statistics of iCOGS and OncoArray can be accessed through the BCAC website (<http://bcac.ccge.medschl.cam.ac.uk/bcacdata/>). All participating studies of the BCAC were approved by their corresponding ethics review boards and all subjects provided informed consent. Our analyses were limited to the women of European ancestry included in the BCAC. Details of the genotyping protocols in the BCAC have been published elsewhere¹⁵⁻¹⁷ (iCOGS: <http://ccge.medschl.cam.ac.uk/research/consortia/icogs/>). Samples included in the OncoArray,

iCOGS, and nine of the individual GWAS datasets were imputed by IMPUTE version 2, using the 1000 Genomes Project (October 2014 version 3 release) dataset as the reference panel^{16,18}. Two of the individual GWAS, BPC3 and EBCG were imputed separately using MACH and Minimac^{19,20}.

Approximately 25% of the instruments were constructed using multiple genetic variants. When multiple variants were associated with a single protein, only those with linkage disequilibrium (LD) < 0.1 were retained for downstream analyses. The F-statistic was used to measure the strength of the instruments, with 10 being a commonly used threshold²¹. It was calculated following the formula $R^2 * (n-1-k) / (1-R^2) / k$, where R^2 is percentage of variance explained by used SNPs; n is the sample size of BCAC data (=228,951); and k is the number of SNPs used in the instrument. Thanks to the large sample size of the BCAC, all of the instruments have an F-statistic of > 1,000. The beta coefficient of the association between genetically predicted concentrations of a given protein and breast cancer risk was estimated using $\sum_i \beta_{i,GX} * \beta_{i,GY} * \sigma_{i,GY}^{-2} / (\sum_i \beta_{i,GX}^2 * \sigma_{i,GY}^{-2})$ and its standard error calculated as $1 / (\sum_i \beta_{i,GX}^2 * \sigma_{i,GY}^{-2})^{0.5}$, where $\beta_{i,GX}$ is the beta coefficient of the association between i th SNP and the protein of interest from the above-mentioned pQTL study¹⁰. GY represents the association between i th SNP and breast cancer risk in the BCAC meta-analysis [overall, estrogen receptor-positive (ER+), or ER-negative (ER-)]; thus, $\beta_{i,GY}$ and $\sigma_{i,GY}$ are the corresponding beta coefficient and standard error for SNP _{i} , respectively. Odds ratio (OR) was expressed as the exponential of beta coefficients. The Benjamini-Hochberg false discovery rate (FDR) of < 0.05 was used as the significance level for a two-sided test. The ingenuity pathway analysis was employed to visualize the potential interplay of genes and proteins.

We downloaded genetic association summary statistics for each identified risk-associated protein from <http://www.phpc.cam.ac.uk/ceu/proteins>. We abstracted pQTL variants associated at the level of 5×10^{-8} ($LD R^2 < 0.1$) to construct new instruments, then performed sensitivity analyses.

Summary statistics derived from the associations between genetic variants and breast cancer risk using the UK Biobank samples were obtained to replicate the associations revealed in the BCAC²². The imputation was completed by combining the Haplotype Reference Consortium and the UK10K haplotype resource as the reference panel. Genome-wide association analyses for over 2,000 phenotypes were conducted using data from ~337,000 unrelated individuals of British ancestry included in the UK Biobank (<https://sites.google.com/broadinstitute.org/ukbbgwasresults/home?authuser=0>). The statistics for the associations of SNPs with breast cancer risk were used for our validation study. A highly correlated proxy SNP ($R^2 > 0.9$) was identified and used to construct the genetic instrument if the original SNP was not available (e.g. if insertions/deletions or variants failed in the quality control assessment). Since the majority of the 2,000 phenotypes were in continuous form, a linear regression model was employed for all phenotypes, including binary outcomes. We obtained summary statistics data derived from the analysis conducted for histologically-confirmed incident breast cancers (ICD-10: C50, $N = 5,510$) and prevalent breast cancers reported by participants at the baseline interview ($N = 7,480$). We also abstracted pQTL variants from other two genome-wide pQTL studies^{9,23} ($P < 5 \times 10^{-8}$, $LD R^2 < 0.1$) to construct new instruments for the risk-associated proteins. Both studies were conducted in the populations of European descent and the same SOMAscan platform was used to measure blood proteins. Genome-wide association analysis was performed to identify significant pQTL variants for circulating proteins

in the two studies. The aforementioned inverse-variance weighted method was applied to validate our primary findings. The potential pleiotropic effects of our genetic instruments were investigated via Phenoscanner²⁴. The lead pQTL variants for the identified proteins were queried.

Results

We constructed genetic instruments for 1,469 out of the 1,478 proteins, using one to six genetic variants that were associated with the circulating concentration of each protein. Of the 375 proteins whose concentrations could be predicted using multiple variants, 27 showed associations with overall breast cancer risk, after accounting for multiple comparisons (FDR < 0.05, Table 1). Of them, the concentrations of 10 proteins were positively associated with breast cancer risk (ORs ranging from 1.03 to 1.08 per unit of increase; *P* values ranging from 1.41×10^{-3} to 1.19×10^{-7}), while the other 17 were inversely associated with the risk (ORs ranging from 0.90 to 0.98; *P* values ranging from 1.56×10^{-3} to 5.20×10^{-8}). The most noticeable association was observed for the immunoglobulin superfamily, particularly the leucine-rich repeat protein 2 (ISLR2), of which the genetically predicted concentration was inversely associated with breast cancer risk (OR: 0.93, *P* = 5.20×10^{-8}). Analyses using single-variant instruments identified an additional 29 proteins at 11 loci, with their predicted circulating concentrations associated with overall breast cancer risk after accounting for multiple comparisons (FDR < 0.05, Table 2). The effect sizes of these associations were comparable and consistent in direction across the three independent datasets included in the BCAC for all associated proteins (supplementary Table S1).

A recently reported breast cancer susceptibility locus, 9q34.2 (*ABO*)¹⁶, showed strong pleiotropy with 32 risk-associated proteins. All of the instruments for these 32 protein biomarkers were constructed using genetic variants located at 9q34.2, alone or in combination with variants in other chromosomes. For instance, both genetically predicted concentrations of IGF1 receptors and insulin receptors were associated with a reduced risk of breast cancer (IGF1R: OR = 0.82, IR: OR = 0.93, $P = 3.28 \times 10^{-8}$ for both proteins). Of the 32 proteins, 20 are membrane receptors and 11 are linked to the estrogen receptor via the ingenuity pathway analysis (supplementary Figure S1). The majority of the risk-associated proteins showed consistent associations for ER positive (+) and ER negative (-) breast cancer (supplementary Table S2). The association for seven of the proteins was stronger in risk of ER- than of ER+ breast cancer ($P_{\text{het}} < 0.05$ from heterogeneity tests, Table 3).

In the sensitivity analysis, we constructed new instruments using independent pQTL variants, with $P < 5 \times 10^{-8}$ for the 56 identified proteins (see Methods). The associations were not materially changed (Supplementary Table S3). Furthermore, we provided another source of validation via new instruments (see Methods). The associations of 27 proteins were replicated at $P < 0.05$ (Table 4). The pleiotropic effects of lead pQTL variants for the 56 proteins are presented in supplementary Table S4 ($P < 5 \times 10^{-8}$).

We evaluated 55 of the 56 predicted protein biomarkers with breast cancer risk in the UK Biobank data (data for Fas ligand via rs371314787 were not available and no proxy could be identified within 500 Kb). Consistent associations were observed for 22 proteins with either histologically-confirmed or self-reported breast cancer risk (Table 5, $P < 0.05$). We also observed nominally consistent associations for an additional four proteins (Table 5, $P < 0.1$).

Discussion

The use of genetic variants as instrumental variables to assess the exposure-outcome relationship could help reduce confounding and selection bias, and eliminate biases due to reverse causation¹². Using data from a large-scale consortium (the BCAC), we identified 56 circulating protein biomarkers associated with overall breast cancer risk, after adjusting for multiple comparisons. Of these, 22 associations were nominally replicated using data from the UK Biobank, providing assurance of the validity of our findings. Although the causality cannot be determined for the identified proteins, our study provides substantial new information about protein biomarker candidates for breast cancer risk.

A recently reported breast cancer susceptibility locus, 9q34.2¹⁶, was related to more than half of the identified protein risk biomarkers. This region is known for its wide spectrum of pleiotropy on its concentrations of metabolites²⁵, lipids²⁶, and proteins^{9,10}, as well as its risk of coronary artery disease²⁷ and pancreatic cancer²⁸. The biological mechanisms underlying this pleiotropy remain obscure. The ingenuity pathway analysis revealed a network of multiple membrane proteins regulated by genetic variants in 9q34.2, such as insulin-like growth factor 1 receptor (IGF1R), insulin receptor (IR), hepatocyte growth factor receptor (MET), neurogenic locus notch homolog protein 1 (NOTCH1), and vascular endothelial growth factor receptor 2 (VEGFR2). All of these are linked to estrogen receptor signaling (Supplementary Figure S1) and insulin resistance²⁹⁻³². It is possible that the genetic variants in 9q34.2 may affect the concentration of these receptors, subsequently leading to impaired insulin sensitivity and/or abnormal estrogen signaling. Of note, the biological activities triggered by the contacts between ligands and these receptors are not limited to insulin resistance. Some examples are: 1)

insulin/IGF1 has a mitogenic effect on cell proliferation and growth through its binding to IR/IGF1R³³; 2) hepatocyte growth factor (HGF) and MET are important players in mammary gland development³⁴; 3) the notch signaling pathway is widely involved in diverse developmental and homeostatic processes³⁵; 4) VEGF/VEGFR2 interaction is responsible for developmental and pathological angiogenesis³⁶. Thus, the down-regulation of these receptors may trigger carcinogenic effects through elongated interactions with their ligands. However, the causality between specific proteins and breast cancer risk cannot be established due to the strong pleiotropy observed in this and several other loci. Nevertheless, these proteins can serve as candidate biomarkers for future studies.

We also identified associations for several other proteins that play important roles in various biological processes. For instance, we found that higher genetically predicted concentrations of copine 1 and Fas ligand were associated with a reduced risk of overall breast cancer. Copine 1 belongs to calcium-dependent membrane-binding proteins. It has been shown that the interaction between copine 1 and p65 could repress the transcription of NF- κ B, which is essential for cancer initiation and progression³⁷. Fas and Fas ligand's role in apoptosis and immune homeostasis have long been acknowledged. By engaging Fas ligand with Fas in the cancer cell membrane, CD8+ cytotoxic lymphocytes can activate caspase 8 and initiate the apoptotic death of cancer cells³⁸. Thus, our analyses support the hypothesis that down-regulated copine 1 and Fas ligands may contribute to breast cancer risk. Another example is beta-1,3-N-Acetylglucosaminyltransferase 2 (B3GNT2), which is the main polylectosamine synthase³⁹. Its important role in glycan formation (glycosylation) and its well-known link to aberrant glycosylation and carcinogenesis⁴⁰ support the hypothesis that the B3GNT2 protein may have a carcinogenic effect. The positive association we observed for genetically predicted B3GNT2

concentrations and breast cancer risk is consistent with a previous report that *B3GNT2* expression was up-regulated in malignant breast tissues compared to that of normal tissues from healthy women ⁴⁰.

The interpretation of some of our findings is less straightforward. For example, we identified an inverse correlation for a genetically predicted R-spondin 3 (*RSPO3*) concentration with breast cancer risk. R-spondins are critical regulators in the canonical Wnt/ β -catenin pathway, and they have been shown to be activators of this pathway ⁴¹. It would be expected that excessive R-spondins may be positively related to breast cancer development, as the over-activation of Wnt signaling is generally considered to be mechanistically related to cancer initiation ⁴². Similarly, we observed an inverse relationship between genetically predicted vascular cell adhesion protein 1 (*VCAM1*) concentrations and breast cancer risk, which deserves further investigation. *VCAM1* has been widely studied for its role in promoting tumor angiogenesis, progression, and metastasis ⁴³, but less for its effect on tumorigenesis. Thus, some of the associations observed in the present study should be interpreted cautiously, despite their statistical significance.

We evaluated multiple circulating protein biomarkers reported by previous epidemiological studies using genetic instruments. The results were not entirely consistent with previous findings. For example, we observed only a nominal association between genetically predicted CRP concentrations and overall breast cancer risk (OR: 1.04, $P = 0.048$), and the association was trivial after adjusting for multiple comparisons. This contradicts a recent meta-analysis suggesting that an elevated circulating concentration of CRP may be associated with an increased breast cancer risk ^{5,44}. Of note, this association varied greatly between retrospective case-control studies and prospective cohort/nested case-control studies. Similarly, no association

was observed for the genetically predicted concentrations of IGF1 and HGF, which is in contrast with the findings for measured proteins in previous studies^{7, 38, 45}. These inconsistencies could be due to the inaccurate or confounded estimates of associations commonly encountered in traditional observational epidemiological studies. It is also possible that genetic instruments we used in this study are not adequate for the analysis.

Our study is unprecedented in its power to discover novel circulating protein biomarkers for breast cancer risk. Our findings also provide novel evidence revealing mechanistic networks underlying breast carcinogenesis. The identified proteins could serve as candidates in future investigations. Another great strength of this study is that we were able to validate a large number of our identified associations using an independent dataset from the UK Biobank. That we were able to replicate associations with breast cancer for 22 out of 55 proteins from an independent dataset cannot be explained by chance alone (binomial $P = 5 \times 10^{-10}$ when assuming 5% of the associations could be replicated). We recognize that the number of breast cancer cases was relatively small in the UK Biobank and the SNP-breast cancer associations were derived from a linear regression model instead of a logistic regression model. The association estimates and 95% CIs might be biased; Thus, the design of replication stage was not ideal. We also recognize that the strong genetic pleiotropy, particularly at 9q34.2, prevents us from making causal inferences. Some of the associations may be largely attributable to the correlation between protein concentrations. In addition, our analysis depends on the number of proteins measured and the number of pQTLs identified in the GWAS of circulating protein concentrations. A more comprehensive analysis could be conducted when data becomes available for proteins that have not been evaluated in the current study. The explained variation in protein concentrations is also expected to improve with the identification of additional pQTLs. Lastly, all of the pQTLs

involved in the current analysis were identified in the blood. Whether these pQTLs were consistent in breast tissues remains unknown. However, we found that the coding genes of nearly all the proteins analyzed in the current study are expressed in the breast tissues from the Genotype-Tissue Expression project (data not shown).

The Strong pleiotropy of pQTL variants has limited our ability to infer causal roles of the identified proteins in breast cancer development. However, some pleiotropy may reveal potential intermediate phenotypes involved in the causal pathways for breast cancer. For example, rs2489623 (RSPO3) and rs7041 (JAG1) were associated with both central obesity and circulating 25-OH vitamin D concentrations⁴⁶⁻⁴⁸, respectively. Another example is that pQTLs at 3p21.31 associated with multiple proteins (ADH1B, CRYBB2, DOCK9, STOM, TMPRSS11D, and TNS2) were also linked to age at menarche, which is an established risk factor for breast cancer. Additionally, solid evidence has linked the 9q34.2 (ABO) locus to invasive ovarian cancer risk⁴⁹. Thus, proteins associated with variants in 9q34.2 could be potential biomarkers for both malignancies.

Although sensitivity analysis and extra replication were conducted, our findings should be interpreted with caution. To establish causality and understand the underlying mechanisms for the identified proteins in breast cancer etiology, assays at cell levels such as cell viability and colony formation assays, and whole-transcriptome profiling are potential next steps to depict the impact on breast cancer cell growth and gene-gene interplay networks, after knocking down the encoding genes.

In summary, using genetic instruments, we identified 56 proteins with their genetically predicted circulating levels associated with breast cancer risk in this study. Future investigations

are needed to replicate our findings, particularly for the proteins that failed to reach statistical significance in the UK Biobank dataset. Understanding and establishing causality for the identified proteins are important next steps.

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References

1. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global cancer statistics, 2012. *CA Cancer J Clin* 2015;65: 87-108.
2. Colditz GA, Bohlke K. Priorities for the primary prevention of breast cancer. *CA Cancer J Clin* 2014;64: 186-94.
3. Howell A, Anderson AS, Clarke RB, Duffy SW, Evans DG, Garcia-Closas M, Gescher AJ, Key TJ, Saxton JM, Harvie MN. Risk determination and prevention of breast cancer. *Breast Cancer Res* 2014;16: 446.
4. Borrebaeck CA. Precision diagnostics: moving towards protein biomarker signatures of clinical utility in cancer. *Nat Rev Cancer* 2017;17: 199-204.
5. Chan DS, Bandera EV, Greenwood DC, Norat T. Circulating C-Reactive Protein and Breast Cancer Risk-Systematic Literature Review and Meta-analysis of Prospective Cohort Studies. *Cancer Epidemiol Biomarkers Prev* 2015;24: 1439-49.
6. Schernhammer ES, Holly JM, Pollak MN, Hankinson SE. Circulating levels of insulin-like growth factors, their binding proteins, and breast cancer risk. *Cancer Epidemiol Biomarkers Prev* 2005;14: 699-704.
7. Endogenous H, Breast Cancer Collaborative G, Key TJ, Appleby PN, Reeves GK, Roddam AW. Insulin-like growth factor 1 (IGF1), IGF binding protein 3 (IGFBP3), and breast cancer risk: pooled individual data analysis of 17 prospective studies. *Lancet Oncol* 2010;11: 530-42.
8. Ollberding NJ, Kim Y, Shvetsov YB, Wilkens LR, Franke AA, Cooney RV, Maskarinec G, Hernandez BY, Henderson BE, Le Marchand L, Kolonel LN, Goodman MT. Prediagnostic leptin, adiponectin, C-reactive protein, and the risk of postmenopausal breast cancer. *Cancer Prev Res (Phila)* 2013;6: 188-95.
9. Suhre K, Arnold M, Bhagwat AM, Cotton RJ, Engelke R, Raffler J, Sarwath H, Thareja G, Wahl A, DeLisle RK, Gold L, Pezer M, et al. Connecting genetic risk to disease end points through the human blood plasma proteome. *Nat Commun* 2017;8: 14357.
10. Sun BB, Maranville JC, Peters JE, Stacey D, Staley JR, Blackshaw J, Burgess S, Jiang T, Paige E, Surendran P, Oliver-Williams C, Kamat MA, et al. Genomic atlas of the human plasma proteome. *Nature* 2018;558: 73-9.
11. Liu Y, Buil A, Collins BC, Gillet LC, Blum LC, Cheng LY, Vitek O, Mouritsen J, Lachance G, Spector TD, Dermitzakis ET, Aebersold R. Quantitative variability of 342 plasma proteins in a human twin population. *Molecular systems biology* 2015;11: 786.
12. Burgess S, Small DS, Thompson SG. A review of instrumental variable estimators for Mendelian randomization. *Stat Methods Med Res* 2017;26: 2333-55.
13. Burgess S, Butterworth A, Thompson SG. Mendelian randomization analysis with multiple genetic variants using summarized data. *Genet Epidemiol* 2013;37: 658-65.
14. Amos CI, Dennis J, Wang Z, Byun J, Schumacher FR, Gayther SA, Casey G, Hunter DJ, Sellers TA, Gruber SB, Dunning AM, Michailidou K, et al. The OncoArray Consortium: A Network for Understanding the Genetic Architecture of Common Cancers. *Cancer Epidemiol Biomarkers Prev* 2017;26: 126-35.
15. Michailidou K, Hall P, Gonzalez-Neira A, Ghoussaini M, Dennis J, Milne RL, Schmidt MK, Chang-Claude J, Bojesen SE, Bolla MK, Wang Q, Dicks E, et al. Large-scale genotyping identifies 41 new loci associated with breast cancer risk. *Nat Genet* 2013;45: 353-61, 61e1-2.
16. Michailidou K, Lindstrom S, Dennis J, Beesley J, Hui S, Kar S, Lemacon A, Soucy P, Glubb D, Rostamianfar A, Bolla MK, Wang Q, et al. Association analysis identifies 65 new breast cancer risk loci. *Nature* 2017.

17. Michailidou K, Beesley J, Lindstrom S, Canisius S, Dennis J, Lush MJ, Maranian MJ, Bolla MK, Wang Q, Shah M, Perkins BJ, Czene K, et al. Genome-wide association analysis of more than 120,000 individuals identifies 15 new susceptibility loci for breast cancer. *Nat Genet* 2015;47: 373-80.
18. Howie BN, Donnelly P, Marchini J. A flexible and accurate genotype imputation method for the next generation of genome-wide association studies. *PLoS Genet* 2009;5: e1000529.
19. Li Y, Willer CJ, Ding J, Scheet P, Abecasis GR. MaCH: using sequence and genotype data to estimate haplotypes and unobserved genotypes. *Genet Epidemiol* 2010;34: 816-34.
20. Howie B, Fuchsberger C, Stephens M, Marchini J, Abecasis GR. Fast and accurate genotype imputation in genome-wide association studies through pre-phasing. *Nat Genet* 2012;44: 955-9.
21. Burgess S, Thompson SG, Collaboration CCG. Avoiding bias from weak instruments in Mendelian randomization studies. *International journal of epidemiology* 2011;40: 755-64.
22. Bycroft C, Freeman C, Petkova D, Band G, Elliott LT, Sharp K, Motyer A, Vukcevic D, Delaneau O, O'Connell J, Cortes A, Welsh S, et al. Genome-wide genetic data on ~500,000 UK Biobank participants. *bioRxiv* 2017.
23. Emilsson V, Ilkov M, Lamb JR, Finkel N, Gudmundsson EF, Pitts R, Hoover H, Gudmundsdottir V, Horman SR, Aspelund T, Shu L, Trifonov V, et al. Co-regulatory networks of human serum proteins link genetics to disease. *Science* 2018;361: 769-73.
24. Staley JR, Blackshaw J, Kamat MA, Ellis S, Surendran P, Sun BB, Paul DS, Freitag D, Burgess S, Danesh J, Young R, Butterworth AS. PhenoScanner: a database of human genotype-phenotype associations. *Bioinformatics* 2016;32: 3207-9.
25. Shin SY, Fauman EB, Petersen AK, Krumsiek J, Santos R, Huang J, Arnold M, Erte I, Forgetta V, Yang TP, Walter K, Menni C, et al. An atlas of genetic influences on human blood metabolites. *Nat Genet* 2014;46: 543-50.
26. Willer CJ, Schmidt EM, Sengupta S, Peloso GM, Gustafsson S, Kanoni S, Ganna A, Chen J, Buchkovich ML, Mora S, Beckmann JS, Bragg-Gresham JL, et al. Discovery and refinement of loci associated with lipid levels. *Nat Genet* 2013;45: 1274-83.
27. Nelson CP, Goel A, Butterworth AS, Kanoni S, Webb TR, Marouli E, Zeng L, Ntalla I, Lai FY, Hopewell JC, Giannakopoulou O, Jiang T, et al. Association analyses based on false discovery rate implicate new loci for coronary artery disease. *Nat Genet* 2017;49: 1385-91.
28. Wolpin BM, Rizzato C, Kraft P, Kooperberg C, Petersen GM, Wang Z, Arslan AA, Beane-Freeman L, Bracci PM, Buring J, Canzian F, Duell EJ, et al. Genome-wide association study identifies multiple susceptibility loci for pancreatic cancer. *Nat Genet* 2014;46: 994-1000.
29. Clemmons DR. The relative roles of growth hormone and IGF-1 in controlling insulin sensitivity. *J Clin Invest* 2004;113: 25-7.
30. Fafalios A, Ma J, Tan X, Stoops J, Luo J, Defrances MC, Zarnegar R. A hepatocyte growth factor receptor (Met)-insulin receptor hybrid governs hepatic glucose metabolism. *Nat Med* 2011;17: 1577-84.
31. Pajvani UB, Shawber CJ, Samuel VT, Birkenfeld AL, Shulman GI, Kitajewski J, Accili D. Inhibition of Notch signaling ameliorates insulin resistance in a FoxO1-dependent manner. *Nat Med* 2011;17: 961-7.
32. Robciuc MR, Kivela R, Williams IM, de Boer JF, van Dijk TH, Elamaa H, Tigistu-Sahle F, Molotkov D, Leppanen VM, Kakela R, Eklund L, Wasserman DH, et al. VEGFB/VEGFR1-Induced Expansion of Adipose Vasculature Counteracts Obesity and Related Metabolic Complications. *Cell Metab* 2016;23: 712-24.
33. Wilcox G. Insulin and insulin resistance. *Clin Biochem Rev* 2005;26: 19-39.
34. Yant J, Buluwela L, Niranjana B, Gusterson B, Kamalati T. In vivo effects of hepatocyte growth factor/scatter factor on mouse mammary gland development. *Exp Cell Res* 1998;241: 476-81.
35. Bray SJ. Notch signalling in context. *Nat Rev Mol Cell Biol* 2016;17: 722-35.
36. Shibuya M. Vascular Endothelial Growth Factor (VEGF) and Its Receptor (VEGFR) Signaling in Angiogenesis: A Crucial Target for Anti- and Pro-Angiogenic Therapies. *Genes Cancer* 2011;2: 1097-105.

37. Ramsey CS, Yeung F, Stoddard PB, Li D, Creutz CE, Mayo MW. Copine-I represses NF-kappaB transcription by endoproteolysis of p65. *Oncogene* 2008;27: 3516-26.
38. Peter ME, Hadji A, Murmann AE, Brockway S, Putzbach W, Pattanayak A, Ceppi P. The role of CD95 and CD95 ligand in cancer. *Cell Death Differ* 2015;22: 549-59.
39. Togayachi A, Kozono Y, Kuno A, Ohkura T, Sato T, Hirabayashi J, Ikehara Y, Narimatsu H. Beta3GnT2 (B3GNT2), a major polylactosamine synthase: analysis of B3GNT2-deficient mice. *Methods Enzymol* 2010;479: 185-204.
40. Potapenko IO, Haakensen VD, Luders T, Helland A, Bukholm I, Sorlie T, Kristensen VN, Lingjaerde OC, Borresen-Dale AL. Glycan gene expression signatures in normal and malignant breast tissue; possible role in diagnosis and progression. *Mol Oncol* 2010;4: 98-118.
41. Jin YR, Yoon JK. The R-spondin family of proteins: emerging regulators of WNT signaling. *Int J Biochem Cell Biol* 2012;44: 2278-87.
42. Zhan T, Rindtorff N, Boutros M. Wnt signaling in cancer. *Oncogene* 2017;36: 1461-73.
43. Schlesinger M, Bendas G. Vascular cell adhesion molecule-1 (VCAM-1)--an increasing insight into its role in tumorigenicity and metastasis. *Int J Cancer* 2015;136: 2504-14.
44. Guo L, Liu S, Zhang S, Chen Q, Zhang M, Quan P, Lu J, Sun X. C-reactive protein and risk of breast cancer: A systematic review and meta-analysis. *Sci Rep* 2015;5: 10508.
45. Sheen-Chen SM, Liu YW, Eng HL, Chou FF. Serum levels of hepatocyte growth factor in patients with breast cancer. *Cancer Epidemiol Biomarkers Prev* 2005;14: 715-7.
46. Randall JC, Winkler TW, Kutalik Z, Berndt SI, Jackson AU, Monda KL, Kilpelainen TO, Esko T, Magi R, Li S, Workalemahu T, Feitosa MF, et al. Sex-stratified genome-wide association studies including 270,000 individuals show sexual dimorphism in genetic loci for anthropometric traits. *PLoS Genet* 2013;9: e1003500.
47. Wang TJ, Zhang F, Richards JB, Kestenbaum B, van Meurs JB, Berry D, Kiel DP, Streeten EA, Ohlsson C, Koller DL, Peltonen L, Cooper JD, et al. Common genetic determinants of vitamin D insufficiency: a genome-wide association study. *Lancet* 2010;376: 180-8.
48. Ahn J, Yu K, Stolzenberg-Solomon R, Simon KC, McCullough ML, Gallicchio L, Jacobs EJ, Ascherio A, Helzlsouer K, Jacobs KB, Li Q, Weinstein SJ, et al. Genome-wide association study of circulating vitamin D levels. *Human molecular genetics* 2010;19: 2739-45.
49. Kuchenbaecker KB, Ramus SJ, Tyrer J, Lee A, Shen HC, Beesley J, Lawrenson K, McGuffog L, Healey S, Lee JM, Spindler TJ, Lin YG, et al. Identification of six new susceptibility loci for invasive epithelial ovarian cancer. *Nat Genet* 2015;47: 164-71.

Figure legend

Figure S1. Multiple identified proteins are relevant to estrogen receptor signaling

The interplay of identified proteins were generated using the Ingenuity Pathway Analysis software. Several proteins associated with genetic variants in 9q34.2 (ABO) are linked to estrogen receptor signaling.

Tables

Table 1. Associations between genetically predicted concentrations of circulating proteins and breast cancer risk using multi-variant instruments

Protein	Protein-associated SNPs	OR (95% CI)	<i>P</i> value
ISLR2	rs115478735, rs2959011, rs4055121	0.93 (0.90-0.95)	5.20×10 ⁻⁸
C1GALT1C1	rs2519093, rs7787942	1.06 (1.04-1.09)	1.19×10 ⁻⁷
ALPI	rs550057, rs679574	0.90 (0.87-0.94)	8.61×10 ⁻⁷
FAM177A1	rs550057, rs679574	0.91 (0.87-0.94)	1.28×10 ⁻⁶
SELP	rs2519093, rs6136, rs74227709	0.96 (0.94-0.98)	1.69×10 ⁻⁵
CPNE1	rs12481228, rs62143206	0.96 (0.95-0.98)	4.69×10 ⁻⁵
RELT	rs3741148, rs7952686	1.07 (1.03-1.10)	6.06×10 ⁻⁵
CTSF	rs11347749, rs1791679	1.08 (1.04-1.11)	8.68×10 ⁻⁵
TPST2	rs115478735, rs2283824, rs34436714	1.06 (1.03-1.10)	1.22×10 ⁻⁴
VEGFR3/FLT4	rs10935473, rs2519093, rs34221241	0.97 (0.96-0.99)	1.56×10 ⁻⁴
KIN	rs149092047, rs62143198, rs7412	0.94 (0.91-0.97)	1.64×10 ⁻⁴
QSOX2	rs10858248, rs149092047	1.03 (1.01-1.04)	1.67×10 ⁻⁴
B3GNT2	rs2519093, rs67047091	1.05 (1.02-1.07)	2.29×10 ⁻⁴
VEGFR2/KDR	rs34231037, rs34336071, rs635634	0.96 (0.94-0.98)	2.54×10 ⁻⁴
KLRF1	rs11708955, rs62143194	1.10 (1.05-1.16)	2.72×10 ⁻⁴
MAN1A2	rs35505705, rs8176643	1.08 (1.04-1.13)	3.07×10 ⁻⁴
TIE1 (soluble)	rs10935473, rs2275180, rs8176743	0.97 (0.95-0.99)	3.32×10 ⁻⁴
CAMK1	rs4525, rs61751507	0.98 (0.96-0.99)	3.53×10 ⁻⁴
GOLM1	rs149092047, rs601338	1.04 (1.02-1.06)	4.11×10 ⁻⁴
BCAM	rs144579705, rs8176747	0.92 (0.88-0.96)	5.48×10 ⁻⁴
AKR1A1	rs62143198, rs72688441	0.97 (0.96-0.99)	9.68×10 ⁻⁴
THSD1	rs2519093, rs41292808	0.95 (0.92-0.98)	1.14×10 ⁻³
PSD	rs1303, rs429358	0.96 (0.94-0.99)	1.14×10 ⁻³
SULF2	rs10424405, rs7614709, rs7971133	0.94 (0.91-0.98)	1.15×10 ⁻³
PRDM1	rs13093385, rs2232613	1.03 (1.01-1.05)	1.41×10 ⁻³
SEMA6A	rs3733724, rs56278466, rs8176743	0.94 (0.91-0.98)	1.52×10 ⁻³
JAG1	rs550057, rs7041	0.93 (0.90-0.97)	1.56×10 ⁻³

Table 2. Associations between genetically predicted concentrations of circulating proteins and breast cancer risk using single-variant instruments

Protein-associated SNPs	Locus	Protein	ORs	<i>P</i> values
rs2519093 ^a	9q34.2, <i>ABO</i>	IGF1R (soluble), IR, MET, IL3RA, SELE (soluble), ENG, LIFR (soluble), FAM20B, ICAM2 (soluble), CHST15	0.82 to 1.18	1.39×10 ⁻⁶ to 3.28×10 ⁻⁸
rs3184504	12q24.12, <i>SH2B3</i>	VCAM1	0.85	4.09×10 ⁻⁷
rs3197999	3p21.31, <i>MST1</i>	TMPRSS11D, DOCK9, TNS2, CRYBB2	1.06 to 1.16	2.51×10 ⁻⁵
rs151288400	7q22.1, <i>PILRB</i>	HTN1	1.09	4.62×10 ⁻⁵
rs6770670 ^a	3p21.31, <i>BSN</i>	STOM, ADH1B	1.06	7.17×10 ⁻⁵
rs371314787	3p21.31, <i>APEH</i>	FASLG (soluble)	0.89	1.58×10 ⁻⁴
rs2205895	1q24.2, <i>SELP</i>	GAL	0.88	3.90×10 ⁻⁴
rs1800594 ^a	1q24.2, <i>F5</i>	SEC13, TFPI	0.88 to 1.08	1.46×10 ⁻³ to 5.21×10 ⁻⁴
rs8176693 ^a	9q34.2, <i>ABO</i>	CD36, NOTCH1, TLL1, CDH5	0.90 to 0.93	6.96×10 ⁻⁴ to 6.41×10 ⁻⁴
rs2489623	6q22.33, <i>RSPO3</i>	RSPO3	0.92	6.82×10 ⁻⁴
rs1378892	15q21.2	SCG3	1.05	1.24×10 ⁻³
rs148410779	9q31.3, <i>LOC107987116</i>	PTGR1	0.93	1.89×10 ⁻³

^a SNPs are in strong LD with other pQTL SNPs in CEU population. Only a representative SNP was presented.

Table 3. Associations between genetically predicted concentrations of circulating proteins and breast cancer risk differed by ER status: analysis using genetic instruments

Protein	Estrogen receptor +		Estrogen receptor -		P_{het}
	OR (95% CI)	P	OR (95% CI)	P	
TMPRSS11D	1.06 (1.03-1.09)	1.41×10^{-4}	1.13 (1.08-1.19)	4.00×10^{-7}	0.026
DOCK9	1.11 (1.05-1.17)	1.41×10^{-4}	1.25 (1.14-1.36)	4.00×10^{-7}	0.024
TNS2	1.09 (1.04-1.13)	1.41×10^{-4}	1.19 (1.11-1.27)	4.00×10^{-7}	0.03
CRYBB2	1.17 (1.08-1.27)	1.41×10^{-4}	1.39 (1.22-1.58)	4.00×10^{-7}	0.027
STOM	1.06 (1.03-1.10)	6.11×10^{-4}	1.14 (1.08-1.20)	1.50×10^{-6}	0.022
ADH1B	1.07 (1.03-1.11)	6.10×10^{-4}	1.16 (1.09-1.23)	1.60×10^{-6}	0.026
PRDM1	1.03 (1.01-1.05)	0.013	1.08 (1.05-1.12)	6.20×10^{-6}	0.014

Table 4. Validation of primary results with instruments constructed using pQTL variants from independent studies

Protein	Protein-associated SNPs	OR (95% CI)	<i>P</i> value	Consistent in direction
SELP	rs10800462, rs651007	0.94 (0.92-0.97)	1.89×10 ⁻⁴	Yes
CPNE1	rs2425143	0.97 (0.95-0.98)	4.10×10 ⁻⁵	Yes
RELT	rs7119167	1.06 (1.02-1.10)	3.91×10 ⁻³	Yes
VEGFR3/FLT4	rs10935480, rs651007	0.97 (0.96-0.99)	5.50×10 ⁻⁴	Yes
VEGFR2/KDR	rs34231037, rs651007	0.96 (0.94-0.99)	7.49×10 ⁻³	Yes
TIE1 (soluble)	rs10935480, rs8176749	0.97 (0.95-0.99)	6.57×10 ⁻⁴	Yes
BCAM	rs8176749	0.93 (0.89-0.97)	7.49×10 ⁻⁴	Yes
AKR1A1	rs6662572	0.97 (0.93-1.01)	1.72×10 ⁻¹	Yes
JAG1	rs4588, rs651007	0.95 (0.92-0.98)	1.07×10 ⁻³	Yes
IR	rs651007	0.95 (0.93-0.97)	8.30×10 ⁻⁷	Yes
MET	rs35349146, rs651007	0.93 (0.90-0.96)	7.20×10 ⁻⁶	Yes
SELE (soluble)	rs651007	0.96 (0.95-0.98)	8.30×10 ⁻⁷	Yes
ENG	rs651007	0.93 (0.91-0.96)	8.30×10 ⁻⁷	Yes
ICAM2 (soluble)	rs651007	0.91 (0.88-0.95)	8.30×10 ⁻⁷	Yes
CHST15	rs651007	0.90 (0.87-0.94)	8.30×10 ⁻⁷	Yes
TFPI	rs6027	0.97 (0.92-1.01)	1.76×10 ⁻¹	No
CD36	rs651007	0.93 (0.91-0.96)	8.30×10 ⁻⁷	Yes
NOTCH1	rs8176749	0.92 (0.87-0.96)	7.49×10 ⁻⁴	Yes
CDH5	rs8176749	0.97 (0.95-0.99)	7.49×10 ⁻⁴	Yes
ALPI	rs4942471	1.07 (0.99-1.15)	9.51×10 ⁻²	No
B3GNT2	rs1800470, rs492488	1.04 (0.99-1.08)	1.05×10 ⁻¹	Yes
C1GALT1C1	rs579459	1.12 (1.07-1.17)	7.40×10 ⁻⁷	Yes
CTSF	rs607736	1.18 (1.10-1.27)	1.30×10 ⁻⁵	Yes
FAM177A1	rs492488, rs799498	0.99 (0.96-1.01)	3.18×10 ⁻¹	-
GOLM1	rs492488, rs7854118	1.03 (1.00-1.06)	4.58×10 ⁻²	Yes
ISLR2	rs579459, rs923118	0.94 (0.91-0.97)	1.42×10 ⁻⁴	Yes
KIN	rs579459, rs7412	0.95 (0.92-0.97)	1.90×10 ⁻⁴	Yes

MAN1A2	rs1289863	0.95 (0.89-1.02)	1.41×10^{-1}	No
PRDM1	rs9852529	1.08 (1.04-1.13)	7.60×10^{-5}	Yes
QSOX2	rs12378344, rs492488	1.03 (1.01-1.05)	2.22×10^{-3}	Yes
RSPO3	rs3734626	0.94 (0.91-0.98)	1.51×10^{-3}	Yes
SCG3	rs1456297	1.05 (1.02-1.09)	1.08×10^{-3}	Yes
SEC13	rs62295996	0.99 (0.92-1.07)	8.45×10^{-1}	-
SULF2	rs7485577	0.97 (0.91-1.03)	3.43×10^{-1}	-
THSD1	rs704	0.97 (0.92-1.02)	1.90×10^{-1}	Yes
TMPRSS11D	rs9852529	1.09 (1.04-1.13)	7.60×10^{-5}	Yes
TPST2	rs9608491	1.00 (0.92-1.08)	9.10×10^{-1}	-

Table 5. Protein biomarkers replicated using data from the UK Biobank: associations of genetically predicted concentrations of circulating proteins with breast cancer risk

Protein	Protein-associated SNPs	Histologically confirmed breast cancer		Self-reported breast cancer	
		Association direction	<i>P</i> values	Association direction	<i>P</i> values
B3GNT2	rs2519093, rs2231940 ^a	+	0.003	+	0.007
HTN1	rs1063945 ^a	+	0.003	+	5.67×10 ⁻⁴
CPNE1	rs62143206, rs12481228	-	0.007	-	0.044
VCAM1	rs3184504	-	0.010	-	0.063
RSPO3	rs2489623	-	0.014	-	0.240
CHST15	rs550057 ^a	-	0.015	-	0.006
KIN	rs7412, rs62143198, rs550057 ^a	-	0.016	-	0.011
JAG1	rs7041, rs550057 ^a	-	0.017	-	0.068
ALPI	rs679574, rs550057 ^a	-	0.025	-	0.068
FAM177A1	rs679574, rs550057 ^a	-	0.029	-	0.086
IGFIR (soluble), MET, ICAM2 (soluble), LIFR (soluble), ENG, FAM20B	rs635634 ^a	-/+ ^b	0.040	-/+ ^b	0.012
IR	rs507666	-	0.042	-	0.012
MAN1A2	rs532436 ^a	+	0.044	+	0.015
SELE (soluble), IL3RA	rs2519093	-	0.046	-	0.012
C1GALT1C1	rs7787942, rs2519093	+	0.048	+	0.029
GOLM1	rs601338, rs550057 ^a	+	0.066	+	0.009
AKR1A1	rs72688441, rs62143198	-	0.077	-	0.061
VEGFR2/KDR	rs34231037, rs635634	-	0.084	-	0.053
QSOX2	rs550057,	+	0.197	+	0.055

ISLR2	rs10858248 rs4055121, rs2959011, rs532436	-	0.207	-	0.088
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^a Proxy SNPs were used ($R^2 > 0.9$ in the 1000 Genome Project CEU population)

^b Inverse associations (-) for IGF1R, MET, ICAM2, LIFR, ENG; positive association (+) for FAM20B.

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eTable 1. Associations between genetically predicted concentrations of circulating proteins and overall breast cancer risk: by BCAC sub-study

Protein	Protein-associated SNPs	GWAS		iCOGS		OncoArray	
		OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
SELE (soluble)	rs2519093	0.97 (0.94-1.01)	0.13	0.95 (0.93-0.97)	2.02×10 ⁻⁶	0.97 (0.95-0.99)	0.003
IL3RA	rs2519093	0.96 (0.91-1.01)	0.13	0.93 (0.91-0.96)	2.02×10 ⁻⁶	0.96 (0.94-0.99)	0.003
MET	rs635634	0.91 (0.81-1.02)	0.12	0.85 (0.80-0.91)	1.83×10 ⁻⁶	0.92 (0.87-0.97)	0.004
ENG	rs635634	0.86 (0.72-1.04)	0.12	0.78 (0.70-0.86)	1.83×10 ⁻⁶	0.87 (0.80-0.96)	0.004
IGF1R (soluble)	rs635634	0.85 (0.70-1.04)	0.12	0.76 (0.68-0.85)	1.83×10 ⁻⁶	0.86 (0.78-0.96)	0.004
IR	rs507666	0.94 (0.88-1.02)	0.12	0.90 (0.87-0.94)	2.24×10 ⁻⁶	0.94 (0.91-0.98)	0.003
LIFR (soluble)	rs635634	0.89 (0.77-1.03)	0.12	0.82 (0.75-0.89)	1.83×10 ⁻⁶	0.90 (0.84-0.97)	0.004
FAM20B	rs587729126	1.16 (0.97-1.38)	0.1	1.24 (1.13-1.36)	6.50×10 ⁻⁶	1.13 (1.04-1.23)	0.003
ICAM2 (soluble)	rs587729126	0.85 (0.70-1.03)	0.1	0.79 (0.71-0.87)	6.50×10 ⁻⁶	0.87 (0.80-0.95)	0.003
ISLR2	rs115478735,rs2959011,rs4055121	0.94 (0.87-1.02)	0.12	0.91 (0.87-0.95)	3.34×10 ⁻⁵	0.94 (0.90-0.97)	0.001
C1GALT1C1	rs2519093,rs7787942	1.06 (0.99-1.12)	0.09	1.08 (1.04-1.12)	3.79×10 ⁻⁵	1.05 (1.02-1.08)	0.002
VCAM1	rs3184504	0.78 (0.65-0.94)	0.01	0.84 (0.76-0.93)	0.001	0.87 (0.79-0.95)	0.003
ALPI	rs550057,rs679574	1.01 (0.90-1.13)	0.92	0.86 (0.81-0.92)	8.10×10 ⁻⁶	0.91 (0.86-0.97)	0.002
FAM177A1	rs550057,rs679574	1.01 (0.90-1.13)	0.93	0.87 (0.82-0.92)	1.08×10 ⁻⁵	0.92 (0.86-0.97)	0.003
CHST15	rs550057	1.02 (0.90-1.15)	0.78	0.87 (0.81-0.93)	2.01×10 ⁻⁵	0.91 (0.85-0.96)	0.002
SELP	rs2519093,rs6136,rs74227709	0.95 (0.90-1.00)	0.07	0.95 (0.92-0.98)	3.30×10 ⁻⁴	0.97 (0.94-1.00)	0.053
TMPRSS11D	rs3197999	1.04 (0.96-1.12)	0.35	1.06 (1.02-1.10)	0.005	1.06 (1.02-1.10)	0.002
DOCK9	rs3197999	1.07 (0.93-1.23)	0.35	1.11 (1.03-1.19)	0.005	1.11 (1.04-1.19)	0.002
TNS2	rs3197999	1.05 (0.95-1.17)	0.35	1.08 (1.02-1.14)	0.005	1.08 (1.03-1.14)	0.002
CRYBB2	rs3197999	1.10 (0.90-1.36)	0.35	1.17 (1.05-1.30)	0.005	1.17 (1.06-1.29)	0.002
HTN1	rs151288400	1.09 (0.96-1.24)	0.19	1.13 (1.06-1.21)	4.32×10 ⁻⁴	1.06 (1.00-1.13)	0.044
CPNE1	rs12481228,rs62143206	0.93 (0.88-0.98)	0	0.98 (0.95-1.00)	0.092	0.96 (0.94-0.99)	0.004
RELT	rs3741148,rs7952686	0.99 (0.91-1.08)	0.83	1.09 (1.04-1.14)	8.12×10 ⁻⁴	1.07 (1.02-1.12)	0.004
STOM	rs6770670	1.04 (0.96-1.14)	0.32	1.06 (1.02-1.11)	0.008	1.06 (1.02-1.10)	0.005
ADH1B	rs13085791	1.05 (0.95-1.16)	0.33	1.07 (1.02-1.12)	0.008	1.07 (1.02-1.12)	0.005
CTSF	rs11347749,rs1791679	1.07 (0.97-1.19)	0.2	1.10 (1.03-1.16)	0.002	1.06 (1.01-1.12)	0.023
TPST2	rs115478735,rs2283824,rs34436714	1.06 (0.97-1.16)	0.22	1.06 (1.01-1.12)	0.026	1.07 (1.02-1.12)	0.004
VEGFR3/FLT4	rs10935473,rs2519093,rs34221241	0.99 (0.95-1.03)	0.65	0.97 (0.94-0.99)	0.007	0.97 (0.95-0.99)	0.005
FASLG (soluble)	rs371314787	0.98 (0.80-1.20)	0.85	0.87 (0.79-0.96)	0.006	0.88 (0.81-0.96)	0.005
KIN	rs149092047,rs62143198,rs7412	0.96 (0.88-1.06)	0.47	0.93 (0.88-0.97)	0.002	0.95 (0.91-0.99)	0.026
QSO×2	rs10858248,rs149092047	1.00 (0.95-1.04)	0.82	1.04 (1.01-1.06)	0.002	1.03 (1.01-1.05)	0.008

B3GNT2	rs2519093,rs67047091	1.01 (0.94-1.09)	0.74	1.06 (1.02-1.11)	0.003	1.04 (1.01-1.08)	0.013
VEGFR2/KDR	rs34231037,rs34336071,rs635634	0.99 (0.93-1.05)	0.69	0.95 (0.92-0.98)	0.003	0.97 (0.94-0.99)	0.018
KLRF1	rs11708955,rs62143194	1.13 (0.95-1.33)	0.16	1.10 (1.01-1.20)	0.026	1.10 (1.02-1.18)	0.013
MAN1A2	rs35505705,rs8176643	1.07 (0.92-1.24)	0.39	1.10 (1.03-1.18)	0.006	1.07 (1.01-1.14)	0.023
TIE1 (soluble)	rs10935473,rs2275180,rs8176743	0.94 (0.89-0.99)	0.01	0.96 (0.94-0.99)	0.012	0.98 (0.95-1.00)	0.099
CAMK1	rs4525,rs61751507	0.97 (0.94-1.01)	0.11	0.98 (0.96-1.00)	0.048	0.98 (0.96-0.99)	0.01
GAL	rs2205895	0.85 (0.70-1.03)	0.1	0.87 (0.78-0.97)	0.01	0.90 (0.82-1.00)	0.049
GOLM1	rs149092047,rs601338	1.00 (0.94-1.07)	0.94	1.05 (1.02-1.09)	0.004	1.04 (1.01-1.07)	0.017
SEC13	rs1800594	0.80 (0.65-0.97)	0.02	0.91 (0.82-1.02)	0.106	0.88 (0.80-0.98)	0.016
BCAM	rs144579705,rs8176747	0.79 (0.68-0.92)	0	0.91 (0.84-0.99)	0.033	0.95 (0.89-1.01)	0.075
CD36	rs8176693	0.84 (0.75-0.94)	0	0.91 (0.86-0.97)	0.004	0.98 (0.93-1.03)	0.445
NOTCH1	rs8176743	0.75 (0.63-0.90)	0	0.87 (0.78-0.96)	0.005	0.96 (0.88-1.05)	0.409
RSPO3	rs2489623	0.99 (0.88-1.13)	0.93	0.90 (0.84-0.97)	0.005	0.92 (0.87-0.99)	0.019
TLL1	rs8176747	0.82 (0.73-0.93)	0	0.91 (0.85-0.97)	0.005	0.97 (0.92-1.04)	0.428
CDH5	rs8176746	0.92 (0.87-0.97)	0	0.96 (0.93-0.99)	0.005	0.99 (0.96-1.02)	0.426
AKR1A1	rs62143198,rs72688441	0.95 (0.91-1.00)	0.06	0.98 (0.95-1.00)	0.082	0.97 (0.95-1.00)	0.026
THSD1	rs2519093,rs41292808	0.93 (0.84-1.03)	0.16	0.93 (0.88-0.98)	0.007	0.96 (0.92-1.01)	0.116
PSD	rs1303,rs429358	1.01 (0.95-1.07)	0.79	0.97 (0.93-1.01)	0.104	0.95 (0.92-0.98)	7.83×10 ⁻⁴
SULF2	rs10424405,rs7614709,rs7971133	0.92 (0.83-1.02)	0.1	0.95 (0.90-1.01)	0.1	0.94 (0.90-0.99)	0.02
SCG3	rs1378892	1.08 (0.99-1.18)	0.1	1.06 (1.02-1.11)	0.009	1.03 (0.99-1.08)	0.143
PRDM1	rs13093385,rs2232613	1.03 (0.97-1.09)	0.3	1.04 (1.01-1.07)	0.016	1.03 (1.00-1.05)	0.065
TFPI	rs10800453	1.13 (0.99-1.30)	0.08	1.06 (0.98-1.15)	0.126	1.09 (1.01-1.17)	0.02
SEMA6A	rs3733724,rs56278466,rs8176743	0.87 (0.78-0.97)	0.01	0.92 (0.87-0.98)	0.008	0.98 (0.93-1.03)	0.388
JAG1	rs550057,rs7041	1.07 (0.95-1.21)	0.24	0.92 (0.86-0.99)	0.016	0.91 (0.86-0.97)	0.003
PTGR1	rs148410779	0.95 (0.83-1.08)	0.44	0.94 (0.87-1.00)	2.02×10 ⁻⁶	0.92 (0.86-0.98)	0.015

eTable 2. Associations between genetically predicted concentrations of circulating proteins and breast cancer risk by ER status: analysis using genetic instruments

Protein	Estrogen receptor +		Estrogen receptor -		
	OR (95% CI)		OR (95% CI)	P	P _{het}
SELE (soluble)	0.96 (0.95-0.98)	5.20×10 ⁻⁶	0.97 (0.95-0.99)	0.013	0.432
IL3RA	0.95 (0.93-0.97)	5.20×10 ⁻⁶	0.96 (0.93-0.99)	0.013	0.586
MET	0.90 (0.85-0.94)	6.00×10 ⁻⁶	0.91 (0.85-0.98)	0.017	0.804
ENG	0.84 (0.78-0.90)	6.00×10 ⁻⁶	0.87 (0.77-0.97)	0.017	0.613
IGFIR (soluble)	0.82 (0.76-0.90)	6.00×10 ⁻⁶	0.86 (0.75-0.97)	0.017	0.544
IR	0.93 (0.90-0.96)	5.20×10 ⁻⁶	0.94 (0.90-0.99)	0.014	0.716
LIFR (soluble)	0.87 (0.82-0.92)	6.00×10 ⁻⁶	0.89 (0.81-0.98)	0.017	0.689
FAM20B	1.16 (1.08-1.24)	2.30×10 ⁻⁵	1.16 (1.04-1.29)	0.008	1
ICAM2 (soluble)	0.85 (0.79-0.92)	2.30×10 ⁻⁵	0.85 (0.76-0.96)	0.008	1
ISLR2	0.93 (0.90-0.96)	1.30×10 ⁻⁵	0.94 (0.89-0.98)	0.009	0.718
C1GALT1C1	1.06 (1.03-1.09)	1.30×10 ⁻⁵	1.07 (1.02-1.11)	0.002	0.718
VCAM1	0.85 (0.79-0.92)	4.80×10 ⁻⁵	0.84 (0.74-0.94)	0.003	0.87
ALPI	0.90 (0.86-0.94)	2.10×10 ⁻⁵	0.96 (0.89-1.04)	0.317	0.158
FAM177A1	0.90 (0.86-0.95)	2.80×10 ⁻⁵	0.97 (0.90-1.04)	0.349	0.094
CHST15	0.90 (0.86-0.94)	2.60×10 ⁻⁵	0.94 (0.87-1.01)	0.091	0.326
SELP	0.96 (0.94-0.98)	7.86×10 ⁻⁴	0.96 (0.92-0.99)	0.017	1
TMPRSS11D	1.06 (1.03-1.09)	1.41×10 ⁻⁴	1.13 (1.08-1.19)	4.00×10 ⁻⁷	0.026
DOCK9	1.11 (1.05-1.17)	1.41×10 ⁻⁴	1.25 (1.14-1.36)	4.00×10 ⁻⁷	0.024
TNS2	1.09 (1.04-1.13)	1.41×10 ⁻⁴	1.19 (1.11-1.27)	4.00×10 ⁻⁷	0.03
CRYBB2	1.17 (1.08-1.27)	1.41×10 ⁻⁴	1.39 (1.22-1.58)	4.00×10 ⁻⁷	0.027
HTN1	1.09 (1.04-1.15)	6.59×10 ⁻⁴	1.13 (1.04-1.22)	0.002	0.454
CPNE1	0.96 (0.94-0.98)	6.17×10 ⁻⁴	0.97 (0.94-1.00)	0.054	0.586
RELT	1.07 (1.03-1.11)	5.54×10 ⁻⁴	1.01 (0.95-1.07)	0.82	0.107
STOM	1.06 (1.03-1.10)	6.11×10 ⁻⁴	1.14 (1.08-1.20)	1.50×10 ⁻⁶	0.022
ADH1B	1.07 (1.03-1.11)	6.10×10 ⁻⁴	1.16 (1.09-1.23)	1.60×10 ⁻⁶	0.026
CTSF	1.08 (1.04-1.13)	2.41×10 ⁻⁴	1.08 (1.01-1.16)	0.017	1
TPST2	1.06 (1.02-1.10)	0.001	1.07 (1.01-1.13)	0.021	0.786
VEGFR3/FLT4	0.97 (0.95-0.98)	8.60×10 ⁻⁵	0.98 (0.96-1.01)	0.226	0.499
FASLG (soluble)	0.88 (0.82-0.95)	0.001	0.75 (0.67-0.84)	1.60×10 ⁻⁶	0.02
KIN	0.94 (0.91-0.98)	9.97×10 ⁻⁴	0.97 (0.92-1.03)	0.365	0.362
QSOX2	1.03 (1.01-1.04)	0.002	1.02 (0.99-1.05)	0.117	0.561
B3GNT2	1.05 (1.02-1.09)	5.80×10 ⁻⁴	1.03 (0.98-1.08)	0.234	0.522
VEGFR2/KDR	0.96 (0.93-0.98)	2.76×10 ⁻⁴	0.99 (0.95-1.02)	0.462	0.172
KLRF1	1.10 (1.03-1.17)	0.003	1.20 (1.08-1.32)	3.47×10 ⁻⁴	0.151
MAN1A2	1.07 (1.02-1.13)	0.006	1.04 (0.96-1.13)	0.293	0.563
TIE1 (soluble)	0.96 (0.94-0.98)	6.59×10 ⁻⁴	0.97 (0.94-1.00)	0.083	0.586
CAMK1	0.98 (0.97-1.00)	0.021	0.98 (0.96-1.00)	0.081	1
GAL	0.90 (0.82-0.97)	0.008	0.97 (0.85-1.10)	0.626	0.34
GOLM1	1.04 (1.01-1.07)	0.002	1.04 (1.00-1.09)	0.041	1
SEC13	0.90 (0.83-0.98)	0.016	0.89 (0.78-1.01)	0.063	0.887
BCAM	0.91 (0.86-0.96)	0.001	0.91 (0.84-0.99)	0.035	1
CD36	0.93 (0.89-0.98)	0.004	0.93 (0.86-0.99)	0.031	1

NOTCH1	0.90 (0.83-0.97)	0.005	0.88 (0.79-0.99)	0.037	0.748
RSPO3	0.92 (0.87-0.97)	0.002	0.90 (0.83-0.98)	0.012	0.664
TLL1	0.93 (0.88-0.98)	0.005	0.92 (0.85-1.00)	0.039	0.828
CDH5	0.97 (0.95-0.99)	0.005	0.96 (0.93-1.00)	0.039	0.627
AKR1A1	0.97 (0.95-0.99)	0.005	0.99 (0.96-1.02)	0.45	0.275
THSD1	0.95 (0.91-0.98)	0.005	0.96 (0.90-1.02)	0.175	0.778
PSD	0.95 (0.93-0.98)	5.70×10^{-4}	0.98 (0.94-1.02)	0.373	0.209
SULF2	0.95 (0.91-0.99)	0.015	0.96 (0.90-1.03)	0.243	0.796
SCG3	1.06 (1.02-1.10)	9.44×10^{-4}	1.02 (0.97-1.08)	0.407	0.251
PRDM1	1.03 (1.01-1.05)	0.013	1.08 (1.05-1.12)	6.20×10^{-6}	0.014
TFPI	1.06 (1.00-1.13)	0.05	1.09 (0.99-1.19)	0.07	0.62
SEMA6A	0.94 (0.90-0.98)	0.003	0.94 (0.88-1.00)	0.059	1
JAG1	0.92 (0.87-0.96)	5.71×10^{-4}	0.97 (0.90-1.05)	0.454	0.257
PTGR1	0.91 (0.86-0.96)	8.30×10^{-4}	0.95 (0.87-1.03)	0.23	0.403

eTable 3. Associations between genetically predicted concentrations of circulating proteins and breast cancer risk using multi-variant instruments constructed by pQTL variants with $P < 5 \times 10^{-8}$

Protein	OR (95% CI)	P	Protein-associated SNPs
ICAM2	0.82 (0.78-0.87)	1.33×10^{-13}	12:111884608:T:C, 9:136138765:GCGCCACCACTA:G
INSR	0.93 (0.91-0.95)	8.29×10^{-10}	rs760459, rs60484807, 9:136149399:G:A
SELE	0.96 (0.95-0.98)	4.70×10^{-9}	rs12288924, rs11603123, rs35434910, rs635634, rs116851371
C1GALT1C1	1.06 (1.04-1.08)	8.98×10^{-9}	rs9267920, rs7787942, rs8176765, 9:136141870:C:T
IL3RA	0.96 (0.94-0.97)	9.15×10^{-9}	rs9264642, rs7772305, rs3128759, rs12378537, 9:136141870:C:T
ENG	0.83 (0.78-0.89)	3.60×10^{-8}	rs635634
IGF1R	0.82 (0.76-0.88)	3.60×10^{-8}	rs635634
LIFR	0.87 (0.82-0.91)	3.60×10^{-8}	rs635634
TMPRSS11D	1.06 (1.04-1.08)	3.68×10^{-8}	rs78691034, rs7640031, rs71324929, rs63714761, rs3197999, rs36101994
SEMA6A	0.92 (0.89-0.95)	8.16×10^{-8}	rs56278466, rs3733724, rs8176743, 9:136146597:C:T
ALPI	0.90 (0.87-0.94)	8.61×10^{-7}	rs679574, 9:136146597:C:T
TNS2	1.08 (1.04-1.11)	9.72×10^{-7}	rs12492271, rs6773261, rs3197999
DOCK9	1.10 (1.06-1.15)	1.10×10^{-6}	rs11710798, rs3197999
MET	0.92 (0.89-0.96)	4.46×10^{-6}	rs1858830, rs6955032, rs635634
STOM	1.06 (1.03-1.08)	7.22×10^{-6}	rs78691034, rs13084000, rs6770670
FLT4	0.96 (0.94-0.98)	7.33×10^{-6}	rs115410474, rs73133989, rs6762552, rs34221241, 9:136141870:C:T
FAM20B	1.09 (1.05-1.14)	3.45×10^{-5}	rs12064702, rs62143198, 9:136138765:GCGCCACCACTA:G
PRDM1	1.03 (1.02-1.05)	3.94×10^{-5}	rs2232613, rs144645644, rs2291903, rs78691034, rs78700949, rs11709092, rs143916056, rs11713251, rs374609508, rs63714761, rs13093385, rs138621393
HTN1	1.09 (1.05-1.14)	5.10×10^{-5}	rs151288400
VCAM1	0.91 (0.87-0.95)	5.13×10^{-5}	12:111884608:T:C, rs1257168, rs80286094
CAMK1	0.97 (0.96-0.99)	5.41×10^{-5}	rs57904876, rs78328556, rs1557570, rs61751507, rs72706368
SEC13	0.91 (0.88-0.96)	5.58×10^{-5}	rs1800594, rs3766126, rs927826
ISLR2	0.95 (0.92-0.97)	8.89×10^{-5}	rs4055121, rs2959011, rs10793962
TPST2	1.06 (1.03-1.09)	1.17×10^{-4}	rs35139041, rs34436714, rs2283824, rs115478735
QSOX2	1.03 (1.01-1.04)	1.26×10^{-4}	9:136146597:C:T, rs116851371, rs10858248
FASLG	0.89 (0.83-0.94)	1.51×10^{-4}	3:49709912:C:CT
RSPO3	0.93 (0.89-0.96)	1.73×10^{-4}	rs80010360, rs2489623
SELP	0.97 (0.95-0.98)	1.78×10^{-4}	rs182855188, rs140217668, rs6136, rs2235303, rs41315846, rs74227709, rs9820851, rs6993770, 9:136141870:C:T
CHST15	0.93 (0.90-0.97)	1.84×10^{-4}	rs7247412, 9:136146597:C:T
RELT	1.06 (1.03-1.09)	2.01×10^{-4}	rs3741148, rs7952686, rs71640036

MAN1A2	1.06 (1.03-1.09)	2.65×10^{-4}	rs7548848 rs7512060 rs41296190 rs114047680 rs10418046 rs8176643
CPNE1	0.97 (0.96-0.99)	2.74×10^{-4}	rs62143206 rs139295665 rs145186586 rs2248393 rs12481228 20:34436780:TA:T 20:34555466:TA:T, rs11908144
ADH1B	1.05 (1.02-1.08)	2.81×10^{-4}	rs78844723, rs11709092, rs13085791
TIE1	0.97 (0.95-0.99)	3.32×10^{-4}	rs2275180, rs10935473, rs8176743
GOLM1	1.04 (1.02-1.06)	4.11×10^{-4}	rs601338, 9:136139907:GAAACTGCC:G
B3GNT2	1.04 (1.02-1.06)	4.14×10^{-4}	rs284647, rs67047091, rs12986356, rs679574, rs11375378, rs4073090 9:136141870:C:T
TFPI	1.07 (1.03-1.11)	4.16×10^{-4}	rs9332701, rs10800453, rs6025, rs11596680
BCAM	0.92 (0.88-0.96)	4.45×10^{-4}	rs28399656, rs8176747
PSD	0.96 (0.94-0.98)	4.77×10^{-4}	rs1303, rs157580, rs429358, rs74480769
KIN	0.95 (0.93-0.98)	4.97×10^{-4}	rs73515693, rs7412, rs62143198, rs3917549, 9:136139907:GAAACTGCC:G
CD36	0.93 (0.90-0.97)	6.01×10^{-4}	rs8176693
NOTCH1	0.90 (0.84-0.95)	6.56×10^{-4}	rs8176743
TLL1	0.93 (0.89-0.97)	7.13×10^{-4}	rs8176747
PTGR1	0.95 (0.92-0.98)	8.01×10^{-4}	rs76461890, rs144875739, rs148410779
KDR	0.97 (0.95-0.99)	8.06×10^{-4}	rs34336071, rs34231037, rs2305948, rs116245354, rs1380069, rs184838577, rs635634
THSD1	0.95 (0.92-0.98)	1.39×10^{-3}	rs76603855, rs41292808, 9:136141870:C:T
CDH5	0.97 (0.96-0.99)	1.53×10^{-3}	rs2289150, rs7859473, rs8176746 rs2519145
JAG1	0.93 (0.90-0.97)	1.56×10^{-3}	rs7041, 9:136146597:C:T
AKR1A1	0.98 (0.96-0.99)	2.62×10^{-3}	rs116512105, rs113825465, 1:45565962:C:T, rs60515365, rs72688441, rs10416363 rs62143198, rs139295665
KLRF1	1.07 (1.02-1.12)	2.70×10^{-3}	rs62143194, rs77271561, rs11708955
SULF2	0.95 (0.92-0.98)	2.87×10^{-3}	12:57770098:C:T, rs117978438, rs10424405, rs7614709
CTSF	1.05 (1.01-1.08)	4.53×10^{-3}	rs1791679, 12:102212154:CT:C, rs1260326
GAL	0.94 (0.90-0.99)	8.74×10^{-3}	rs72708013, rs2205895, rs1409338
SCG3	1.03 (1.00-1.05)	3.29×10^{-2}	rs35696230, 15:51822784:TA:T, rs1378892, rs2305710
FAM177A1	0.98 (0.96-1.00)	4.61×10^{-2}	rs799473, rs140182729, rs8013122, rs679574, 9:136146597:C:T
CRYBB2	1.05 (1.00-1.10)	4.98×10^{-2}	rs4774039, rs3197999, rs4576502

Independent pQTL variants (LD R2<0.1, P<5) were obtained from the study of Sun et al.

eTable 4. Compiled pleiotropic effects of pQTL variants used to construct instruments for the 56 identified proteins

pQTL SNPs	Protein	Chr	BP	A1	A2	Trait	Ancestry	PMID
rs13085791	ADH1B	3	49721798	A	C	High light scatter percentage of red cells	European	27863252
rs13085791	ADH1B	3	49721798	A	C	High light scatter reticulocyte count	European	27863252
rs13085791	ADH1B	3	49721798	A	C	Immature fraction of reticulocytes	European	27863252
rs13085791	ADH1B	3	49721798	A	C	Mean corpuscular volume	European	27863252
rs13085791	ADH1B	3	49721798	A	C	Reticulocyte count	European	27863252
rs13085791	ADH1B	3	49721798	A	C	Reticulocyte fraction of red cells	European	27863252
rs13085791	ADH1B	3	49721798	A	C	Age first birth	European	27798627
rs13085791	ADH1B	3	49721798	A	C	Crohns disease	European	26192919
rs13085791	ADH1B	3	49721798	A	C	Inflammatory bowel disease	European	26192919
rs13085791	ADH1B	3	49721798	A	C	Ulcerative colitis	European	26192919
rs13085791	ADH1B	3	49721798	A	C	Primary sclerosing cholangitis	European	27992413
rs13085791	ADH1B	3	49721798	A	C	Age at menarche	European	25231870
rs13085791	ADH1B	3	49721798	A	C	Years of educational attainment in females	European	27225129
rs13085791	ADH1B	3	49721798	A	C	Years of educational attainment in males	European	27225129
rs13085791	ADH1B	3	49721798	A	C	Years of educational attainment	European	27225129
rs62143198	AKR1A1	19	54320939	A	G	Granulocyte percentage of myeloid white cells	European	27863252
rs62143198	AKR1A1	19	54320939	A	G	Monocyte count	European	27863252
rs62143198	AKR1A1	19	54320939	A	G	Monocyte percentage of white cells	European	27863252
rs550057	ALPI	9	136146597	C	T	Granulocyte count	European	27863252
rs550057	ALPI	9	136146597	C	T	Hematocrit	European	27863252
rs550057	ALPI	9	136146597	C	T	Hemoglobin concentration	European	27863252
rs550057	ALPI	9	136146597	C	T	Mean corpuscular volume	European	27863252
rs550057	ALPI	9	136146597	C	T	Monocyte count	European	27863252
rs550057	ALPI	9	136146597	C	T	Myeloid white cell count	European	27863252
rs550057	ALPI	9	136146597	C	T	Neutrophil count	European	27863252
rs550057	ALPI	9	136146597	C	T	Red blood cell count	European	27863252
rs550057	ALPI	9	136146597	C	T	Red cell distribution width	European	27863252
rs550057	ALPI	9	136146597	C	T	Sum basophil neutrophil counts	European	27863252
rs550057	ALPI	9	136146597	C	T	Sum neutrophil eosinophil counts	European	27863252
rs550057	ALPI	9	136146597	C	T	White blood cell count	European	27863252
rs550057	ALPI	9	136146597	C	T	Coronary artery disease	Mixed	26343387
rs550057	ALPI	9	136146597	C	T	Myocardial infarction	Mixed	26343387

rs550057	ALPI	9	136146597	C	T	Venous thrombosis	European	22675575
rs550057	ALPI	9	136146597	C	T	LDL cholesterol	European	25961943
rs550057	ALPI	9	136146597	C	T	High grade serous ovarian cancer	European	28346442
rs550057	ALPI	9	136146597	C	T	Serous invasive ovarian cancer	European	28346442
rs550057	ALPI	9	136146597	C	T	Alkaline phosphatase	European	28887542
rs550057	ALPI	9	136146597	C	T	Ferritin	European	28887542
rs550057	ALPI	9	136146597	C	T	Coronary artery disease	Mixed	29212778
rs679574	ALPI	19	49206108	C	G	Mean platelet volume	European	27863252
rs679574	ALPI	19	49206108	C	G	Total cholesterol	European	24097068
rs679574	ALPI	19	49206108	C	G	Total cholesterol	Mixed	20686565
rs679574	ALPI	19	49206108	C	G	Total cholesterol	Mixed	20686565
rs679574	ALPI	19	49206108	C	G	Crohns disease	European	26192919
rs679574	ALPI	19	49206108	C	G	Alkaline phosphatase	European	28887542
rs2519093	B3GNT2	9	136141870	C	T	Granulocyte count	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Hematocrit	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Hemoglobin concentration	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Lymphocyte percentage of white cells	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Monocyte count	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Myeloid white cell count	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Neutrophil count	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Platelet distribution width	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Red blood cell count	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Red cell distribution width	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Sum basophil neutrophil counts	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Sum eosinophil basophil counts	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Sum neutrophil eosinophil counts	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	White blood cell count	European	27863252
rs2519093	B3GNT2	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	B3GNT2	9	136141870	C	T	Myocardial infarction	Mixed	26343387
rs2519093	B3GNT2	9	136141870	C	T	Low density lipoprotein	European	24097068
rs2519093	B3GNT2	9	136141870	C	T	Total cholesterol	European	24097068
rs2519093	B3GNT2	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	B3GNT2	9	136141870	C	T	Venous thrombosis	European	22675575
rs2519093	B3GNT2	9	136141870	C	T	Allergy	European	27182965
rs2519093	B3GNT2	9	136141870	C	T	Coronary artery disease	Mixed	26343387

rs2519093	B3GNT2	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs2519093	B3GNT2	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	B3GNT2	9	136141870	C	T	Venous thromboembolism	European	28373160
rs2519093	B3GNT2	9	136141870	C	T	Coronary artery disease	Mixed	28714975
rs2519093	B3GNT2	9	136141870	C	T	High grade serous ovarian cancer	European	28346442
rs2519093	B3GNT2	9	136141870	C	T	Invasive ovarian cancer	European	28346442
rs2519093	B3GNT2	9	136141870	C	T	Serous invasive ovarian cancer	European	28346442
rs2519093	B3GNT2	9	136141870	C	T	Alkaline phosphatase	European	28887542
rs2519093	B3GNT2	9	136141870	C	T	Ferritin	European	28887542
rs2519093	B3GNT2	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs8176747	BCAM	9	136131315	G	C	Granulocyte percentage of myeloid white cells	European	27863252
rs8176747	BCAM	9	136131315	G	C	Hematocrit	European	27863252
rs8176747	BCAM	9	136131315	G	C	Hemoglobin concentration	European	27863252
rs8176747	BCAM	9	136131315	G	C	Mean corpuscular hemoglobin	European	27863252
rs8176747	BCAM	9	136131315	G	C	Mean corpuscular hemoglobin concentration	European	27863252
rs8176747	BCAM	9	136131315	G	C	Mean corpuscular volume	European	27863252
rs8176747	BCAM	9	136131315	G	C	Monocyte percentage of white cells	European	27863252
rs8176747	BCAM	9	136131315	G	C	Neutrophil percentage of white cells	European	27863252
rs8176747	BCAM	9	136131315	G	C	Platelet count	European	27863252
rs8176747	BCAM	9	136131315	G	C	Plateletcrit	European	27863252
rs8176747	BCAM	9	136131315	G	C	Red blood cell count	European	27863252
rs8176747	BCAM	9	136131315	G	C	Red cell distribution width	European	27863252
rs8176747	BCAM	9	136131315	G	C	Reticulocyte count	European	27863252
rs8176747	BCAM	9	136131315	G	C	Activated partial thromboplastin time	European	22703881
rs8176747	BCAM	9	136131315	G	C	Factor XIII antigen	European	23381943
rs8176747	BCAM	9	136131315	G	C	Hemoglobin Hb	Mixed	23222517
rs8176747	BCAM	9	136131315	G	C	Plasma carcinoembryonic antigen CEA levels	East Asian	23300138
rs8176747	BCAM	9	136131315	G	C	Red blood cell count RBC	Mixed	23222517
rs8176747	BCAM	9	136131315	G	C	von Willebrand factor vWF	European	23381943
rs8176747	BCAM	9	136131315	G	C	Platelet count	European	27863252
rs8176747	BCAM	9	136131315	G	C	Reticulocyte count	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Granulocyte count	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Hematocrit	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Hemoglobin concentration	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Lymphocyte percentage of white cells	European	27863252

rs2519093	C1GALT1C1	9	136141870	C	T	Monocyte count	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Myeloid white cell count	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Neutrophil count	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Platelet distribution width	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Red blood cell count	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Red cell distribution width	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Sum basophil neutrophil counts	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Sum eosinophil basophil counts	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Sum neutrophil eosinophil counts	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	White blood cell count	European	27863252
rs2519093	C1GALT1C1	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	C1GALT1C1	9	136141870	C	T	Myocardial infarction	Mixed	26343387
rs2519093	C1GALT1C1	9	136141870	C	T	Low density lipoprotein	European	24097068
rs2519093	C1GALT1C1	9	136141870	C	T	Total cholesterol	European	24097068
rs2519093	C1GALT1C1	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	C1GALT1C1	9	136141870	C	T	Venous thrombosis	European	22675575
rs2519093	C1GALT1C1	9	136141870	C	T	Allergy	European	27182965
rs2519093	C1GALT1C1	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	C1GALT1C1	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs2519093	C1GALT1C1	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	C1GALT1C1	9	136141870	C	T	Venous thromboembolism	European	28373160
rs2519093	C1GALT1C1	9	136141870	C	T	Coronary artery disease	Mixed	28714975
rs2519093	C1GALT1C1	9	136141870	C	T	High grade serous ovarian cancer	European	28346442
rs2519093	C1GALT1C1	9	136141870	C	T	Invasive ovarian cancer	European	28346442
rs2519093	C1GALT1C1	9	136141870	C	T	Serous invasive ovarian cancer	European	28346442
rs2519093	C1GALT1C1	9	136141870	C	T	Alkaline phosphatase	European	28887542
rs2519093	C1GALT1C1	9	136141870	C	T	Ferritin	European	28887542
rs2519093	C1GALT1C1	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs4525	CAMK1D	1	169511734	T	C	Blood protein levels	European	28240269
rs8176693	CD36	9	136137657	T	C	Granulocyte percentage of myeloid white cells	European	27863252
rs8176693	CD36	9	136137657	T	C	Hematocrit	European	27863252
rs8176693	CD36	9	136137657	T	C	Hemoglobin concentration	European	27863252
rs8176693	CD36	9	136137657	T	C	Mean corpuscular hemoglobin	European	27863252
rs8176693	CD36	9	136137657	T	C	Mean corpuscular hemoglobin concentration	European	27863252
rs8176693	CD36	9	136137657	T	C	Mean corpuscular volume	European	27863252

rs8176693	CD36	9	136137657	T	C	Monocyte percentage of white cells	European	27863252
rs8176693	CD36	9	136137657	T	C	Neutrophil percentage of white cells	European	27863252
rs8176693	CD36	9	136137657	T	C	Platelet count	European	27863252
rs8176693	CD36	9	136137657	T	C	Plateletcrit	European	27863252
rs8176693	CD36	9	136137657	T	C	Red blood cell count	European	27863252
rs8176693	CD36	9	136137657	T	C	Red cell distribution width	European	27863252
rs8176693	CD36	9	136137657	T	C	Reticulocyte count	European	27863252
rs8176693	CD36	9	136137657	T	C	Low density lipoprotein	European	24097068
rs8176693	CD36	9	136137657	T	C	Activated partial thromboplastin time	European	22703881
rs8176693	CD36	9	136137657	T	C	Factor XIII antigen	European	23381943
rs8176693	CD36	9	136137657	T	C	Hemoglobin Hb	Mixed	23222517
rs8176693	CD36	9	136137657	T	C	Malaria	African	23717212
rs8176693	CD36	9	136137657	T	C	Metabolic syndrome domains Multivariate analysis	Mixed	22022282
rs8176693	CD36	9	136137657	T	C	Plasma carcinoembryonic antigen CEA levels	East Asian	23300138
rs8176693	CD36	9	136137657	T	C	Red blood cell count RBC	Mixed	23222517
rs8176693	CD36	9	136137657	T	C	von Willebrand factor vWF	European	23381943
rs8176693	CD36	9	136137657	T	C	Endothelial growth factor levels	European	25552591
rs8176693	CD36	9	136137657	T	C	High serum lipase activity	European	25028398
rs8176693	CD36	9	136137657	T	C	Serum lipase activity	European	25028398
rs8176746	CDH5	9	136131322	T	G	Granulocyte percentage of myeloid white cells	European	27863252
rs8176746	CDH5	9	136131322	T	G	Hematocrit	European	27863252
rs8176746	CDH5	9	136131322	T	G	Hemoglobin concentration	European	27863252
rs8176746	CDH5	9	136131322	T	G	Mean corpuscular hemoglobin	European	27863252
rs8176746	CDH5	9	136131322	T	G	Mean corpuscular hemoglobin concentration	European	27863252
rs8176746	CDH5	9	136131322	T	G	Mean corpuscular volume	European	27863252
rs8176746	CDH5	9	136131322	T	G	Monocyte percentage of white cells	European	27863252
rs8176746	CDH5	9	136131322	T	G	Platelet count	European	27863252
rs8176746	CDH5	9	136131322	T	G	Plateletcrit	European	27863252
rs8176746	CDH5	9	136131322	T	G	Red blood cell count	European	27863252
rs8176746	CDH5	9	136131322	T	G	Red cell distribution width	European	27863252
rs8176746	CDH5	9	136131322	T	G	Reticulocyte count	European	27863252
rs8176746	CDH5	9	136131322	T	G	Low density lipoprotein	European	24097068
rs8176746	CDH5	9	136131322	T	G	Activated partial thromboplastin time	European	22703881
rs8176746	CDH5	9	136131322	T	G	Angiotensin converting enzyme ACE activity	East Asian	20066004
rs8176746	CDH5	9	136131322	T	G	Factor XIII antigen	European	23381943

rs8176746	CDH5	9	136131322	T	G	Hemoglobin Hb	Mixed	23222517
rs8176746	CDH5	9	136131322	T	G	Mean corpuscular hemoglobin concentration	East Asian	20139978
rs8176746	CDH5	9	136131322	T	G	Plasma carcinoembryonic antigen CEA levels	East Asian	23300138
rs8176746	CDH5	9	136131322	T	G	Red blood cell count RBC	Mixed	23222517
rs8176746	CDH5	9	136131322	T	G	TNF alpha TNF a	European	18464913
rs8176746	CDH5	9	136131322	T	G	von Willebrand factor vWF	European	23381943
rs8176746	CDH5	9	136131322	T	G	Mean corpuscular hemoglobin concentration	East Asian	20139978
rs8176746	CDH5	9	136131322	T	G	Mean corpuscular volume	Mixed	28017375
rs550057	CHST15	9	136146597	C	T	Granulocyte count	European	27863252
rs550057	CHST15	9	136146597	C	T	Hematocrit	European	27863252
rs550057	CHST15	9	136146597	C	T	Hemoglobin concentration	European	27863252
rs550057	CHST15	9	136146597	C	T	Mean corpuscular volume	European	27863252
rs550057	CHST15	9	136146597	C	T	Monocyte count	European	27863252
rs550057	CHST15	9	136146597	C	T	Myeloid white cell count	European	27863252
rs550057	CHST15	9	136146597	C	T	Neutrophil count	European	27863252
rs550057	CHST15	9	136146597	C	T	Red blood cell count	European	27863252
rs550057	CHST15	9	136146597	C	T	Red cell distribution width	European	27863252
rs550057	CHST15	9	136146597	C	T	Sum basophil neutrophil counts	European	27863252
rs550057	CHST15	9	136146597	C	T	Sum neutrophil eosinophil counts	European	27863252
rs550057	CHST15	9	136146597	C	T	White blood cell count	European	27863252
rs550057	CHST15	9	136146597	C	T	Coronary artery disease	Mixed	26343387
rs550057	CHST15	9	136146597	C	T	Myocardial infarction	Mixed	26343387
rs550057	CHST15	9	136146597	C	T	Venous thrombosis	European	22675575
rs550057	CHST15	9	136146597	C	T	LDL cholesterol	European	25961943
rs550057	CHST15	9	136146597	C	T	High grade serous ovarian cancer	European	28346442
rs550057	CHST15	9	136146597	C	T	Serous invasive ovarian cancer	European	28346442
rs550057	CHST15	9	136146597	C	T	Alkaline phosphatase	European	28887542
rs550057	CHST15	9	136146597	C	T	Ferritin	European	28887542
rs550057	CHST15	9	136146597	C	T	Coronary artery disease	Mixed	29212778
rs62143206	CPNE1	19	54326212	G	T	Granulocyte percentage of myeloid white cells	European	27863252
rs62143206	CPNE1	19	54326212	G	T	Monocyte count	European	27863252
rs62143206	CPNE1	19	54326212	G	T	Monocyte percentage of white cells	European	27863252
rs62143206	CPNE1	19	54326212	G	T	Granulocyte percentage of myeloid white cells	European	27863252
rs62143206	CPNE1	19	54326212	G	T	Monocyte percentage of white cells	European	27863252
rs12481228	CPNE1	20	34218673	C	G	Height	European	28146470

rs12481228	CPNE1	20	34218673	C	G	Height	Mixed	28146470
rs3197999	CRYBB2	3	49721532	G	A	High light scatter percentage of red cells	European	27863252
rs3197999	CRYBB2	3	49721532	G	A	High light scatter reticulocyte count	European	27863252
rs3197999	CRYBB2	3	49721532	G	A	Immature fraction of reticulocytes	European	27863252
rs3197999	CRYBB2	3	49721532	G	A	Reticulocyte count	European	27863252
rs3197999	CRYBB2	3	49721532	G	A	Reticulocyte fraction of red cells	European	27863252
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	18587394
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	19915574
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	21102463
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	21150878
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	21297633
rs3197999	CRYBB2	3	49721532	G	A	Inflammatory bowel disease	European	23128233
rs3197999	CRYBB2	3	49721532	G	A	Irritable bowel disorder	European	19915574
rs3197999	CRYBB2	3	49721532	G	A	Primary sclerosing cholangitis	European	21151127
rs3197999	CRYBB2	3	49721532	G	A	Primary sclerosing cholangitis	European	23603763
rs3197999	CRYBB2	3	49721532	G	A	Selective immunoglobulin A deficiency IgAD	European	20694011
rs3197999	CRYBB2	3	49721532	G	A	Ulcerative colitis	European	20228799
rs3197999	CRYBB2	3	49721532	G	A	Ulcerative colitis	European	21297633
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	23128233
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	26192919
rs3197999	CRYBB2	3	49721532	G	A	Inflammatory bowel disease	European	26192919
rs3197999	CRYBB2	3	49721532	G	A	Ulcerative colitis	European	23128233
rs3197999	CRYBB2	3	49721532	G	A	Ulcerative colitis	European	26192919
rs3197999	CRYBB2	3	49721532	G	A	Primary sclerosing cholangitis	European	27992413
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	18587394
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	21102463
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	European	26192919
rs3197999	CRYBB2	3	49721532	G	A	Crohns disease	Mixed	28067908
rs3197999	CRYBB2	3	49721532	G	A	Inflammatory bowel disease	European	23128233
rs3197999	CRYBB2	3	49721532	G	A	Inflammatory bowel disease	Mixed	28067908
rs3197999	CRYBB2	3	49721532	G	A	Primary sclerosing cholangitis	European	21151127
rs3197999	CRYBB2	3	49721532	G	A	Primary sclerosing cholangitis	European	27992413
rs3197999	CRYBB2	3	49721532	G	A	Ulcerative colitis	European	20228799
rs3197999	CRYBB2	3	49721532	G	A	Ulcerative colitis	European	26192919
rs3197999	CRYBB2	3	49721532	G	A	Ulcerative colitis	Mixed	28067908

rs3197999	CRYBB2	3	49721532	G	A	Age at menarche	European	25231870
rs3197999	CRYBB2	3	49721532	G	A	Years of educational attainment in females	European	27225129
rs3197999	CRYBB2	3	49721532	G	A	Years of educational attainment in males	European	27225129
rs3197999	CRYBB2	3	49721532	G	A	Years of educational attainment	European	27225129
rs3197999	CRYBB2	3	49721532	G	A	Cholangitis sclerosing	European	21151127
rs3197999	CRYBB2	3	49721532	G	A	Colitis ulcerative	European	20228799
rs3197999	CRYBB2	3	49721532	G	A	Crohn disease	European	18587394
rs3197999	DOCK9	3	49721532	G	A	High light scatter percentage of red cells	European	27863252
rs3197999	DOCK9	3	49721532	G	A	High light scatter reticulocyte count	European	27863252
rs3197999	DOCK9	3	49721532	G	A	Immature fraction of reticulocytes	European	27863252
rs3197999	DOCK9	3	49721532	G	A	Reticulocyte count	European	27863252
rs3197999	DOCK9	3	49721532	G	A	Reticulocyte fraction of red cells	European	27863252
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	18587394
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	19915574
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	21102463
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	21150878
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	21297633
rs3197999	DOCK9	3	49721532	G	A	Inflammatory bowel disease	European	23128233
rs3197999	DOCK9	3	49721532	G	A	Irritable bowel disorder	European	19915574
rs3197999	DOCK9	3	49721532	G	A	Primary sclerosing cholangitis	European	21151127
rs3197999	DOCK9	3	49721532	G	A	Primary sclerosing cholangitis	European	23603763
rs3197999	DOCK9	3	49721532	G	A	Selective immunoglobulin A deficiency IgAD	European	20694011
rs3197999	DOCK9	3	49721532	G	A	Ulcerative colitis	European	20228799
rs3197999	DOCK9	3	49721532	G	A	Ulcerative colitis	European	21297633
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	23128233
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	26192919
rs3197999	DOCK9	3	49721532	G	A	Inflammatory bowel disease	European	26192919
rs3197999	DOCK9	3	49721532	G	A	Ulcerative colitis	European	23128233
rs3197999	DOCK9	3	49721532	G	A	Ulcerative colitis	European	26192919
rs3197999	DOCK9	3	49721532	G	A	Primary sclerosing cholangitis	European	27992413
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	18587394
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	21102463
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	European	26192919
rs3197999	DOCK9	3	49721532	G	A	Crohns disease	Mixed	28067908
rs3197999	DOCK9	3	49721532	G	A	Inflammatory bowel disease	European	23128233

rs3197999	DOCK9	3	49721532	G	A	Inflammatory bowel disease	Mixed	28067908
rs3197999	DOCK9	3	49721532	G	A	Primary sclerosing cholangitis	European	21151127
rs3197999	DOCK9	3	49721532	G	A	Primary sclerosing cholangitis	European	27992413
rs3197999	DOCK9	3	49721532	G	A	Ulcerative colitis	European	20228799
rs3197999	DOCK9	3	49721532	G	A	Ulcerative colitis	European	26192919
rs3197999	DOCK9	3	49721532	G	A	Ulcerative colitis	Mixed	28067908
rs3197999	DOCK9	3	49721532	G	A	Age at menarche	European	25231870
rs3197999	DOCK9	3	49721532	G	A	Years of educational attainment in females	European	27225129
rs3197999	DOCK9	3	49721532	G	A	Years of educational attainment in males	European	27225129
rs3197999	DOCK9	3	49721532	G	A	Years of educational attainment	European	27225129
rs3197999	DOCK9	3	49721532	G	A	Cholangitis sclerosing	European	21151127
rs3197999	DOCK9	3	49721532	G	A	Colitis ulcerative	European	20228799
rs3197999	DOCK9	3	49721532	G	A	Crohn disease	European	18587394
rs635634	ENG	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	ENG	9	136155000	T	C	Hematocrit	European	27863252
rs635634	ENG	9	136155000	T	C	Hemoglobin concentration	European	27863252
rs635634	ENG	9	136155000	T	C	Lymphocyte percentage of white cells	European	27863252
rs635634	ENG	9	136155000	T	C	Monocyte count	European	27863252
rs635634	ENG	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	ENG	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	ENG	9	136155000	T	C	Platelet distribution width	European	27863252
rs635634	ENG	9	136155000	T	C	Red blood cell count	European	27863252
rs635634	ENG	9	136155000	T	C	Red cell distribution width	European	27863252
rs635634	ENG	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	ENG	9	136155000	T	C	Sum eosinophil basophil counts	European	27863252
rs635634	ENG	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	ENG	9	136155000	T	C	White blood cell count	European	27863252
rs635634	ENG	9	136155000	T	C	Coronary artery disease	Mixed	26343387
rs635634	ENG	9	136155000	T	C	Myocardial infarction	Mixed	26343387
rs635634	ENG	9	136155000	T	C	Low density lipoprotein	European	24097068
rs635634	ENG	9	136155000	T	C	Low density lipoprotein	Mixed	20686565
rs635634	ENG	9	136155000	T	C	Total cholesterol	European	24097068
rs635634	ENG	9	136155000	T	C	Total cholesterol	Mixed	20686565
rs635634	ENG	9	136155000	T	C	Circulating galectin 3 levels	European	23056639
rs635634	ENG	9	136155000	T	C	Venous thrombosis	European	22675575

rs635634	ENG	9	136155000	T	C	Cholesterol total	Mixed	20686565
rs635634	ENG	9	136155000	T	C	Cholesterol total	European	24097068
rs635634	ENG	9	136155000	T	C	GIP levels in response to oral glucose tolerance test 120 minutes	European	29093273
rs635634	ENG	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	ENG	9	136155000	T	C	Ischemic stroke	European	27997041
rs635634	ENG	9	136155000	T	C	LDL cholesterol	Mixed	20686565
rs635634	ENG	9	136155000	T	C	LDL cholesterol	European	24097068
rs635634	ENG	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	ENG	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	ENG	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	ENG	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	ENG	9	136155000	T	C	Tonsillectomy	European	27182965
rs635634	ENG	9	136155000	T	C	Tonsillectomy	European	28928442
rs635634	ENG	9	136155000	T	C	Type 2 diabetes	European	28566273
rs635634	ENG	9	136155000	T	C	White blood cell count	European	27863252
rs635634	ENG	9	136155000	T	C	Coronary artery disease	Mixed	28714975
rs635634	ENG	9	136155000	T	C	High grade serous ovarian cancer	European	28346442
rs635634	ENG	9	136155000	T	C	Invasive ovarian cancer	European	28346442
rs635634	ENG	9	136155000	T	C	Serous invasive ovarian cancer	European	28346442
rs635634	ENG	9	136155000	T	C	Alkaline phosphatase	European	28887542
rs635634	ENG	9	136155000	T	C	Ferritin	European	28887542
rs635634	ENG	9	136155000	T	C	Coronary artery disease	Mixed	29212778
rs550057	FAM177A1	9	136146597	C	T	Granulocyte count	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Hematocrit	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Hemoglobin concentration	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Mean corpuscular volume	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Monocyte count	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Myeloid white cell count	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Neutrophil count	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Red blood cell count	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Red cell distribution width	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Sum basophil neutrophil counts	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Sum neutrophil eosinophil counts	European	27863252
rs550057	FAM177A1	9	136146597	C	T	White blood cell count	European	27863252
rs550057	FAM177A1	9	136146597	C	T	Coronary artery disease	Mixed	26343387

rs550057	FAM177A1	9	136146597	C	T	Myocardial infarction	Mixed	26343387
rs550057	FAM177A1	9	136146597	C	T	Venous thrombosis	European	22675575
rs550057	FAM177A1	9	136146597	C	T	LDL cholesterol	European	25961943
rs550057	FAM177A1	9	136146597	C	T	High grade serous ovarian cancer	European	28346442
rs550057	FAM177A1	9	136146597	C	T	Serous invasive ovarian cancer	European	28346442
rs550057	FAM177A1	9	136146597	C	T	Alkaline phosphatase	European	28887542
rs550057	FAM177A1	9	136146597	C	T	Ferritin	European	28887542
rs550057	FAM177A1	9	136146597	C	T	Coronary artery disease	Mixed	29212778
rs679574	FAM177A1	19	49206108	C	G	Mean platelet volume	European	27863252
rs679574	FAM177A1	19	49206108	C	G	Total cholesterol	European	24097068
rs679574	FAM177A1	19	49206108	C	G	Total cholesterol	Mixed	20686565
rs679574	FAM177A1	19	49206108	C	G	Total cholesterol	Mixed	20686565
rs679574	FAM177A1	19	49206108	C	G	Crohns disease	European	26192919
rs679574	FAM177A1	19	49206108	C	G	Alkaline phosphatase	European	28887542
rs371314787	FASLG (soluble)	3	49709912	-	T	High light scatter percentage of red cells	European	27863252
rs371314787	FASLG (soluble)	3	49709912	-	T	High light scatter reticulocyte count	European	27863252
rs371314787	FASLG (soluble)	3	49709912	-	T	Immature fraction of reticulocytes	European	27863252
rs371314787	FASLG (soluble)	3	49709912	-	T	Mean corpuscular volume	European	27863252
rs371314787	FASLG (soluble)	3	49709912	-	T	Reticulocyte count	European	27863252
rs371314787	FASLG (soluble)	3	49709912	-	T	Reticulocyte fraction of red cells	European	27863252
rs601338	GOLM1	19	49206674	A	G	Mean platelet volume	European	27863252
rs601338	GOLM1	19	49206674	A	G	Total cholesterol	European	24097068
rs601338	GOLM1	19	49206674	A	G	Total cholesterol	Mixed	20686565
rs601338	GOLM1	19	49206674	A	G	Alkaline phosphatase ALP in plasma	Mixed	22001757
rs601338	GOLM1	19	49206674	A	G	Gamma glutamyl transferase	Mixed	22001757
rs601338	GOLM1	19	49206674	A	G	Total cholesterol	Mixed	20686565
rs601338	GOLM1	19	49206674	A	G	Vitamin B12 female	European	18776911
rs601338	GOLM1	19	49206674	A	G	Crohns disease	European	23128233
rs601338	GOLM1	19	49206674	A	G	Crohns disease	European	26192919
rs601338	GOLM1	19	49206674	A	G	Blood metabolite levels	European	24816252
rs601338	GOLM1	19	49206674	A	G	Blood metabolite ratios	European	24816252
rs601338	GOLM1	19	49206674	A	G	Alkaline phosphatase	European	28887542
rs635634	IGFIR (soluble)	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Hematocrit	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Hemoglobin concentration	European	27863252

rs635634	IGFIR (soluble)	9	136155000	T	C	Lymphocyte percentage of white cells	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Monocyte count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Platelet distribution width	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Red blood cell count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Red cell distribution width	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Sum eosinophil basophil counts	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	White blood cell count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Coronary artery disease	Mixed	26343387
rs635634	IGFIR (soluble)	9	136155000	T	C	Myocardial infarction	Mixed	26343387
rs635634	IGFIR (soluble)	9	136155000	T	C	Low density lipoprotein	European	24097068
rs635634	IGFIR (soluble)	9	136155000	T	C	Low density lipoprotein	Mixed	20686565
rs635634	IGFIR (soluble)	9	136155000	T	C	Total cholesterol	European	24097068
rs635634	IGFIR (soluble)	9	136155000	T	C	Total cholesterol	Mixed	20686565
rs635634	IGFIR (soluble)	9	136155000	T	C	Circulating galectin 3 levels	European	23056639
rs635634	IGFIR (soluble)	9	136155000	T	C	Venous thrombosis	European	22675575
rs635634	IGFIR (soluble)	9	136155000	T	C	Cholesterol total	Mixed	20686565
rs635634	IGFIR (soluble)	9	136155000	T	C	Cholesterol total	European	24097068
rs635634	IGFIR (soluble)	9	136155000	T	C	GIP levels in response to oral glucose tolerance test 120 minutes	European	29093273
rs635634	IGFIR (soluble)	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Ischemic stroke	European	27997041
rs635634	IGFIR (soluble)	9	136155000	T	C	LDL cholesterol	Mixed	20686565
rs635634	IGFIR (soluble)	9	136155000	T	C	LDL cholesterol	European	24097068
rs635634	IGFIR (soluble)	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Tonsillectomy	European	27182965
rs635634	IGFIR (soluble)	9	136155000	T	C	Tonsillectomy	European	28928442
rs635634	IGFIR (soluble)	9	136155000	T	C	Type 2 diabetes	European	28566273
rs635634	IGFIR (soluble)	9	136155000	T	C	White blood cell count	European	27863252
rs635634	IGFIR (soluble)	9	136155000	T	C	Coronary artery disease	Mixed	28714975

rs635634	IGFIR (soluble)	9	136155000	T	C	High grade serous ovarian cancer	European	28346442
rs635634	IGFIR (soluble)	9	136155000	T	C	Invasive ovarian cancer	European	28346442
rs635634	IGFIR (soluble)	9	136155000	T	C	Serous invasive ovarian cancer	European	28346442
rs635634	IGFIR (soluble)	9	136155000	T	C	Alkaline phosphatase	European	28887542
rs635634	IGFIR (soluble)	9	136155000	T	C	Ferritin	European	28887542
rs635634	IGFIR (soluble)	9	136155000	T	C	Coronary artery disease	Mixed	29212778
rs2519093	IL3RA	9	136141870	C	T	Granulocyte count	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Hematocrit	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Hemoglobin concentration	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Lymphocyte percentage of white cells	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Monocyte count	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Myeloid white cell count	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Neutrophil count	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Platelet distribution width	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Red blood cell count	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Red cell distribution width	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Sum basophil neutrophil counts	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Sum eosinophil basophil counts	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Sum neutrophil eosinophil counts	European	27863252
rs2519093	IL3RA	9	136141870	C	T	White blood cell count	European	27863252
rs2519093	IL3RA	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	IL3RA	9	136141870	C	T	Myocardial infarction	Mixed	26343387
rs2519093	IL3RA	9	136141870	C	T	Low density lipoprotein	European	24097068
rs2519093	IL3RA	9	136141870	C	T	Total cholesterol	European	24097068
rs2519093	IL3RA	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	IL3RA	9	136141870	C	T	Venous thrombosis	European	22675575
rs2519093	IL3RA	9	136141870	C	T	Allergy	European	27182965
rs2519093	IL3RA	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	IL3RA	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs2519093	IL3RA	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	IL3RA	9	136141870	C	T	Venous thromboembolism	European	28373160
rs2519093	IL3RA	9	136141870	C	T	Coronary artery disease	Mixed	28714975
rs2519093	IL3RA	9	136141870	C	T	High grade serous ovarian cancer	European	28346442
rs2519093	IL3RA	9	136141870	C	T	Invasive ovarian cancer	European	28346442
rs2519093	IL3RA	9	136141870	C	T	Serous invasive ovarian cancer	European	28346442

rs2519093	IL3RA	9	136141870	C	T	Alkaline phosphatase	European	28887542
rs2519093	IL3RA	9	136141870	C	T	Ferritin	European	28887542
rs2519093	IL3RA	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs507666	IR	9	136149399	A	G	Granulocyte count	European	27863252
rs507666	IR	9	136149399	A	G	Hematocrit	European	27863252
rs507666	IR	9	136149399	A	G	Hemoglobin concentration	European	27863252
rs507666	IR	9	136149399	A	G	Lymphocyte percentage of white cells	European	27863252
rs507666	IR	9	136149399	A	G	Monocyte count	European	27863252
rs507666	IR	9	136149399	A	G	Myeloid white cell count	European	27863252
rs507666	IR	9	136149399	A	G	Neutrophil count	European	27863252
rs507666	IR	9	136149399	A	G	Platelet distribution width	European	27863252
rs507666	IR	9	136149399	A	G	Red blood cell count	European	27863252
rs507666	IR	9	136149399	A	G	Red cell distribution width	European	27863252
rs507666	IR	9	136149399	A	G	Sum basophil neutrophil counts	European	27863252
rs507666	IR	9	136149399	A	G	Sum eosinophil basophil counts	European	27863252
rs507666	IR	9	136149399	A	G	Sum neutrophil eosinophil counts	European	27863252
rs507666	IR	9	136149399	A	G	White blood cell count	European	27863252
rs507666	IR	9	136149399	A	G	Coronary artery disease	Mixed	26343387
rs507666	IR	9	136149399	A	G	Myocardial infarction	Mixed	26343387
rs507666	IR	9	136149399	A	G	Low density lipoprotein	European	24097068
rs507666	IR	9	136149399	A	G	Total cholesterol	European	24097068
rs507666	IR	9	136149399	A	G	LDL cholesterol large lipoprotein fraction concentration	European	19936222
rs507666	IR	9	136149399	A	G	LDL cholesterol lipoprotein fraction concentration	European	19936222
rs507666	IR	9	136149399	A	G	LDL cholesterol lipoprotein fraction concentration in fasting sample	European	19936222
rs507666	IR	9	136149399	A	G	Plasma carcinoembryonic antigen CEA levels	East Asian	23300138
rs507666	IR	9	136149399	A	G	Plasma soluble intercellular adhesion molecule 1 ICAM 1 females	European	18604267
rs507666	IR	9	136149399	A	G	Soluble intercellular adhesion molecule 1 ICAM 1	European	21533024
rs507666	IR	9	136149399	A	G	VLDL cholesterol mean size lipoprotein fraction concentration	European	19936222
rs507666	IR	9	136149399	A	G	VLDL cholesterol small lipoprotein fraction concentration	European	19936222
rs507666	IR	9	136149399	A	G	VLDL cholesterol small lipoprotein fraction concentration in fasting sample	European	19936222
rs507666	IR	9	136149399	A	G	Venous thrombosis	European	22675575
rs507666	IR	9	136149399	A	G	Blood protein levels	European	28240269
rs507666	IR	9	136149399	A	G	Cholesterol total	European	25961943
rs507666	IR	9	136149399	A	G	Coronary artery disease	Mixed	28714975
rs507666	IR	9	136149399	A	G	Coronary artery disease	Mixed	29212778

rs507666	IR	9	136149399	A	G	Lipid traits	East Asian	24386095
rs507666	IR	9	136149399	A	G	Lipid traits	East Asian	24386095
rs507666	IR	9	136149399	A	G	Soluble ICAM 1	European	18604267
rs507666	IR	9	136149399	A	G	Soluble ICAM 1	European	21533024
rs507666	IR	9	136149399	A	G	Coronary artery disease	Mixed	28714975
rs507666	IR	9	136149399	A	G	High grade serous ovarian cancer	European	28346442
rs507666	IR	9	136149399	A	G	Invasive ovarian cancer	European	28346442
rs507666	IR	9	136149399	A	G	Serous invasive ovarian cancer	European	28346442
rs507666	IR	9	136149399	A	G	Alkaline phosphatase	European	28887542
rs507666	IR	9	136149399	A	G	Ferritin	European	28887542
rs507666	IR	9	136149399	A	G	Intercellular adhesion molecule 1	European	18604267
rs507666	IR	9	136149399	A	G	Intercellular adhesion molecule 1	European	21533024
rs507666	IR	9	136149399	A	G	Coronary artery disease	Mixed	29212778
rs115478735	ISLR2	9	136149711	A	T	Granulocyte count	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Hematocrit	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Hemoglobin concentration	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Lymphocyte percentage of white cells	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Monocyte count	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Myeloid white cell count	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Neutrophil count	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Platelet distribution width	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Red blood cell count	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Red cell distribution width	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Sum basophil neutrophil counts	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Sum eosinophil basophil counts	European	27863252
rs115478735	ISLR2	9	136149711	A	T	Sum neutrophil eosinophil counts	European	27863252
rs115478735	ISLR2	9	136149711	A	T	White blood cell count	European	27863252
rs115478735	ISLR2	9	136149711	A	T	High grade serous ovarian cancer	European	28346442
rs115478735	ISLR2	9	136149711	A	T	Invasive ovarian cancer	European	28346442
rs115478735	ISLR2	9	136149711	A	T	Serous invasive ovarian cancer	European	28346442
rs7041	JAG1	4	72618334	C	A	25 hydroxy vitamin D concentrations	European	20541252
rs7041	JAG1	4	72618334	C	A	Circulating 25OHD vitamin D levels	European	20418485
rs7041	JAG1	4	72618334	C	A	Serum vitamin D binding protein levels	European	24740207
rs550057	JAG1	9	136146597	C	T	Granulocyte count	European	27863252
rs550057	JAG1	9	136146597	C	T	Hematocrit	European	27863252

rs550057	JAG1	9	136146597	C	T	Hemoglobin concentration	European	27863252
rs550057	JAG1	9	136146597	C	T	Mean corpuscular volume	European	27863252
rs550057	JAG1	9	136146597	C	T	Monocyte count	European	27863252
rs550057	JAG1	9	136146597	C	T	Myeloid white cell count	European	27863252
rs550057	JAG1	9	136146597	C	T	Neutrophil count	European	27863252
rs550057	JAG1	9	136146597	C	T	Red blood cell count	European	27863252
rs550057	JAG1	9	136146597	C	T	Red cell distribution width	European	27863252
rs550057	JAG1	9	136146597	C	T	Sum basophil neutrophil counts	European	27863252
rs550057	JAG1	9	136146597	C	T	Sum neutrophil eosinophil counts	European	27863252
rs550057	JAG1	9	136146597	C	T	White blood cell count	European	27863252
rs550057	JAG1	9	136146597	C	T	Coronary artery disease	Mixed	26343387
rs550057	JAG1	9	136146597	C	T	Myocardial infarction	Mixed	26343387
rs550057	JAG1	9	136146597	C	T	Venous thrombosis	European	22675575
rs550057	JAG1	9	136146597	C	T	LDL cholesterol	European	25961943
rs550057	JAG1	9	136146597	C	T	High grade serous ovarian cancer	European	28346442
rs550057	JAG1	9	136146597	C	T	Serous invasive ovarian cancer	European	28346442
rs550057	JAG1	9	136146597	C	T	Alkaline phosphatase	European	28887542
rs550057	JAG1	9	136146597	C	T	Ferritin	European	28887542
rs550057	JAG1	9	136146597	C	T	Coronary artery disease	Mixed	29212778
rs7412	KIN	19	45412079	C	T	High light scatter percentage of red cells	European	27863252
rs7412	KIN	19	45412079	C	T	High light scatter reticulocyte count	European	27863252
rs7412	KIN	19	45412079	C	T	Immature fraction of reticulocytes	European	27863252
rs7412	KIN	19	45412079	C	T	Red cell distribution width	European	27863252
rs7412	KIN	19	45412079	C	T	Reticulocyte count	European	27863252
rs7412	KIN	19	45412079	C	T	Reticulocyte fraction of red cells	European	27863252
rs7412	KIN	19	45412079	C	T	Coronary artery disease	Mixed	26343387
rs7412	KIN	19	45412079	C	T	High density lipoprotein	European	24097068
rs7412	KIN	19	45412079	C	T	Total cholesterol	European	24097068
rs7412	KIN	19	45412079	C	T	Triglycerides	European	24097068
rs7412	KIN	19	45412079	C	T	APOB apolipoprotein B	European	23100282
rs7412	KIN	19	45412079	C	T	APOB apolipoprotein B response after 40mg daily simvastatin treatment	European	23100282
rs7412	KIN	19	45412079	C	T	LDL cholesterol	European	20838585
rs7412	KIN	19	45412079	C	T	LDL cholesterol	European	23063622
rs7412	KIN	19	45412079	C	T	LDL cholesterol	African	23067351
rs7412	KIN	19	45412079	C	T	LDL cholesterol	European	23100282

rs7412	KIN	19	45412079	C	T	LDL cholesterol among a group where cancer diabetes hyper/hypothyroidism and LDL altering medications were not present	African	23067351
rs7412	KIN	19	45412079	C	T	LDL cholesterol change with statins	Mixed	20031582
rs7412	KIN	19	45412079	C	T	LDL cholesterol response after 40mg daily simvastatin treatment	European	23100282
rs7412	KIN	19	45412079	C	T	LDL cholesterol response to statins baseline LDL cholesterol	European	22331829
rs7412	KIN	19	45412079	C	T	LDL cholesterol response to statins fractional change in LDL cholesterol	European	22331829
rs7412	KIN	19	45412079	C	T	LDL cholesterol response to statins residuals of the measure of fractional change in LDL cholesterol	European	22331829
rs7412	KIN	19	45412079	C	T	Late onset Alzheimers disease	Unspecified	20885792
rs7412	KIN	19	45412079	C	T	Late onset Alzheimers disease	European	21390209
rs7412	KIN	19	45412079	C	T	Lipoprotein associated phospholipase A2 activity Lp2	European	23118302
rs7412	KIN	19	45412079	C	T	Total cholesterol	European	23063622
rs7412	KIN	19	45412079	C	T	Alzheimers disease	European	24162737
rs7412	KIN	19	45412079	C	T	Cholesterol total	European	25961943
rs7412	KIN	19	45412079	C	T	Cholesterol total	European	28270201
rs7412	KIN	19	45412079	C	T	Coronary artery disease	Mixed	28714975
rs7412	KIN	19	45412079	C	T	Coronary artery disease	Mixed	29212778
rs7412	KIN	19	45412079	C	T	Coronary artery disease	Mixed	29212778
rs7412	KIN	19	45412079	C	T	Coronary artery disease	Mixed	29212778
rs7412	KIN	19	45412079	C	T	HDL cholesterol	European	28270201
rs7412	KIN	19	45412079	C	T	High light scatter reticulocyte count	European	27863252
rs7412	KIN	19	45412079	C	T	High light scatter reticulocyte percentage of red cells	European	27863252
rs7412	KIN	19	45412079	C	T	Ideal cardiovascular health clinical and behavioral	European	27179730
rs7412	KIN	19	45412079	C	T	Immature fraction of reticulocytes	European	27863252
rs7412	KIN	19	45412079	C	T	LDL cholesterol	African	23067351
rs7412	KIN	19	45412079	C	T	LDL cholesterol levels	East Asian	28334899
rs7412	KIN	19	45412079	C	T	LDL cholesterol levels	East Asian	28371326
rs7412	KIN	19	45412079	C	T	Lipid metabolism phenotypes	European	22286219
rs7412	KIN	19	45412079	C	T	Lipid traits	Filipino	24023260
rs7412	KIN	19	45412079	C	T	Lipid traits	Filipino	24023260
rs7412	KIN	19	45412079	C	T	Lipoprotein a levels	European	28512139
rs7412	KIN	19	45412079	C	T	Lipoprotein associated phospholipase A2 activity change in response to darapladib treatment in cardiovascular disease	Mixed	28753643
rs7412	KIN	19	45412079	C	T	Lipoprotein phospholipase A2 activity in cardiovascular disease	Mixed	28753643
rs7412	KIN	19	45412079	C	T	Lipoproteina levels adjusted for apolipoproteina isoforms	European	28512139
rs7412	KIN	19	45412079	C	T	Low density lipoprotein cholesterol	Mixed	28548082
rs7412	KIN	19	45412079	C	T	Metabolite levels lipoprotein measures	European	27005778

rs7412	KIN	19	45412079	C	T	Pulse pressure	European	28135244
rs7412	KIN	19	45412079	C	T	Red cell distribution width	European	27863252
rs7412	KIN	19	45412079	C	T	Response to statin therapy LDL C	European	22331829
rs7412	KIN	19	45412079	C	T	Reticulocyte count	European	27863252
rs7412	KIN	19	45412079	C	T	Reticulocyte fraction of red cells	European	27863252
rs7412	KIN	19	45412079	C	T	Total cholesterol levels	Mixed	28548082
rs7412	KIN	19	45412079	C	T	Coronary artery disease	Mixed	28714975
rs7412	KIN	19	45412079	C	T	Low density lipoprotein	European	28887542
rs7412	KIN	19	45412079	C	T	Total cholesterol	European	28887542
rs7412	KIN	19	45412079	C	T	High density lipoprotein	East Asian	28334899
rs7412	KIN	19	45412079	C	T	Low density lipoprotein	East Asian	28334899
rs7412	KIN	19	45412079	C	T	Total cholesterol	East Asian	28334899
rs7412	KIN	19	45412079	C	T	Cholesterol ldl	European	22331829
rs7412	KIN	19	45412079	C	T	Lipid metabolism	European	22286219
rs7412	KIN	19	45412079	C	T	Coronary artery disease	Mixed	29212778
rs7412	KIN	19	45412079	C	T	Coronary artery disease	Mixed	29212778
rs62143198	KIN	19	54320939	A	G	Granulocyte percentage of myeloid white cells	European	27863252
rs62143198	KIN	19	54320939	A	G	Monocyte count	European	27863252
rs62143198	KIN	19	54320939	A	G	Monocyte percentage of white cells	European	27863252
rs11708955	KLRF1	3	49540114	C	T	High light scatter percentage of red cells	European	27863252
rs11708955	KLRF1	3	49540114	C	T	High light scatter reticulocyte count	European	27863252
rs11708955	KLRF1	3	49540114	C	T	Immature fraction of reticulocytes	European	27863252
rs11708955	KLRF1	3	49540114	C	T	Mean corpuscular volume	European	27863252
rs11708955	KLRF1	3	49540114	C	T	Reticulocyte count	European	27863252
rs11708955	KLRF1	3	49540114	C	T	Reticulocyte fraction of red cells	European	27863252
rs11708955	KLRF1	3	49540114	C	T	Crohns disease	European	26192919
rs11708955	KLRF1	3	49540114	C	T	Inflammatory bowel disease	European	26192919
rs11708955	KLRF1	3	49540114	C	T	Ulcerative colitis	European	26192919
rs11708955	KLRF1	3	49540114	C	T	Primary sclerosing cholangitis	European	27992413
rs11708955	KLRF1	3	49540114	C	T	Years of educational attainment in females	European	27225129
rs11708955	KLRF1	3	49540114	C	T	Years of educational attainment in males	European	27225129
rs11708955	KLRF1	3	49540114	C	T	Years of educational attainment	European	27225129
rs62143194	KLRF1	19	54319624	C	G	Granulocyte percentage of myeloid white cells	European	27863252
rs62143194	KLRF1	19	54319624	C	G	Monocyte count	European	27863252
rs62143194	KLRF1	19	54319624	C	G	Monocyte percentage of white cells	European	27863252

rs635634	LIFR (soluble)	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Hematocrit	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Hemoglobin concentration	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Lymphocyte percentage of white cells	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Monocyte count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Platelet distribution width	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Red blood cell count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Red cell distribution width	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Sum eosinophil basophil counts	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	White blood cell count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Coronary artery disease	Mixed	26343387
rs635634	LIFR (soluble)	9	136155000	T	C	Myocardial infarction	Mixed	26343387
rs635634	LIFR (soluble)	9	136155000	T	C	Low density lipoprotein	European	24097068
rs635634	LIFR (soluble)	9	136155000	T	C	Low density lipoprotein	Mixed	20686565
rs635634	LIFR (soluble)	9	136155000	T	C	Total cholesterol	European	24097068
rs635634	LIFR (soluble)	9	136155000	T	C	Total cholesterol	Mixed	20686565
rs635634	LIFR (soluble)	9	136155000	T	C	Circulating galectin 3 levels	European	23056639
rs635634	LIFR (soluble)	9	136155000	T	C	Venous thrombosis	European	22675575
rs635634	LIFR (soluble)	9	136155000	T	C	Cholesterol total	Mixed	20686565
rs635634	LIFR (soluble)	9	136155000	T	C	Cholesterol total	European	24097068
rs635634	LIFR (soluble)	9	136155000	T	C	GIP levels in response to oral glucose tolerance test 120 minutes	European	29093273
rs635634	LIFR (soluble)	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Ischemic stroke	European	27997041
rs635634	LIFR (soluble)	9	136155000	T	C	LDL cholesterol	Mixed	20686565
rs635634	LIFR (soluble)	9	136155000	T	C	LDL cholesterol	European	24097068
rs635634	LIFR (soluble)	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Tonsillectomy	European	27182965
rs635634	LIFR (soluble)	9	136155000	T	C	Tonsillectomy	European	28928442

rs635634	LIFR (soluble)	9	136155000	T	C	Type 2 diabetes	European	28566273
rs635634	LIFR (soluble)	9	136155000	T	C	White blood cell count	European	27863252
rs635634	LIFR (soluble)	9	136155000	T	C	Coronary artery disease	Mixed	28714975
rs635634	LIFR (soluble)	9	136155000	T	C	High grade serous ovarian cancer	European	28346442
rs635634	LIFR (soluble)	9	136155000	T	C	Invasive ovarian cancer	European	28346442
rs635634	LIFR (soluble)	9	136155000	T	C	Serous invasive ovarian cancer	European	28346442
rs635634	LIFR (soluble)	9	136155000	T	C	Alkaline phosphatase	European	28887542
rs635634	LIFR (soluble)	9	136155000	T	C	Ferritin	European	28887542
rs635634	LIFR (soluble)	9	136155000	T	C	Coronary artery disease	Mixed	29212778
rs635634	MET	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	MET	9	136155000	T	C	Hematocrit	European	27863252
rs635634	MET	9	136155000	T	C	Hemoglobin concentration	European	27863252
rs635634	MET	9	136155000	T	C	Lymphocyte percentage of white cells	European	27863252
rs635634	MET	9	136155000	T	C	Monocyte count	European	27863252
rs635634	MET	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	MET	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	MET	9	136155000	T	C	Platelet distribution width	European	27863252
rs635634	MET	9	136155000	T	C	Red blood cell count	European	27863252
rs635634	MET	9	136155000	T	C	Red cell distribution width	European	27863252
rs635634	MET	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	MET	9	136155000	T	C	Sum eosinophil basophil counts	European	27863252
rs635634	MET	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	MET	9	136155000	T	C	White blood cell count	European	27863252
rs635634	MET	9	136155000	T	C	Coronary artery disease	Mixed	26343387
rs635634	MET	9	136155000	T	C	Myocardial infarction	Mixed	26343387
rs635634	MET	9	136155000	T	C	Low density lipoprotein	European	24097068
rs635634	MET	9	136155000	T	C	Low density lipoprotein	Mixed	20686565
rs635634	MET	9	136155000	T	C	Total cholesterol	European	24097068
rs635634	MET	9	136155000	T	C	Total cholesterol	Mixed	20686565
rs635634	MET	9	136155000	T	C	Circulating galectin 3 levels	European	23056639
rs635634	MET	9	136155000	T	C	Venous thrombosis	European	22675575
rs635634	MET	9	136155000	T	C	Cholesterol total	Mixed	20686565
rs635634	MET	9	136155000	T	C	Cholesterol total	European	24097068
rs635634	MET	9	136155000	T	C	GIP levels in response to oral glucose tolerance test 120 minutes	European	29093273
rs635634	MET	9	136155000	T	C	Granulocyte count	European	27863252

rs635634	MET	9	136155000	T	C	Ischemic stroke	European	27997041
rs635634	MET	9	136155000	T	C	LDL cholesterol	Mixed	20686565
rs635634	MET	9	136155000	T	C	LDL cholesterol	European	24097068
rs635634	MET	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	MET	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	MET	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	MET	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	MET	9	136155000	T	C	Tonsillectomy	European	27182965
rs635634	MET	9	136155000	T	C	Tonsillectomy	European	28928442
rs635634	MET	9	136155000	T	C	Type 2 diabetes	European	28566273
rs635634	MET	9	136155000	T	C	White blood cell count	European	27863252
rs635634	MET	9	136155000	T	C	Coronary artery disease	Mixed	28714975
rs635634	MET	9	136155000	T	C	High grade serous ovarian cancer	European	28346442
rs635634	MET	9	136155000	T	C	Invasive ovarian cancer	European	28346442
rs635634	MET	9	136155000	T	C	Serous invasive ovarian cancer	European	28346442
rs635634	MET	9	136155000	T	C	Alkaline phosphatase	European	28887542
rs635634	MET	9	136155000	T	C	Ferritin	European	28887542
rs635634	MET	9	136155000	T	C	Coronary artery disease	Mixed	29212778
rs8176743	NOTCH1	9	136131415	T	C	Granulocyte percentage of myeloid white cells	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Hematocrit	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Hemoglobin concentration	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Mean corpuscular hemoglobin	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Mean corpuscular hemoglobin concentration	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Mean corpuscular volume	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Monocyte percentage of white cells	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Platelet count	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Plateletcrit	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Red blood cell count	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Red cell distribution width	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Reticulocyte count	European	27863252
rs8176743	NOTCH1	9	136131415	T	C	Low density lipoprotein	European	24097068
rs8176743	NOTCH1	9	136131415	T	C	Activated partial thromboplastin time	European	22703881
rs8176743	NOTCH1	9	136131415	T	C	Factor XIII antigen	European	23381943
rs8176743	NOTCH1	9	136131415	T	C	Hemoglobin Hb	Mixed	23222517
rs8176743	NOTCH1	9	136131415	T	C	Plasma carcinoembryonic antigen CEA levels	East Asian	23300138

rs8176743	NOTCH1	9	136131415	T	C	Red blood cell count RBC	Mixed	23222517
rs8176743	NOTCH1	9	136131415	T	C	von Willebrand factor vWF	European	23381943
rs8176743	NOTCH1	9	136131415	T	C	End stage coagulation	European	23381943
rs8176743	NOTCH1	9	136131415	T	C	Intraocular pressure	Mixed	25173106
rs13093385	PRDM1	3	49710479	A	T	High light scatter percentage of red cells	European	27863252
rs13093385	PRDM1	3	49710479	A	T	High light scatter reticulocyte count	European	27863252
rs13093385	PRDM1	3	49710479	A	T	Immature fraction of reticulocytes	European	27863252
rs13093385	PRDM1	3	49710479	A	T	Mean corpuscular volume	European	27863252
rs13093385	PRDM1	3	49710479	A	T	Reticulocyte count	European	27863252
rs13093385	PRDM1	3	49710479	A	T	Reticulocyte fraction of red cells	European	27863252
rs13093385	PRDM1	3	49710479	A	T	Crohns disease	European	26192919
rs13093385	PRDM1	3	49710479	A	T	Inflammatory bowel disease	European	26192919
rs13093385	PRDM1	3	49710479	A	T	Ulcerative colitis	European	26192919
rs13093385	PRDM1	3	49710479	A	T	Years of educational attainment in females	European	27225129
rs13093385	PRDM1	3	49710479	A	T	Years of educational attainment in males	European	27225129
rs13093385	PRDM1	3	49710479	A	T	Years of educational attainment	European	27225129
rs1303	PSD	14	94844843	G	T	Metabolite levels	European	22916037
rs429358	PSD	19	45411941	C	T	Platelet count	European	27863252
rs429358	PSD	19	45411941	C	T	Plateletcrit	European	27863252
rs429358	PSD	19	45411941	C	T	Red cell distribution width	European	27863252
rs429358	PSD	19	45411941	C	T	Coronary artery disease	Mixed	26343387
rs429358	PSD	19	45411941	C	T	Myocardial infarction	Mixed	26343387
rs429358	PSD	19	45411941	C	T	Type II diabetes	European	28566273
rs429358	PSD	19	45411941	C	T	Age-related macular degeneration	European	26691988
rs429358	PSD	19	45411941	C	T	APOE apolipoprotein E	European	21418511
rs429358	PSD	19	45411941	C	T	APOE apolipoprotein E females	European	21418511
rs429358	PSD	19	45411941	C	T	APOE apolipoprotein E males	European	21418511
rs429358	PSD	19	45411941	C	T	Alzheimers disease	Mixed	19668339
rs429358	PSD	19	45411941	C	T	Alzheimers disease age of onset	European	22005931
rs429358	PSD	19	45411941	C	T	Cognitive ageing	European	23207651
rs429358	PSD	19	45411941	C	T	Cognitive ageing females	European	23207651
rs429358	PSD	19	45411941	C	T	Cortical amyloid beta load	European	23419831
rs429358	PSD	19	45411941	C	T	LDL cholesterol change with statins	Mixed	20031582
rs429358	PSD	19	45411941	C	T	Late onset Alzheimers disease	Unspecified	20885792
rs429358	PSD	19	45411941	C	T	Late onset Alzheimers disease	European	21390209

rs429358	PSD	19	45411941	C	T	Late onset Alzheimers disease	African	23571587
rs429358	PSD	19	45411941	C	T	Advanced age related macular degeneration	Mixed	26691988
rs429358	PSD	19	45411941	C	T	Alzheimers disease biomarkers	European	23419831
rs429358	PSD	19	45411941	C	T	Blood protein levels	European	28240269
rs429358	PSD	19	45411941	C	T	Brain imaging	European	20100581
rs429358	PSD	19	45411941	C	T	Cerebral amyloid deposition PET imaging	European	26252872
rs429358	PSD	19	45411941	C	T	Cerebral amyloid deposition positivity PET imaging	European	26252872
rs429358	PSD	19	45411941	C	T	Cerebrospinal AB1 42 levels in Alzheimers disease dementia	European	25027320
rs429358	PSD	19	45411941	C	T	Cognitive decline age related	African	28078323
rs429358	PSD	19	45411941	C	T	Dementia with Lewy bodies	European	29263008
rs429358	PSD	19	45411941	C	T	HDL cholesterol	European	25961943
rs429358	PSD	19	45411941	C	T	Lewy body disease	Unspecified	25188341
rs429358	PSD	19	45411941	C	T	Lewy body disease	Unspecified	25188341
rs429358	PSD	19	45411941	C	T	Lewy body disease	Unspecified	25188341
rs429358	PSD	19	45411941	C	T	Lifespan	Mixed	27029810
rs429358	PSD	19	45411941	C	T	Parental lifespan	Mixed	29030599
rs429358	PSD	19	45411941	C	T	Platelet count	European	27863252
rs429358	PSD	19	45411941	C	T	Red cell distribution width	European	27863252
rs429358	PSD	19	45411941	C	T	Coronary artery disease	Mixed	28714975
rs429358	PSD	19	45411941	C	T	C-reactive protein	European	28887542
rs429358	PSD	19	45411941	C	T	Low density lipoprotein	European	28887542
rs429358	PSD	19	45411941	C	T	Total cholesterol	European	28887542
rs429358	PSD	19	45411941	C	T	Posterior cortical atrophy	Mixed	26993346
rs429358	PSD	19	45411941	C	T	Coronary artery disease	Mixed	29212778
rs429358	PSD	19	45411941	C	T	Coronary artery disease	Mixed	29212778
rs2489623	RSPO3	6	127455821	A	C	Hematocrit	European	27863252
rs2489623	RSPO3	6	127455821	A	C	Hemoglobin concentration	European	27863252
rs2489623	RSPO3	6	127455821	A	C	Red blood cell count	European	27863252
rs2489623	RSPO3	6	127455821	A	C	Waist circumference	European	25673412
rs2489623	RSPO3	6	127455821	A	C	Waist circumference adjusted for BMI	Mixed	25673412
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in physically active females	Mixed	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in physically active individuals	European	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in physically active individuals	Mixed	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in females	European	23754948
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in females	Mixed	25673412

rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in males	Mixed	25673412
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in female non-smokers	Mixed	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in non-smokers	European	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio in non-smokers	Mixed	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for physical activity in females	Mixed	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for physical activity	European	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for physical activity	Mixed	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist circumference adjusted for smoking in females	Mixed	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for smoking	European	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for smoking	Mixed	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio	European	20935629
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio	European	23754948
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio	European	25673412
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio	Mixed	25673412
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for BMI in females greater than 50 years of age	European	26426971
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for BMI in females less than or equal to 50 years of age	European	26426971
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for BMI in males greater than 50 years of age	European	26426971
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio adjusted for BMI	Mixed	25673412
rs2489623	RSPO3	6	127455821	A	C	Waist circumference in physically active individuals	European	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist circumference in physically active individuals	Mixed	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist circumference in female non-smokers	Mixed	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist circumference in non-smokers	European	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist circumference in non-smokers	Mixed	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist circumference adjusted for physical activity	European	28448500
rs2489623	RSPO3	6	127455821	A	C	Waist circumference adjusted for smoking in females	Mixed	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist circumference adjusted for smoking	European	28443625
rs2489623	RSPO3	6	127455821	A	C	Waist circumference adjusted for smoking	Mixed	28443625
rs2489623	RSPO3	6	127455821	A	C	High density lipoprotein	European	24097068
rs2489623	RSPO3	6	127455821	A	C	Waist hip ratio	European	20935629
rs2519093	SELE (soluble)	9	136141870	C	T	Granulocyte count	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Hematocrit	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Hemoglobin concentration	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Lymphocyte percentage of white cells	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Monocyte count	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Myeloid white cell count	European	27863252

rs2519093	SELE (soluble)	9	136141870	C	T	Neutrophil count	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Platelet distribution width	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Red blood cell count	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Red cell distribution width	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Sum basophil neutrophil counts	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Sum eosinophil basophil counts	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Sum neutrophil eosinophil counts	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	White blood cell count	European	27863252
rs2519093	SELE (soluble)	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	SELE (soluble)	9	136141870	C	T	Myocardial infarction	Mixed	26343387
rs2519093	SELE (soluble)	9	136141870	C	T	Low density lipoprotein	European	24097068
rs2519093	SELE (soluble)	9	136141870	C	T	Total cholesterol	European	24097068
rs2519093	SELE (soluble)	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	SELE (soluble)	9	136141870	C	T	Venous thrombosis	European	22675575
rs2519093	SELE (soluble)	9	136141870	C	T	Allergy	European	27182965
rs2519093	SELE (soluble)	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	SELE (soluble)	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs2519093	SELE (soluble)	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	SELE (soluble)	9	136141870	C	T	Venous thromboembolism	European	28373160
rs2519093	SELE (soluble)	9	136141870	C	T	Coronary artery disease	Mixed	28714975
rs2519093	SELE (soluble)	9	136141870	C	T	High grade serous ovarian cancer	European	28346442
rs2519093	SELE (soluble)	9	136141870	C	T	Invasive ovarian cancer	European	28346442
rs2519093	SELE (soluble)	9	136141870	C	T	Serous invasive ovarian cancer	European	28346442
rs2519093	SELE (soluble)	9	136141870	C	T	Alkaline phosphatase	European	28887542
rs2519093	SELE (soluble)	9	136141870	C	T	Ferritin	European	28887542
rs2519093	SELE (soluble)	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs6136	SELP	1	169563951	T	G	Soluble P selectin	European	20167578
rs6136	SELP	1	169563951	T	G	Blood protein levels	European	28240269
rs6136	SELP	1	169563951	T	G	Soluble levels of adhesion molecules	European	20167578
rs6136	SELP	1	169563951	T	G	P selectin	European	20167578
rs74227709	SELP	1	247722588	A	G	High light scatter percentage of red cells	European	27863252
rs74227709	SELP	1	247722588	A	G	High light scatter reticulocyte count	European	27863252
rs74227709	SELP	1	247722588	A	G	Mean platelet volume	European	27863252
rs74227709	SELP	1	247722588	A	G	Platelet count	European	27863252
rs74227709	SELP	1	247722588	A	G	Platelet distribution width	European	27863252

rs74227709	SELP	1	247722588	A	G	Plateletcrit	European	27863252
rs74227709	SELP	1	247722588	A	G	Reticulocyte count	European	27863252
rs74227709	SELP	1	247722588	A	G	Reticulocyte fraction of red cells	European	27863252
rs2519093	SELP	9	136141870	C	T	Granulocyte count	European	27863252
rs2519093	SELP	9	136141870	C	T	Hematocrit	European	27863252
rs2519093	SELP	9	136141870	C	T	Hemoglobin concentration	European	27863252
rs2519093	SELP	9	136141870	C	T	Lymphocyte percentage of white cells	European	27863252
rs2519093	SELP	9	136141870	C	T	Monocyte count	European	27863252
rs2519093	SELP	9	136141870	C	T	Myeloid white cell count	European	27863252
rs2519093	SELP	9	136141870	C	T	Neutrophil count	European	27863252
rs2519093	SELP	9	136141870	C	T	Platelet distribution width	European	27863252
rs2519093	SELP	9	136141870	C	T	Red blood cell count	European	27863252
rs2519093	SELP	9	136141870	C	T	Red cell distribution width	European	27863252
rs2519093	SELP	9	136141870	C	T	Sum basophil neutrophil counts	European	27863252
rs2519093	SELP	9	136141870	C	T	Sum eosinophil basophil counts	European	27863252
rs2519093	SELP	9	136141870	C	T	Sum neutrophil eosinophil counts	European	27863252
rs2519093	SELP	9	136141870	C	T	White blood cell count	European	27863252
rs2519093	SELP	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	SELP	9	136141870	C	T	Myocardial infarction	Mixed	26343387
rs2519093	SELP	9	136141870	C	T	Low density lipoprotein	European	24097068
rs2519093	SELP	9	136141870	C	T	Total cholesterol	European	24097068
rs2519093	SELP	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	SELP	9	136141870	C	T	Venous thrombosis	European	22675575
rs2519093	SELP	9	136141870	C	T	Allergy	European	27182965
rs2519093	SELP	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	SELP	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs2519093	SELP	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	SELP	9	136141870	C	T	Venous thromboembolism	European	28373160
rs2519093	SELP	9	136141870	C	T	Coronary artery disease	Mixed	28714975
rs2519093	SELP	9	136141870	C	T	High grade serous ovarian cancer	European	28346442
rs2519093	SELP	9	136141870	C	T	Invasive ovarian cancer	European	28346442
rs2519093	SELP	9	136141870	C	T	Serous invasive ovarian cancer	European	28346442
rs2519093	SELP	9	136141870	C	T	Alkaline phosphatase	European	28887542
rs2519093	SELP	9	136141870	C	T	Ferritin	European	28887542
rs2519093	SELP	9	136141870	C	T	Coronary artery disease	Mixed	29212778

rs8176743	SEMA6A	9	136131415	T	C	Granulocyte percentage of myeloid white cells	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Hematocrit	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Hemoglobin concentration	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Mean corpuscular hemoglobin	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Mean corpuscular hemoglobin concentration	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Mean corpuscular volume	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Monocyte percentage of white cells	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Platelet count	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Plateletcrit	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Red blood cell count	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Red cell distribution width	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Reticulocyte count	European	27863252
rs8176743	SEMA6A	9	136131415	T	C	Low density lipoprotein	European	24097068
rs8176743	SEMA6A	9	136131415	T	C	Activated partial thromboplastin time	European	22703881
rs8176743	SEMA6A	9	136131415	T	C	Factor XIII antigen	European	23381943
rs8176743	SEMA6A	9	136131415	T	C	Hemoglobin Hb	Mixed	23222517
rs8176743	SEMA6A	9	136131415	T	C	Plasma carcinoembryonic antigen CEA levels	East Asian	23300138
rs8176743	SEMA6A	9	136131415	T	C	Red blood cell count RBC	Mixed	23222517
rs8176743	SEMA6A	9	136131415	T	C	von Willebrand factor vWF	European	23381943
rs8176743	SEMA6A	9	136131415	T	C	End stage coagulation	European	23381943
rs8176743	SEMA6A	9	136131415	T	C	Intraocular pressure	Mixed	25173106
rs6770670	STOM	3	49686682	C	T	High light scatter percentage of red cells	European	27863252
rs6770670	STOM	3	49686682	C	T	High light scatter reticulocyte count	European	27863252
rs6770670	STOM	3	49686682	C	T	Immature fraction of reticulocytes	European	27863252
rs6770670	STOM	3	49686682	C	T	Mean corpuscular volume	European	27863252
rs6770670	STOM	3	49686682	C	T	Reticulocyte count	European	27863252
rs6770670	STOM	3	49686682	C	T	Reticulocyte fraction of red cells	European	27863252
rs6770670	STOM	3	49686682	C	T	Age first birth	European	27798627
rs6770670	STOM	3	49686682	C	T	Crohns disease	European	26192919
rs6770670	STOM	3	49686682	C	T	Inflammatory bowel disease	European	26192919
rs6770670	STOM	3	49686682	C	T	Ulcerative colitis	European	26192919
rs6770670	STOM	3	49686682	C	T	Primary sclerosing cholangitis	European	27992413
rs6770670	STOM	3	49686682	C	T	Age at menarche	European	25231870
rs6770670	STOM	3	49686682	C	T	Years of educational attainment in females	European	27225129
rs6770670	STOM	3	49686682	C	T	Years of educational attainment in males	European	27225129

rs6770670	STOM	3	49686682	C	T	Years of educational attainment	European	27225129
rs7971133	SULF2	12	57770098	C	T	Coronary artery disease	Mixed	29212778
rs10424405	SULF2	19	54321933	A	G	Granulocyte percentage of myeloid white cells	European	27863252
rs10424405	SULF2	19	54321933	A	G	Monocyte count	European	27863252
rs10424405	SULF2	19	54321933	A	G	Monocyte percentage of white cells	European	27863252
rs2519093	THSD1	9	136141870	C	T	Granulocyte count	European	27863252
rs2519093	THSD1	9	136141870	C	T	Hematocrit	European	27863252
rs2519093	THSD1	9	136141870	C	T	Hemoglobin concentration	European	27863252
rs2519093	THSD1	9	136141870	C	T	Lymphocyte percentage of white cells	European	27863252
rs2519093	THSD1	9	136141870	C	T	Monocyte count	European	27863252
rs2519093	THSD1	9	136141870	C	T	Myeloid white cell count	European	27863252
rs2519093	THSD1	9	136141870	C	T	Neutrophil count	European	27863252
rs2519093	THSD1	9	136141870	C	T	Platelet distribution width	European	27863252
rs2519093	THSD1	9	136141870	C	T	Red blood cell count	European	27863252
rs2519093	THSD1	9	136141870	C	T	Red cell distribution width	European	27863252
rs2519093	THSD1	9	136141870	C	T	Sum basophil neutrophil counts	European	27863252
rs2519093	THSD1	9	136141870	C	T	Sum eosinophil basophil counts	European	27863252
rs2519093	THSD1	9	136141870	C	T	Sum neutrophil eosinophil counts	European	27863252
rs2519093	THSD1	9	136141870	C	T	White blood cell count	European	27863252
rs2519093	THSD1	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	THSD1	9	136141870	C	T	Myocardial infarction	Mixed	26343387
rs2519093	THSD1	9	136141870	C	T	Low density lipoprotein	European	24097068
rs2519093	THSD1	9	136141870	C	T	Total cholesterol	European	24097068
rs2519093	THSD1	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	THSD1	9	136141870	C	T	Venous thrombosis	European	22675575
rs2519093	THSD1	9	136141870	C	T	Allergy	European	27182965
rs2519093	THSD1	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	THSD1	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs2519093	THSD1	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	THSD1	9	136141870	C	T	Venous thromboembolism	European	28373160
rs2519093	THSD1	9	136141870	C	T	Coronary artery disease	Mixed	28714975
rs2519093	THSD1	9	136141870	C	T	High grade serous ovarian cancer	European	28346442
rs2519093	THSD1	9	136141870	C	T	Invasive ovarian cancer	European	28346442
rs2519093	THSD1	9	136141870	C	T	Serous invasive ovarian cancer	European	28346442
rs2519093	THSD1	9	136141870	C	T	Alkaline phosphatase	European	28887542

rs2519093	THSD1	9	136141870	C	T	Ferritin	European	28887542
rs2519093	THSD1	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs8176743	TIE1 (soluble)	9	136131415	T	C	Granulocyte percentage of myeloid white cells	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Hematocrit	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Hemoglobin concentration	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Mean corpuscular hemoglobin	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Mean corpuscular hemoglobin concentration	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Mean corpuscular volume	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Monocyte percentage of white cells	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Platelet count	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Plateletcrit	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Red blood cell count	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Red cell distribution width	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Reticulocyte count	European	27863252
rs8176743	TIE1 (soluble)	9	136131415	T	C	Low density lipoprotein	European	24097068
rs8176743	TIE1 (soluble)	9	136131415	T	C	Activated partial thromboplastin time	European	22703881
rs8176743	TIE1 (soluble)	9	136131415	T	C	Factor XIII antigen	European	23381943
rs8176743	TIE1 (soluble)	9	136131415	T	C	Hemoglobin Hb	Mixed	23222517
rs8176743	TIE1 (soluble)	9	136131415	T	C	Plasma carcinoembryonic antigen CEA levels	East Asian	23300138
rs8176743	TIE1 (soluble)	9	136131415	T	C	Red blood cell count RBC	Mixed	23222517
rs8176743	TIE1 (soluble)	9	136131415	T	C	von Willebrand factor vWF	European	23381943
rs8176743	TIE1 (soluble)	9	136131415	T	C	End stage coagulation	European	23381943
rs8176743	TIE1 (soluble)	9	136131415	T	C	Intraocular pressure	Mixed	25173106
rs8176747	TLL1	9	136131315	G	C	Granulocyte percentage of myeloid white cells	European	27863252
rs8176747	TLL1	9	136131315	G	C	Hematocrit	European	27863252
rs8176747	TLL1	9	136131315	G	C	Hemoglobin concentration	European	27863252
rs8176747	TLL1	9	136131315	G	C	Mean corpuscular hemoglobin	European	27863252
rs8176747	TLL1	9	136131315	G	C	Mean corpuscular hemoglobin concentration	European	27863252
rs8176747	TLL1	9	136131315	G	C	Mean corpuscular volume	European	27863252
rs8176747	TLL1	9	136131315	G	C	Monocyte percentage of white cells	European	27863252
rs8176747	TLL1	9	136131315	G	C	Neutrophil percentage of white cells	European	27863252
rs8176747	TLL1	9	136131315	G	C	Platelet count	European	27863252
rs8176747	TLL1	9	136131315	G	C	Plateletcrit	European	27863252
rs8176747	TLL1	9	136131315	G	C	Red blood cell count	European	27863252
rs8176747	TLL1	9	136131315	G	C	Red cell distribution width	European	27863252

rs8176747	TLL1	9	136131315	G	C	Reticulocyte count	European	27863252
rs8176747	TLL1	9	136131315	G	C	Activated partial thromboplastin time	European	22703881
rs8176747	TLL1	9	136131315	G	C	Factor XIII antigen	European	23381943
rs8176747	TLL1	9	136131315	G	C	Hemoglobin Hb	Mixed	23222517
rs8176747	TLL1	9	136131315	G	C	Plasma carcinoembryonic antigen CEA levels	East Asian	23300138
rs8176747	TLL1	9	136131315	G	C	Red blood cell count RBC	Mixed	23222517
rs8176747	TLL1	9	136131315	G	C	von Willebrand factor vWF	European	23381943
rs8176747	TLL1	9	136131315	G	C	Platelet count	European	27863252
rs8176747	TLL1	9	136131315	G	C	Reticulocyte count	European	27863252
rs3197999	TMPRSS11D	3	49721532	G	A	High light scatter percentage of red cells	European	27863252
rs3197999	TMPRSS11D	3	49721532	G	A	High light scatter reticulocyte count	European	27863252
rs3197999	TMPRSS11D	3	49721532	G	A	Immature fraction of reticulocytes	European	27863252
rs3197999	TMPRSS11D	3	49721532	G	A	Reticulocyte count	European	27863252
rs3197999	TMPRSS11D	3	49721532	G	A	Reticulocyte fraction of red cells	European	27863252
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	18587394
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	19915574
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	21102463
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	21150878
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	21297633
rs3197999	TMPRSS11D	3	49721532	G	A	Inflammatory bowel disease	European	23128233
rs3197999	TMPRSS11D	3	49721532	G	A	Irritable bowel disorder	European	19915574
rs3197999	TMPRSS11D	3	49721532	G	A	Primary sclerosing cholangitis	European	21151127
rs3197999	TMPRSS11D	3	49721532	G	A	Primary sclerosing cholangitis	European	23603763
rs3197999	TMPRSS11D	3	49721532	G	A	Selective immunoglobulin A deficiency IgAD	European	20694011
rs3197999	TMPRSS11D	3	49721532	G	A	Ulcerative colitis	European	20228799
rs3197999	TMPRSS11D	3	49721532	G	A	Ulcerative colitis	European	21297633
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	23128233
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	26192919
rs3197999	TMPRSS11D	3	49721532	G	A	Inflammatory bowel disease	European	26192919
rs3197999	TMPRSS11D	3	49721532	G	A	Ulcerative colitis	European	23128233
rs3197999	TMPRSS11D	3	49721532	G	A	Ulcerative colitis	European	26192919
rs3197999	TMPRSS11D	3	49721532	G	A	Primary sclerosing cholangitis	European	27992413
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	18587394
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	21102463
rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	European	26192919

rs3197999	TMPRSS11D	3	49721532	G	A	Crohns disease	Mixed	28067908
rs3197999	TMPRSS11D	3	49721532	G	A	Inflammatory bowel disease	European	23128233
rs3197999	TMPRSS11D	3	49721532	G	A	Inflammatory bowel disease	Mixed	28067908
rs3197999	TMPRSS11D	3	49721532	G	A	Primary sclerosing cholangitis	European	21151127
rs3197999	TMPRSS11D	3	49721532	G	A	Primary sclerosing cholangitis	European	27992413
rs3197999	TMPRSS11D	3	49721532	G	A	Ulcerative colitis	European	20228799
rs3197999	TMPRSS11D	3	49721532	G	A	Ulcerative colitis	European	26192919
rs3197999	TMPRSS11D	3	49721532	G	A	Ulcerative colitis	Mixed	28067908
rs3197999	TMPRSS11D	3	49721532	G	A	Age at menarche	European	25231870
rs3197999	TMPRSS11D	3	49721532	G	A	Years of educational attainment in females	European	27225129
rs3197999	TMPRSS11D	3	49721532	G	A	Years of educational attainment in males	European	27225129
rs3197999	TMPRSS11D	3	49721532	G	A	Years of educational attainment	European	27225129
rs3197999	TMPRSS11D	3	49721532	G	A	Cholangitis sclerosing	European	21151127
rs3197999	TMPRSS11D	3	49721532	G	A	Colitis ulcerative	European	20228799
rs3197999	TMPRSS11D	3	49721532	G	A	Crohn disease	European	18587394
rs3197999	TNS2	3	49721532	G	A	High light scatter percentage of red cells	European	27863252
rs3197999	TNS2	3	49721532	G	A	High light scatter reticulocyte count	European	27863252
rs3197999	TNS2	3	49721532	G	A	Immature fraction of reticulocytes	European	27863252
rs3197999	TNS2	3	49721532	G	A	Reticulocyte count	European	27863252
rs3197999	TNS2	3	49721532	G	A	Reticulocyte fraction of red cells	European	27863252
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	18587394
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	19915574
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	21102463
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	21150878
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	21297633
rs3197999	TNS2	3	49721532	G	A	Inflammatory bowel disease	European	23128233
rs3197999	TNS2	3	49721532	G	A	Irritable bowel disorder	European	19915574
rs3197999	TNS2	3	49721532	G	A	Primary sclerosing cholangitis	European	21151127
rs3197999	TNS2	3	49721532	G	A	Primary sclerosing cholangitis	European	23603763
rs3197999	TNS2	3	49721532	G	A	Selective immunoglobulin A deficiency IgAD	European	20694011
rs3197999	TNS2	3	49721532	G	A	Ulcerative colitis	European	20228799
rs3197999	TNS2	3	49721532	G	A	Ulcerative colitis	European	21297633
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	23128233
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	26192919
rs3197999	TNS2	3	49721532	G	A	Inflammatory bowel disease	European	26192919

rs3197999	TNS2	3	49721532	G	A	Ulcerative colitis	European	23128233
rs3197999	TNS2	3	49721532	G	A	Ulcerative colitis	European	26192919
rs3197999	TNS2	3	49721532	G	A	Primary sclerosing cholangitis	European	27992413
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	18587394
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	21102463
rs3197999	TNS2	3	49721532	G	A	Crohns disease	European	26192919
rs3197999	TNS2	3	49721532	G	A	Crohns disease	Mixed	28067908
rs3197999	TNS2	3	49721532	G	A	Inflammatory bowel disease	European	23128233
rs3197999	TNS2	3	49721532	G	A	Inflammatory bowel disease	Mixed	28067908
rs3197999	TNS2	3	49721532	G	A	Primary sclerosing cholangitis	European	21151127
rs3197999	TNS2	3	49721532	G	A	Primary sclerosing cholangitis	European	27992413
rs3197999	TNS2	3	49721532	G	A	Ulcerative colitis	European	20228799
rs3197999	TNS2	3	49721532	G	A	Ulcerative colitis	European	26192919
rs3197999	TNS2	3	49721532	G	A	Ulcerative colitis	Mixed	28067908
rs3197999	TNS2	3	49721532	G	A	Age at menarche	European	25231870
rs3197999	TNS2	3	49721532	G	A	Years of educational attainment in females	European	27225129
rs3197999	TNS2	3	49721532	G	A	Years of educational attainment in males	European	27225129
rs3197999	TNS2	3	49721532	G	A	Years of educational attainment	European	27225129
rs3197999	TNS2	3	49721532	G	A	Cholangitis sclerosing	European	21151127
rs3197999	TNS2	3	49721532	G	A	Colitis ulcerative	European	20228799
rs3197999	TNS2	3	49721532	G	A	Crohn disease	European	18587394
rs115478735	TPST2	9	136149711	A	T	Granulocyte count	European	27863252
rs115478735	TPST2	9	136149711	A	T	Hematocrit	European	27863252
rs115478735	TPST2	9	136149711	A	T	Hemoglobin concentration	European	27863252
rs115478735	TPST2	9	136149711	A	T	Lymphocyte percentage of white cells	European	27863252
rs115478735	TPST2	9	136149711	A	T	Monocyte count	European	27863252
rs115478735	TPST2	9	136149711	A	T	Myeloid white cell count	European	27863252
rs115478735	TPST2	9	136149711	A	T	Neutrophil count	European	27863252
rs115478735	TPST2	9	136149711	A	T	Platelet distribution width	European	27863252
rs115478735	TPST2	9	136149711	A	T	Red blood cell count	European	27863252
rs115478735	TPST2	9	136149711	A	T	Red cell distribution width	European	27863252
rs115478735	TPST2	9	136149711	A	T	Sum basophil neutrophil counts	European	27863252
rs115478735	TPST2	9	136149711	A	T	Sum eosinophil basophil counts	European	27863252
rs115478735	TPST2	9	136149711	A	T	Sum neutrophil eosinophil counts	European	27863252
rs115478735	TPST2	9	136149711	A	T	White blood cell count	European	27863252

rs115478735	TPST2	9	136149711	A	T	High grade serous ovarian cancer	European	28346442
rs115478735	TPST2	9	136149711	A	T	Invasive ovarian cancer	European	28346442
rs115478735	TPST2	9	136149711	A	T	Serous invasive ovarian cancer	European	28346442
rs34436714	TPST2	19	54327313	A	C	Granulocyte percentage of myeloid white cells	European	27863252
rs34436714	TPST2	19	54327313	A	C	Monocyte count	European	27863252
rs34436714	TPST2	19	54327313	A	C	Monocyte percentage of white cells	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Basophil count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Eosinophil count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Eosinophil percentage of granulocytes	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Eosinophil percentage of white cells	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Granulocyte count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Hematocrit	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Hemoglobin concentration	European	27863252
rs3184504	VCAM1	12	111884608	C	T	High light scatter percentage of red cells	European	27863252
rs3184504	VCAM1	12	111884608	C	T	High light scatter reticulocyte count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Immature fraction of reticulocytes	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Lymphocyte count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Lymphocyte percentage of white cells	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Monocyte count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Myeloid white cell count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Neutrophil count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Neutrophil percentage of granulocytes	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Neutrophil percentage of white cells	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Platelet count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Plateletcrit	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Red blood cell count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Reticulocyte count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Reticulocyte fraction of red cells	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Sum basophil neutrophil counts	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Sum eosinophil basophil counts	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Sum neutrophil eosinophil counts	European	27863252
rs3184504	VCAM1	12	111884608	C	T	White blood cell count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	Mixed	27618447
rs3184504	VCAM1	12	111884608	C	T	Hypertension	Mixed	27618447
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	23202125

rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	26343387
rs3184504	VCAM1	12	111884608	C	T	Myocardial infarction	Mixed	26343387
rs3184504	VCAM1	12	111884608	C	T	log eGFR cystatin C	European	26831199
rs3184504	VCAM1	12	111884608	C	T	Maternal effects on offspring birthweight	European	29309628
rs3184504	VCAM1	12	111884608	C	T	Body mass index	European	29273807
rs3184504	VCAM1	12	111884608	C	T	Body mass index	Mixed	29273807
rs3184504	VCAM1	12	111884608	C	T	High density lipoprotein	European	24097068
rs3184504	VCAM1	12	111884608	C	T	Low density lipoprotein	European	24097068
rs3184504	VCAM1	12	111884608	C	T	Low density lipoprotein	Mixed	20686565
rs3184504	VCAM1	12	111884608	C	T	Total cholesterol	European	24097068
rs3184504	VCAM1	12	111884608	C	T	Total cholesterol	Mixed	20686565
rs3184504	VCAM1	12	111884608	C	T	Blood eosinophil count	Mixed	19198610
rs3184504	VCAM1	12	111884608	C	T	Celiac disease	European	20190752
rs3184504	VCAM1	12	111884608	C	T	Celiac disease	European	21383967
rs3184504	VCAM1	12	111884608	C	T	Celiac disease	Mixed	22057235
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	European	19820697
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	23202125
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease age 50	Mixed	23202125
rs3184504	VCAM1	12	111884608	C	T	Cystatin C in serum	European	20383146
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	European	19430479
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	African	21378095
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	European	21909110
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	European	21909115
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	Mixed	23202125
rs3184504	VCAM1	12	111884608	C	T	Eosinophil count	Mixed	19198610
rs3184504	VCAM1	12	111884608	C	T	Gene expression of CUX2 in prefrontal cortex	European	21909115
rs3184504	VCAM1	12	111884608	C	T	Gene expression of CUX2 in visual cortex	European	21909115
rs3184504	VCAM1	12	111884608	C	T	Generalized vitiligo	European	22561518
rs3184504	VCAM1	12	111884608	C	T	Hematocrit Hct	European	19862010
rs3184504	VCAM1	12	111884608	C	T	Hematocrit Hct	Mixed	23222517
rs3184504	VCAM1	12	111884608	C	T	Hemoglobin Hb	European	19862010
rs3184504	VCAM1	12	111884608	C	T	Hemoglobin Hb	European	22139419
rs3184504	VCAM1	12	111884608	C	T	Hemoglobin Hb	Mixed	23222517
rs3184504	VCAM1	12	111884608	C	T	Hypertension	African	21347282
rs3184504	VCAM1	12	111884608	C	T	Hypothyroidism	European	22493691

rs3184504	VCAM1	12	111884608	C	T	Juvenile idiopathic arthritis including oligoarticular and rheumatoid factor negative polyarticular JIA	European	23603761
rs3184504	VCAM1	12	111884608	C	T	LDL cholesterol	Mixed	20686565
rs3184504	VCAM1	12	111884608	C	T	LDL cholesterol	European	23063622
rs3184504	VCAM1	12	111884608	C	T	LDL cholesterol	Mixed	23202125
rs3184504	VCAM1	12	111884608	C	T	Lymphocyte count	Mixed	19198610
rs3184504	VCAM1	12	111884608	C	T	Mean arterial pressure	European	21909110
rs3184504	VCAM1	12	111884608	C	T	Myocardial infarction	European	19820697
rs3184504	VCAM1	12	111884608	C	T	Plasma Beta 2 microglobulin levels	European	23417110
rs3184504	VCAM1	12	111884608	C	T	Platelet count PLT	Mixed	19198610
rs3184504	VCAM1	12	111884608	C	T	Platelet count PLT	European	19820697
rs3184504	VCAM1	12	111884608	C	T	Platelet count PLT	European	22139419
rs3184504	VCAM1	12	111884608	C	T	Primary biliary cirrhosis	European	22961000
rs3184504	VCAM1	12	111884608	C	T	Primary sclerosing cholangitis	European	23603763
rs3184504	VCAM1	12	111884608	C	T	Red blood cell count RBC	European	22139419
rs3184504	VCAM1	12	111884608	C	T	Red blood cell count RBC	Mixed	23222517
rs3184504	VCAM1	12	111884608	C	T	Retinal venular caliber	European	21060863
rs3184504	VCAM1	12	111884608	C	T	Rheumatoid arthritis and celiac disease	European	21383967
rs3184504	VCAM1	12	111884608	C	T	Selective immunoglobulin A deficiency IgAD	European	20694011
rs3184504	VCAM1	12	111884608	C	T	Serum urate	European	23263486
rs3184504	VCAM1	12	111884608	C	T	Soluble intercellular adhesion molecule 1 ICAM 1	European	21533024
rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure	European	19430479
rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure	African	21378095
rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure	European	21909110
rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure	European	21909115
rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure	Mixed	23202125
rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure and diastolic blood pressure	European	19862010
rs3184504	VCAM1	12	111884608	C	T	Total cholesterol	Mixed	20686565
rs3184504	VCAM1	12	111884608	C	T	Total cholesterol	European	23063622
rs3184504	VCAM1	12	111884608	C	T	Total cholesterol	Mixed	23202125
rs3184504	VCAM1	12	111884608	C	T	Type 1 diabetes	European	19430480
rs3184504	VCAM1	12	111884608	C	T	Type 1 diabetes	Mixed	21829393
rs3184504	VCAM1	12	111884608	C	T	Type 1 diabetes	European	21980299
rs3184504	VCAM1	12	111884608	C	T	Serum urate	European	23263486
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	European	28530674
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	28530674

rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	European	21909115
rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure	European	21909115
rs3184504	VCAM1	12	111884608	C	T	Primary sclerosing cholangitis	European	27992413
rs3184504	VCAM1	12	111884608	C	T	Beta 2 microglobulin plasma levels	European	23417110
rs3184504	VCAM1	12	111884608	C	T	Blood metabolite levels	European	24816252
rs3184504	VCAM1	12	111884608	C	T	Colorectal cancer	Mixed	26151821
rs3184504	VCAM1	12	111884608	C	T	Colorectal or endometrial cancer	European	26621817
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	26343387
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	29212778
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	European	19430479
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	European	21909115
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	Mixed	26390057
rs3184504	VCAM1	12	111884608	C	T	Diastolic blood pressure	European	28739976
rs3184504	VCAM1	12	111884608	C	T	Eosinophil counts	Mixed	19198610
rs3184504	VCAM1	12	111884608	C	T	Fibrinogen levels	European	28107422
rs3184504	VCAM1	12	111884608	C	T	Granulocyte count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Hematocrit	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Hemoglobin concentration	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Hemoglobin levels	Mixed	28017375
rs3184504	VCAM1	12	111884608	C	T	Hypothyroidism	European	22493691
rs3184504	VCAM1	12	111884608	C	T	Inflammatory bowel disease	European	26192919
rs3184504	VCAM1	12	111884608	C	T	Lymphocyte counts	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Myeloid white cell count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Neutrophil count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Platelet count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Platelet counts	European	22139419
rs3184504	VCAM1	12	111884608	C	T	Platelet counts	European	24026423
rs3184504	VCAM1	12	111884608	C	T	Plateletcrit	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Primary sclerosing cholangitis	European	27992413
rs3184504	VCAM1	12	111884608	C	T	Red blood cell count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Red blood cell traits	Mixed	23222517
rs3184504	VCAM1	12	111884608	C	T	Reticulocyte count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Sum basophil neutrophil counts	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Sum neutrophil eosinophil counts	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure	European	19430479

rs3184504	VCAM1	12	111884608	C	T	Systolic blood pressure	European	28739976
rs3184504	VCAM1	12	111884608	C	T	Tonsillectomy	European	27182965
rs3184504	VCAM1	12	111884608	C	T	Tonsillectomy	European	28928442
rs3184504	VCAM1	12	111884608	C	T	Type 1 diabetes	European	19430480
rs3184504	VCAM1	12	111884608	C	T	Type 1 diabetes autoantibodies	Mixed	21829393
rs3184504	VCAM1	12	111884608	C	T	White blood cell count	European	27863252
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	28714975
rs3184504	VCAM1	12	111884608	C	T	Blood pressure	European	19430479
rs3184504	VCAM1	12	111884608	C	T	Blood pressure	European	19430479
rs3184504	VCAM1	12	111884608	C	T	Blood pressure	European	21909115
rs3184504	VCAM1	12	111884608	C	T	Diabetes mellitus type 1	European	19430480
rs3184504	VCAM1	12	111884608	C	T	Diabetes mellitus type 1	Mixed	21829393
rs3184504	VCAM1	12	111884608	C	T	Eosinophils	Mixed	19198610
rs3184504	VCAM1	12	111884608	C	T	Hypothyroidism	European	22493691
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	29212778
rs3184504	VCAM1	12	111884608	C	T	Coronary artery disease	Mixed	29212778
rs34231037	VEGFR2/KDR	4	55972946	A	G	Blood protein levels	European	28240269
rs635634	VEGFR2/KDR	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Hematocrit	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Hemoglobin concentration	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Lymphocyte percentage of white cells	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Monocyte count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Platelet distribution width	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Red blood cell count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Red cell distribution width	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Sum eosinophil basophil counts	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	White blood cell count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Coronary artery disease	Mixed	26343387
rs635634	VEGFR2/KDR	9	136155000	T	C	Myocardial infarction	Mixed	26343387
rs635634	VEGFR2/KDR	9	136155000	T	C	Low density lipoprotein	European	24097068
rs635634	VEGFR2/KDR	9	136155000	T	C	Low density lipoprotein	Mixed	20686565

rs635634	VEGFR2/KDR	9	136155000	T	C	Total cholesterol	European	24097068
rs635634	VEGFR2/KDR	9	136155000	T	C	Total cholesterol	Mixed	20686565
rs635634	VEGFR2/KDR	9	136155000	T	C	Circulating galectin 3 levels	European	23056639
rs635634	VEGFR2/KDR	9	136155000	T	C	Venous thrombosis	European	22675575
rs635634	VEGFR2/KDR	9	136155000	T	C	Cholesterol total	Mixed	20686565
rs635634	VEGFR2/KDR	9	136155000	T	C	Cholesterol total	European	24097068
rs635634	VEGFR2/KDR	9	136155000	T	C	GIP levels in response to oral glucose tolerance test 120 minutes	European	29093273
rs635634	VEGFR2/KDR	9	136155000	T	C	Granulocyte count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Ischemic stroke	European	27997041
rs635634	VEGFR2/KDR	9	136155000	T	C	LDL cholesterol	Mixed	20686565
rs635634	VEGFR2/KDR	9	136155000	T	C	LDL cholesterol	European	24097068
rs635634	VEGFR2/KDR	9	136155000	T	C	Myeloid white cell count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Neutrophil count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Sum basophil neutrophil counts	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Sum neutrophil eosinophil counts	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Tonsillectomy	European	27182965
rs635634	VEGFR2/KDR	9	136155000	T	C	Tonsillectomy	European	28928442
rs635634	VEGFR2/KDR	9	136155000	T	C	Type 2 diabetes	European	28566273
rs635634	VEGFR2/KDR	9	136155000	T	C	White blood cell count	European	27863252
rs635634	VEGFR2/KDR	9	136155000	T	C	Coronary artery disease	Mixed	28714975
rs635634	VEGFR2/KDR	9	136155000	T	C	High grade serous ovarian cancer	European	28346442
rs635634	VEGFR2/KDR	9	136155000	T	C	Invasive ovarian cancer	European	28346442
rs635634	VEGFR2/KDR	9	136155000	T	C	Serous invasive ovarian cancer	European	28346442
rs635634	VEGFR2/KDR	9	136155000	T	C	Alkaline phosphatase	European	28887542
rs635634	VEGFR2/KDR	9	136155000	T	C	Ferritin	European	28887542
rs635634	VEGFR2/KDR	9	136155000	T	C	Coronary artery disease	Mixed	29212778
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Granulocyte count	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Hematocrit	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Hemoglobin concentration	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Lymphocyte percentage of white cells	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Monocyte count	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Myeloid white cell count	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Neutrophil count	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Platelet distribution width	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Red blood cell count	European	27863252

rs2519093	VEGFR3/FLT4	9	136141870	C	T	Red cell distribution width	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Sum basophil neutrophil counts	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Sum eosinophil basophil counts	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Sum neutrophil eosinophil counts	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	White blood cell count	European	27863252
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Myocardial infarction	Mixed	26343387
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Low density lipoprotein	European	24097068
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Total cholesterol	European	24097068
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Venous thrombosis	European	22675575
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Allergy	European	27182965
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Coronary artery disease	Mixed	26343387
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Coronary artery disease	Mixed	29212778
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Venous thromboembolism	Mixed	22672568
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Venous thromboembolism	European	28373160
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Coronary artery disease	Mixed	28714975
rs2519093	VEGFR3/FLT4	9	136141870	C	T	High grade serous ovarian cancer	European	28346442
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Invasive ovarian cancer	European	28346442
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Serous invasive ovarian cancer	European	28346442
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Alkaline phosphatase	European	28887542
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Ferritin	European	28887542
rs2519093	VEGFR3/FLT4	9	136141870	C	T	Coronary artery disease	Mixed	29212778

