# Detection and replication of epistasis influencing transcription in humans

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#### Abstract

Epistasis is the phenomenon whereby one polymorphism's effect on a trait depends on other polymorphisms present in the genome. The extent to which epistasis influences complex traits and contributes to their variation<sup>2,3</sup> is a fundamental question in evolution and human genetics. Though epistasis has been demonstrated in artificial gene manipulation studies in model organisms, 4,5 and some examples have been reported in other species,<sup>6</sup> few convincing examples exist for epistasis amongst natural polymorphisms in human traits.<sup>7,8</sup> Its absence from empirical findings may simply be due to its low incidence in the genetic control of complex traits,<sup>2,3</sup> but an alternative view is that it has previously been too technically challenging to detect due to statistical power and computational issues.<sup>9</sup> Here we show that, using advanced computation techniques<sup>10</sup> and a gene expression study design, many instances of epistasis are found between common single nucleotide polymorphisms (SNPs). In a cohort of 846 individuals with data on 7339 gene expression levels in peripheral blood, we found 501 significant pairwise epistatic interactions between common SNPs acting on the expression levels of 238 genes  $(p < 2.91 \times 10^{-16})$ . We tested the discovery interactions for replication in two independent data sets. 11,12 Three hundred and forty-five interactions had replication interaction p-values that were more extreme than the 2.5% confidence interval of the distribution under the null hypothesis of no epistasis, with 30 significant at a conservative p < 0.05 Bonferroni level. There was evidence of functional enrichment for the interacting SNPs, for instance 44 of the genetic interactions are located within 2Mb of regions of known physical chromosome interactions<sup>13</sup> ( $p = 1.8 \times 10^{-10}$ ). Epistatic networks of three SNPs or more influence the expression levels of 129 genes, whereby one cis-acting SNP is modulated by several transacting SNPs. For example MBNL1 is influenced by an additive effect at rs13069559 which itself is masked by trans-SNPs on 14 different chromosomes, with nearly identical genotype-phenotype (GP) maps for each cis-trans interaction. This study presents the first evidence for multiple instances of epistatic genetic effects emerging from natural genetic variation in humans.

### Main text

In the genetic analysis of complex traits it is usual for SNP effects to be estimated using an additive model where they are assumed to contribute independently and cumulatively to the mean of a trait. This framework has been successful in identifying thousands of associations. He are to date, though its contribution to phenotypic variance is frequently the subject of debate, here is little empirical exploration of the role that epistasis plays in the architecture of complex traits in humans. Outside the prism of human association studies there is evidence for epistasis, not only at the molecular scale from artificially induced mutations but also at the evolutionary scale in fitness adaptation. and speciation. If

Methods are now available to overcome the computational problems involved in searching for epistasis, but its detection still remains problematic due to reduced statistical power. For example increased dependence on linkage disequilibrium (LD) between causal SNPs and observed SNPs, <sup>17,18</sup> increased model complexity in fitting interaction terms, <sup>19</sup> and more extreme significance thresholds to account for increased multiple testing<sup>9</sup> all make it more difficult to detect epistasis in comparison to additive effects. Thus, when combined with small genetic effect sizes, as is expected in most complex traits of interest, <sup>14</sup> the power to detect epistasis diminishes rapidly. There are two simple ways to overcome this problem. One is by using extremely large sample sizes; <sup>20</sup> another is by analysing traits that are likely to have large effect sizes among common variants. Because our focus was to ascertain the extent to which instances of epistasis occur amongst natural genetic variation we designed a study around the latter approach and searched for epistatic genetic effects that influence gene expression levels. Transcription levels can be measured for thousands of genes. These traits are largely heritable but on average less polygenic than high level phenotypes,<sup>21</sup> thus many genetic effects are relatively large, maximising the chance at detecting epistasis, should it exist.

In our discovery dataset (Brisbane Systems Genetics Study, BSGS<sup>22</sup>) of 846 individuals genotyped at 528,509 SNPs, we exhaustively tested every pair of SNPs for genetic interactions against each of 7339 expression traits in peripheral blood. After stringent filtering and multiple testing correction (5% significance threshold  $p < 2.91 \times 10^{-16}$ , Methods) we identified 501 putative genetic interactions influencing the expression levels of 238 genes (Supplementary Table ). Of the 501 discovery interactions, 434 had available data and passed filtering (Methods) in two independent replication datasets, Fehrmann<sup>12</sup> and the Estonian Genomics Centre University of Tartu (EGCUT), <sup>11</sup> in which we saw convincing evidence for replication. We used the summary statistics from the replication datasets to perform a meta analysis to obtain an independent p-value for the putative interactions, and 30 were significant after applying a Bonferroni correction for multiple testing (5% significance threshold p < 0.0001, Table 1). These significant interactions exhibited remarkable similarity in GP maps between all three datasets (Figure 1).

In addition, using the meta analysis from the replication samples only, we observed that 316 of the remaining 404 discovery SNPs had replication interaction p-values more extreme than the 2.5% confidence interval of the distribution under the null distribution of no epistatic effects ( $p << 1.0 \times 10^{-16}$ , Figure 2 and Supplementary Figure S1). The congruence of the epistatic networks in discovery and replication datasets is shown in Figure 3, demonstrating that these complex genetic patterns are common even across independent datasets. A further replication was attempted using the Centre for Health Discovery and Wellbeing (CHDWB) dataset, <sup>23</sup> but only 20 of the SNP pairs passed filtering because the sample size was small (n = 139), and likely due to insufficient power we found no evidence for replication (Supplementary Figure S5). It should be noted that although it is a necessary step to establish the veracity of the signals from the discovery set, replication of epistasis is difficult in practice because

the dependence on LD between observed SNPs and causal variants is up to three orders of magnitude higher than it is for independent additive effects. <sup>17, 18</sup> Therefore these results are encouraging with regards to the detection and replication of epistasis.

Though seldom the focus of association studies, SNPs with known main effects are often tested for additive  $\times$  additive genetic interactions, but our analysis shows that this is unlikely to be the most effective strategy for its detection. The majority of our discovery interactions comprised of one SNP that was significantly associated with the gene expression level in the discovery dataset, and one SNP that had no previous association (439 out of 501, Methods). Only nine interactions were between SNPs that both had known main effects while 64 were between SNPs that had no known main effects. Additionally, we observed that the largest epistatic variance component for the 501 interactions was equally divided amongst additive  $\times$  additive, additive  $\times$  dominance, dominance  $\times$  additive and dominance  $\times$  dominance at the discovery stage (p=0.22 for departure from expectation). This is not surprising because the patterns of epistasis used for statistical decomposition are not designed to resemble biological function.  $^{24}$ 

Of the discovery interactions, 47 were cis-cis acting (both SNPs were on the same chromosome as the expression gene), 441 were *cis-trans*-acting, and 13 were trans-trans-acting. We observed a wide range of significant GP maps (Figure 1) but the most common pattern of epistasis that we detected involved a trans-SNP masking the effect of an additive cis-SNP. For example, MBNL1 (involved in RNA modification and regulation of splicing<sup>25</sup>) has a cis effect at rs13069559 which in turn is controlled by 13 trans-SNPs and one cis-SNP that each exhibit a masking pattern, such that when the trans-SNP is homozygous for the masking allele the decreasing allele of the cis-SNP no longer has an effect (Supplementary Figure S6). Each of these interactions has evidence for replication in at least one dataset and six are significantly replicated at the Bonferroni level (Supplementary Figure S2). We see similar epistatic networks involving multiple (eight or more) trans-acting SNPs for other gene expresson levels too, for example TMEM149 (Supplementary Figure S7), NAPRT1 (Supplementary Figure S8), TRAPPC5 (Supplementary Figure S9), and CAST (Supplementary Figure S10). We observed that from pedigree analysis these five gene expression phenotypes had non-additive variance component estimates within the 95th percentile of the 17,994 gene expression phenotypes that were analysed previously<sup>21</sup> (Supplementary Table S2, Methods).

In total the 501 interactions comprised 781 unique SNPs, which we analysed for functional enrichment (Methods). We tested the SNPs for cell-type specific overlap with transcriptionally active chromatin regions, tagged by histone-3-lysine-4,tri-methylation (H3K4me3) chromatin marks, in 34 cell types  $^{26}$  (Supplementary Figure S4). There was significant enrichment for cis-acting SNPs in haematopoietic cell types only ( $p < 1 \times 10^{-4}$  for the three tissues with the strongest enrichment after adjusting for multiple testing). However trans-acting SNPs did not show any tissue specific enrichment (p > 0.1 for all tissues). This difference between cis and trans SNPs suggests different roles in epistatic in-

teractions where tissue specificity is provided by the *cis* SNPs. There is also enrichment for *cis*-SNPs to be localised in regions with regulatory genomic features as measured by chromatin states<sup>27</sup> (Supplementary Figure S3).

We also demonstrate physical organisation of interacting loci within the cell, suggesting a mechanism by which biological function can lead to epistatic genetic variance. It has been shown that different chromosomal regions spatially colocalise in the cell through chromatin interactions. We cross-referenced our epistatic SNPs with a map of chromosome interacting regions (n=96,139) in K562 blood cell lines (Methods) and found that 44 epistatic interactions mapped to within 2Mb ( $p<1.8\times10^{-10}$ ), (Supplementary Figure S11). Interaction of distant loci may occur through physical proximity in transcriptional factories that organise across different chromosome regions and can regulate transcription of related genes. <sup>29,30</sup>

Though we present many instances of epistasis, quantifying its relative importance to complex traits in humans remains an open question. In this study we are able to identify 238 gene expression traits with at least one significant interaction given our experiment-wide threshold. How does this compare to the number of traits influenced by additive effects? The BSGS dataset has been previously analysed for additive effects at all expression traits,  $^{22}$  and if we take all the additive eQTLs that were significant at the epistatic threshold of  $p < 2.91 \times 10^{-16}$  we find that 453 gene expression levels out of the 7339 analysed had at least one significant expression quantitative trait locus (eQTL). Therefore it can be argued that the number of instances of detectable epistasis are substantial.

However in terms of their contribution to complex traits a more important metric might be the proportion of the variance that the epistatic loci explain.<sup>2</sup> Ideally one would approach this question from a whole genome perspective<sup>31</sup> but this is intractable for non-additive variance components. Nevertheless, some inference can be made from the ascertained effects in these analyses and it is evident that additive variance is overall a larger component than epistatic variance, as has been argued previously.<sup>2,3</sup> Taking the additive effects detected in Powell et al (2012) at the  $p < 2.91 \times 10^{-16}$  threshold, we calculate that on average they explain 1.73% of the phenotypic variance of each of the 7339 probes. By contrast, the epistatic variance from the interacting SNPs detected in this study on average explain 0.25\% of phenotypic variance, approximately seven times lower than the additive variance. There are several caveats to this comparison. Firstly, the ratio of additive to epistatic variance may differ at different effect sizes, and our estimate is determined by the threshold used. Secondly, the power of a 1 d.f. test exceeds that of an 8 d.f. test. And thirdly, the non-additive variance at causal variants is expected to be underestimated by observed SNPs in comparison to estimates for additive variance, due to differences in the rate of decay of the estimate of the genetic variance of the causal SNPs as LD decreases with the observed SNPs.

Overall, we have demonstrated that it is possible to identify and replicate epistasis in complex traits amongst common human variants, despite the relative contribution of pairwise epistasis to phenotypic variation being small. The

bioinformatic analysis of the significant epistatic loci suggests that there are a large number of possible mechanisms that can lead to non-additive genetic variation. Further research into such epistatic effects may provide a useful framework to understanding molecular mechanisms and complex trait variation in greater detail. With computational techniques and data now widely available the search for epistasis in larger datasets for traits of broader interest is warranted.

## **Methods Summary**

We searched for pairwise epistasis exhaustively in the BSGS discovery dataset, <sup>22</sup> which comprises 846 individuals who are genotyped at 528,509 autosomal SNPs. Each individual had gene expression levels measured in peripheral blood at 47,323 probes. Only the probes that passed quality control and had significant expression in > 90% of individuals were used in the analysis (7,339 probes representing 6,158 RefSeq genes). Recent hardware and software <sup>10</sup> advances that use graphics processing units (GPUs) made it possible to perform the  $1.03 \times 10^{15}$  statistical tests to complete this analysis. We used permutation analysis<sup>32</sup> to calculate an experiment-wide significance threshold of  $T_e = 2.91 \times$  $10^{-16}$  at the 5% family-wise error rate (FWER). SNP pairs were modelled for full genetic effects, including marginal additive and dominance at both SNPs plus four interaction terms. Though we could have used a less complex model to improve statistical efficiency, we deemed it important to be agnostic about the type of epistasis that might exist, and therefore chose not to over-parameterise the test. 18,19 Because there are many large marginal effects present in these data it was necessary to perform several filtering steps to exclude SNP pairs that were significant due to marginal effects alone. All SNP pairs with LD  $r^2 > 0.1$  and  $D'^2 > 0.1$  were removed to minimise the possibility of haplotype effects. All SNP pairs were required to have at least five data points in all nine genotype classes. If multiple SNP pairs were present on the same chromosomes for a particular expression trait then only the sentinel SNP pair was retained. Finally, a nested test contrasting the full genetic model against the marginal additive and dominance model was performed for each remaining SNP pair (Methods), resulting in 501 significant interactions after Bonferroni correction for multiple testing of the filtered SNPs. The significant SNP pairs were carried forward for replication in two independent datasets that used the same expression assays for analysing transcription in peripheral blood, the Fehrmann dataset (n = 1)1240) and the Estonian Genome Centre University of the University of Tartu (EGCUT) dataset<sup>11</sup> (n = 891). Of these, 434 passed filtering in both replication datasets. A meta analysis on the interaction p-values from each replication dataset was performed to provide an overall replication statistic for each putative interaction.

#### Acknowledgements

We are grateful to the volunteers for their generous participation in these studies. We thank Bill Hill, Chris Haley and Lars Ronnegard for helpful discussions and

comments.

This work could not have been completed without access to high performance GPGPU compute clusters. We acknowledge iVEC for the use of advanced computing resources located at iVEC@UWA (www.ivec.org), and the Multimodal Australian ScienceS Imaging and Visualisation Environment (MASSIVE) (www.massive.org.au). We also thank Jake Carroll and Irek Porebski from the Queensland Brain Institute Information Technology Group for HPC support.

The University of Queensland group is supported by the Australian National Health and Medical Research Council (NHMRC) grants 389892, 496667, 613601, 1010374 and 1046880, the Australian Research Council (ARC) grant (DE130100691), and by National Institutes of Health (NIH) grants GM057091 and GM099568.

The QIMR researchers acknowledge funding from the Australian National Health and Medical Research Council (grants 241944, 389875, 389891, 389892, 389938, 442915, 442981, 496739, 496688 and 552485), the and the National Institutes of Health (grants AA07535, AA10248, AA014041, AA13320, AA13321, AA13326 and DA12854). We thank Anthony Caracella and Lisa Bowdler for technical assistance with the micro-array hybridisations.

The CHDWB study funding support from the Georgia Institute of Technology Research Foundation. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript

The Fehrmann study was supported by grants from the Celiac Disease Consortium (an innovative cluster approved by the Netherlands Genomics Initiative and partly funded by the Dutch Government (grant BSIK03009), the Netherlands Organization for Scientific Research (NWO-VICI grant 918.66.620, NWO-VENI grant 916.10.135 to L.F.), the Dutch Digestive Disease Foundation (MLDS WO11-30), and a Horizon Breakthrough grant from the Netherlands Genomics Initiative (grant 92519031 to L.F.). This project was supported by the Prinses Beatrix Fonds, VSB fonds, H. Kersten and M. Kersten (Kersten Foundation), The Netherlands ALS Foundation, and J.R. van Dijk and the Adessium Foundation. The research leading to these results has received funding from the European Communitys Health Seventh Framework Programme (FP7/2007-2013) under grant agreement 259867.

The EGCUT study received targeted financing from Estonian Government SF0180142s08, Center of Excellence in Genomics (EXCEGEN) and University of Tartu (SP1GVARENG). We acknowledge EGCUT technical personnel, especially Mr V. Soo and S. Smit. Data analyzes were carried out in part in the High Performance Computing Center of University of Tartu.

## Tables

Table 1: Epistatic interactions significant at the Bonferroni level in two replication sets

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	Gene (chr.)	SNP 1 (chr.)	SNP 2 (chr.)	$\mathrm{BSGS}^2$			$Meta^4$
1	ADK (10)	rs2395095 (10)	rs10824092 (10)	$6.69^{1}$	$18.33^{1}$	$21.21^{1}$	$39.82^{1}$
2	ATP13A1 (19)	rs4284750 (19)	rs873870 (19)	5.30	12.18	3.25	14.23
3	C21ORF57(21)	rs9978658 (21)	rs11701361 (21)	9.42	6.08	16.36	21.67
$^4$	CSTB $(21)$	rs9979356 (21)	rs3761385 (21)	11.99	25.20	16.72	42.27
5	CTSC (11)	rs7930237 (11)	rs556895 (11)	7.16	18.76	15.06	33.53
6	FN3KRP (17)	rs898095 (17)	rs9892064 (17)	16.16	28.24	29.39	59.95
7	GAA (17)	rs11150847 (17)	rs12602462 (17)	13.91	19.98	12.99	32.60
8	HNRPH1 (5)	rs6894268 (5)	rs4700810 (5)	15.38	8.55	3.01	10.37
9	LAX1 (1)	rs1891432 (1)	rs10900520 (1)	19.16	18.60	11.22	29.24
10	MBNL1(3)	rs16864367 (3)	rs13079208 (3)	13.49	16.25	24.74	41.56
11	MBNL1(3)	rs7710738 (5)	rs13069559 (3)	7.92	2.55	7.89	9.28
12	MBNL1(3)	rs2030926 (6)	rs13069559 (3)	7.10	0.91	5.80	5.53
13	MBNL1 (3)	rs2614467 (14)	rs13069559 (3)	5.74	4.13	2.22	5.30
14	MBNL1 (3)	rs218671 (17)	rs13069559 (3)	7.63	0.62	5.82	5.23
15	MBNL1(3)	rs11981513 (7)	rs13069559 (3)	7.71	0.43	5.36	4.58
16	MBP (18)	rs8092433 (18)	rs4890876 (18)	5.40	7.06	21.91	28.73
17	NAPRT1 (8)	rs2123758 (8)	rs3889129 (8)	8.45	15.12	16.08	30.77
18	NCL (2)	rs7563453 (2)	rs4973397 (2)	7.31	7.51	6.33	12.70
19	PRMT2 (21)	rs2839372 (21)	rs11701058 (21)	4.81	0.69	4.47	4.06
20	RPL13 (16)	rs352935 (16)	rs2965817 (16)	4.98	3.79	14.41	17.24
21	SNORD14A (11)	rs2634462 (11)	rs6486334 (11)	7.31	13.11	10.96	23.22
22	TMEM149 (19)	rs807491 (19)	rs7254601 (19)	12.16	81.55	45.78	145.78
23	TMEM149 (19)	rs8106959 (19)	rs6926382 (6)	5.80	3.06	8.80	10.72
24	TMEM149 (19)	rs8106959 (19)	rs914940 (1)	6.22	3.36	6.96	9.20
25	TMEM149 (19)	rs8106959 (19)	rs2351458 (4)	7.30	0.04	9.61	8.00
26	TMEM149 (19)	rs8106959 (19)	rs6718480 (2)	8.55	3.31	5.15	7.36
27	TMEM149 (19)	rs8106959 (19)	rs1843357 (8)	6.21	3.72	3.33	6.00
28	TMEM149 (19)	rs8106959 (19)	rs9509428 (13)	9.44	0.10	5.75	4.47
29	TRA2A (7)	rs7776572 (7)	rs11770192 (7)	8.23	3.19	1.89	4.09
30	VASP (19)	rs1264226 (19)	rs2276470 (19)	5.09	0.94	5.14	4.95

 $<sup>^{1}</sup>$  - log<sub>10</sub> p-values for 4 d.f. interaction tests  $^{2}$  Discovery dataset

 <sup>&</sup>lt;sup>3</sup> Independent replication dataset
 <sup>4</sup> Meta analysis of interaction terms between replication datasets only

## **Figures**

Figure 1: Replication of GP maps in two independent populations The GP maps for each epistatic interaction that is significant at the Bonferroni level in both replication datasets are shown. Each GP map consists of nine tiles where each tile represents the expression level for that two-locus genotype class. Phenotypes are for gene transcript levels (dark coloured tiles = high expression, light coloured tiles = low expression). Columns of GP maps are for each independent dataset. Rows of GP maps are for each of 30 significantly replicated interactions at the Bonferroni level, corresponding to the rows in Table 1. There is a clear trend of the GP maps replicating across all three datasets.

Figure 2: Q-Q plots of interaction p-values from replication datasets. The top panel shows all 434 discovery SNPs that were tested for interactions. Observed p-values (y-axis,  $-\log_{10}$  scale) are plotted against the expected p-values (x-axis,  $-\log_{10}$  scale). The multiple testing correction threshold for significance following Bonferroni correction is denoted by a dotted line. The bottom panel shows the same data as the top panel but excluding the 30 interactions that were significant at the Bonferroni level in the replication datasets. The shaded grey area represents the 5% confidence interval for the expected distribution of p-values. Dark blue points represent p-values that exceed the confidence interval, light blue are within the confidence interval.

Figure 3: Discovery and replication of epistatic networks All 434 putative genetic interactions (edges) with data common to discovery and replication sets is shown, where black nodes represent SNPs and red nodes represent traits (gene expression probes). Three hundred and forty-five interactions had p-values exceeding the 2.5% confidence interval following meta analysis of the replication data The remaining 89 interactions that did not replicate are depicted in grey. It is evident that a large proportion of the complex networks identified in the discovery set also exist in independent populations.

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## Supplementary Figures

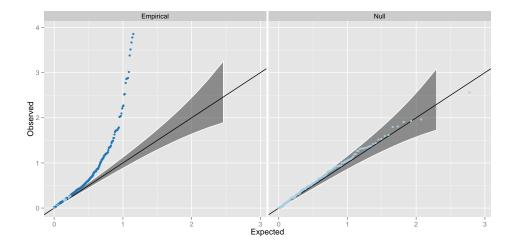


Figure S1: Q-Q plots of interaction p-values from replication datasets, excluding the 30 points significant at the Bonferroni level The right panel (Null) shows the interaction p-values from a meta analysis across two independent datasets on 434 randomly drawn SNP pairs. The left panel (Empirical) shows the interaction p-values from the 404 putative interactions that were not significant at the Bonferroni correction threshold. Dark blue points represent p-values that surpass the 2.5% FDR level, as in Figure 2.

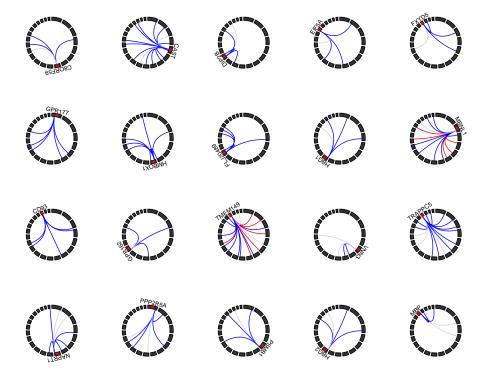


Figure S2: Gene expression traits with four or more genetic interactions Circle plots represent the genomic positions for SNPs (linking lines) and expression probes (red points). Chromosomes are represented by black blocks and ordered from 1 to 22 clockwise, starting from the top. Grey lines represent no evidence for replication, blue lines denote interactions that are outside the 97.5% confidence interval or the Q-Q plot (Figure 2), and red lines denote replication at the Bonferroni correction level. Most interactions are characterised as being cis-trans to the expression probe.



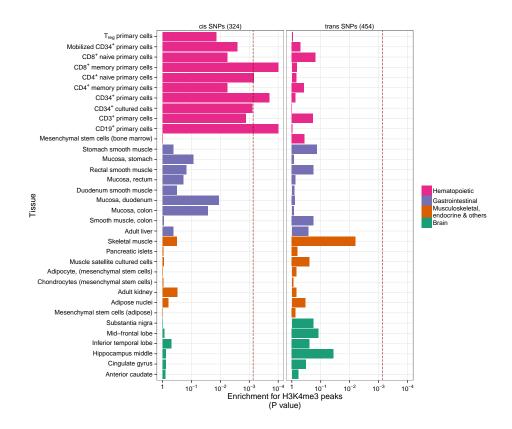


Figure S4: Tissue specific enrichment of SNPs in transcriptionally active regions The locations of transcriptional activity can be predicted by chromatin marks, assayed by  $\rm H3K4me3.^{26}$  Enrichment p-values are calculated using permutation analysis for 34 different cell types (y-axis) in four tissue types (Rows of boxes). The dotted red line denotes significance (Bonferroni correction for 34 cell types, x-axis). There is enrichment for cis-acting SNPs in Haematopoietic tissue types only. Trans-acting SNPs have no tissue specificity.

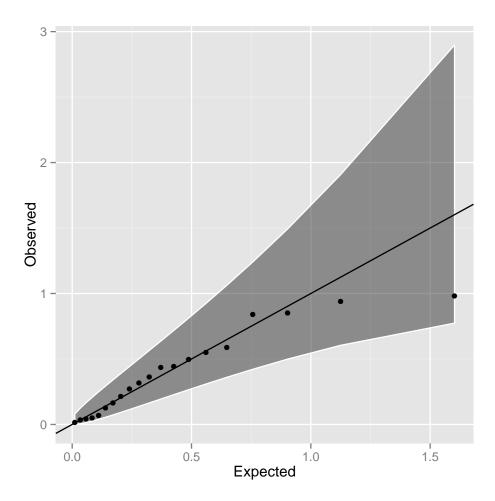


Figure S5: Q-Q plot of interaction p-values in the CDHWB dataset Twenty of the 501 discovery SNP pairs passed filtering in the CDHWB dataset (mainly due to small sample size). There is no evidence for enrichment of interaction terms, most likely due to insufficient power given the limited sample size.

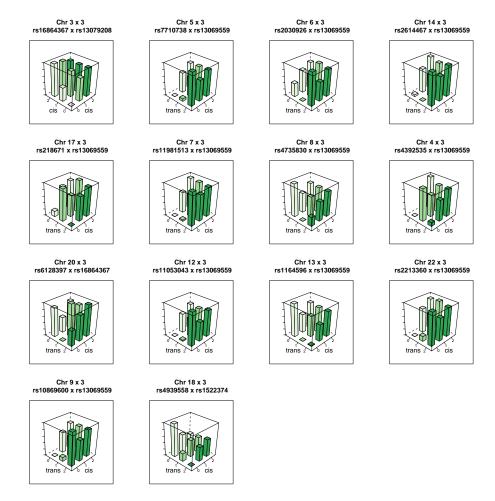


Figure S6: Genotype-phenotype maps for 14 interactions influencing the expression of MBNL1 Each bar represents the mean phenotypic value for individuals in that genotype class. The rs13069559 SNP typically has a *cis*-additive decreasing effect on the expression of MBNL1, but in many of these interactions the *cis* effect is masked when the *trans* SNP is homozygous for the masking allele.



Figure S7: Genotype-phenotype maps for 19 interactions influencing the expression of TMEM149 Each bar represents the mean phenotypic value for individuals in that genotype class. The rs13069559 SNP typically has a *cis*-additive decreasing effect on the expression of TMEM149, but in many of these interactions the *cis* effect is masked when the *trans* SNP is homozygous for the masking allele.

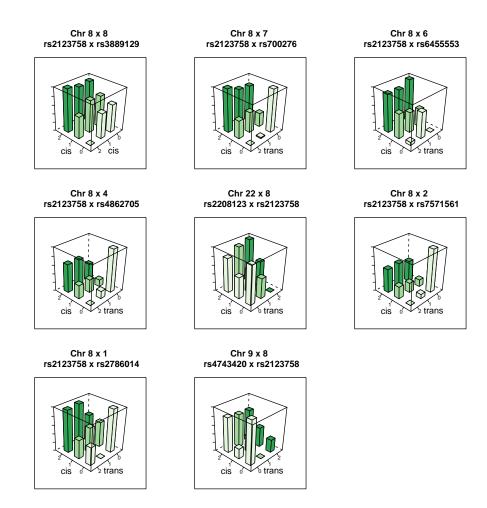


Figure S8: Genotype-phenotype maps for 8 interactions influencing the expression of NAPRT1 Each bar represents the mean phenotypic value for individuals in that genotype class.



Figure S9: Genotype-phenotype maps for 16 interactions influencing the expression of TRAPPC5 Each bar represents the mean phenotypic value for individuals in that genotype class.

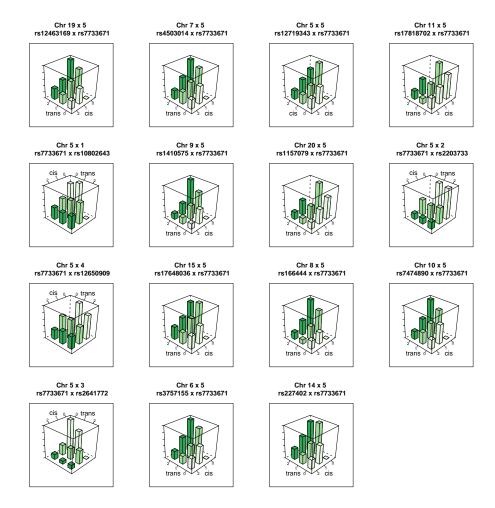


Figure S10: Genotype-phenotype maps for 15 interactions influencing the expression of CAST Each bar represents the mean phenotypic value for individuals in that genotype class.

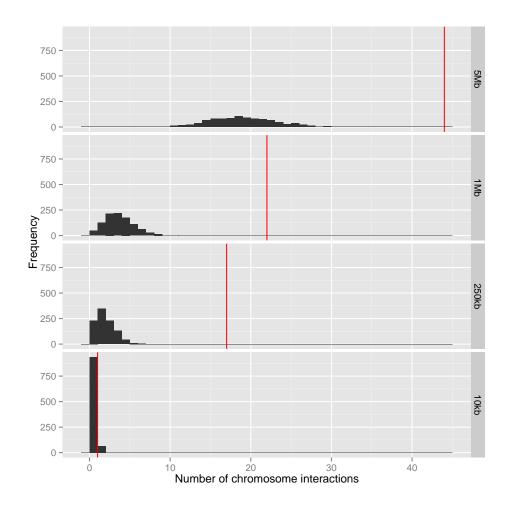


Figure S11: Number of overlaps between chromosome interactions and epistatic interactions Interacting chromosome regions may be a possible mechanism underlying epistatic interactions. The number of epistatic interactions within 20kb, 500kb, 2Mb and 10Mb of known chromosome interacting regions are shown by red vertical lines. The histograms represent the null distribution based on random sampling of 1,000 datasets for each window size.

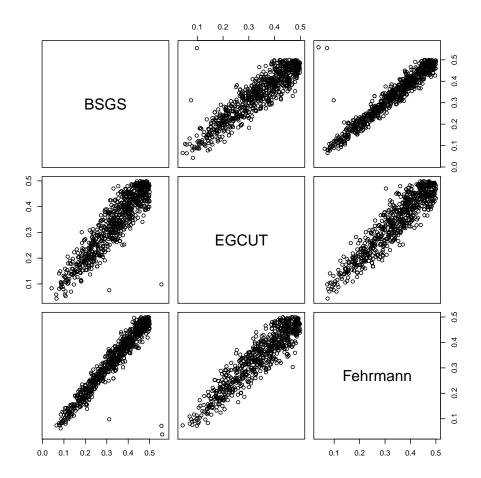


Figure S12: Comparison of allele frequencies for 781 SNPs involved in genetic interactions across independent populations Outliers were removed from the analysis as part of the filtering stage during replication.

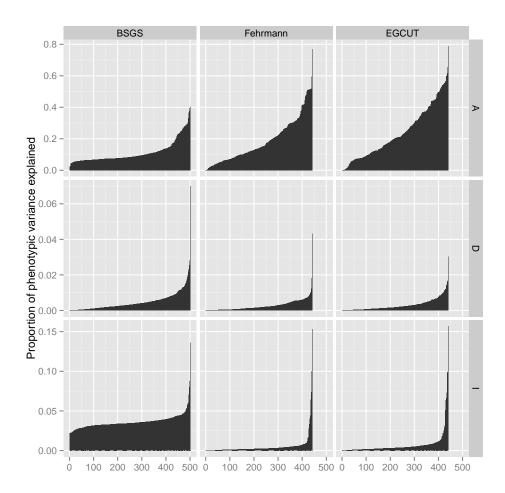


Figure S13: Comparison of variance explained by additive, dominant and epistatic effects from different cohorts How does the estimated variance decomposition change in different cohorts? The proportion of the phenotypic variance that is additive (A), dominant (D), or epistatic (I) for each putative interaction is shown on the y-axis (Note: different scales for each row). BSGS has 501 interactions whereas Fehrmann and EGCUT have 434 (x-axis). The variance estimates in each plot are ordered from lowest additive to highest. This is done independently for each cohort to depict the distribution of estimated effects.

## **Supplementary Tables**

Table S1: Details on 501 interactions discovered in BSGS dataset

	/ MP <sub>p</sub>						0.517			4.231								31.703					0.071																	0.263				
	Distance																	e0																										
values	$Meta^g$	0.09 <sup>j</sup>	0	2.03	0.87	2.05	39.82	88	0.94	0.57	0.42	0.23	1.01	0.04	0.90	0.26	1 16	1					14.23	0.14	0.50	0.54	0.43	0.85	0.24	0.35						0.19	0.13	0.37	0.28	21.67	0.27	0.07	0.21	1 0
$-\log_{10} p$ -values	$\mathtt{EGCUT}^{\mathrm{f}}$	$0.02^{1}$	181	1.78	1.14	0.83	21.21	1 03	0.64	0.99	0.20	0.30	1.37	0.20	1.09	0.T.	1 03						3.25	0.40	0.16	0.04	0.28	0.84	0.28	0.34						0.05	0.50	0.50	0.08	16.36	0.04	0.02	0.18	)
Interaction statistic /	$Fehrmann^f$	$0.38^{i}$	60.0	1.04	0.36	2.04	18.33	1 83	0.92	0.16	0.71	0.27	0.33	0.02	0.44	0.47	0.03						12.18	90.0	0.87	1.15	0.78	09:0	0.31	0.42						0.53	0.01	0.29	0.65	80.9	0.72	0.29	0.38	00.0
Interact	${ m BSGS}_{ m e}$	5.82	5.50	6.59	5.59	6.58	6.69	7 - 7 - 7 - 7	5.45	6.91	5.93	6.18	6.26	5.75	5.85	0.31	5.94 4.00	5.96	6.65	7.64	6.26	о. 100 100	5.30	5.84	09.9	5.66	3.87	6.02	5.98	7.15	4.32	4.40	4.05	4.61	4.69	6.79	5.90	0 m	4.91	9.42	5.55	5.49	7.62	
	Associationd					ADCK1			AHSA2	AKTIP								ARL17B	ARL17B							0,10	CISORFIS	C14ORF173	C14ORF173							C17ORF60	CIORF86	CLORE86	ZNF641		C5ORF4	CSORF59	GG TILOGO	
SNP 2	$Pos/Mb^{c}$	158100199	139522101	72001517	122933691	78088813	75929517	61119471	61388355	53489705	125543391	179323762	161996349	3032625	154511163	178019148	87918528	44064851	44064851	94722497	125831219	101202546	19738554	129906275	248059423	189150656	46913416 153610164	105189504	105189504	238724741	35427324	63371601	63179138	77574438	77574438	1	2082566	2119833	48676038	47764477	154348552	86102223	55242625	200
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	rs ID	rs596183	rs914737	rs4744894	rs4833241	rs12431896	rs10824092	rs2547996	rs1177303	rs13332406	rs1362032	rs1473017	rs11720112	rs4866516	rs3823523	rs6846031	rs4684443	rs8079215	rs8079215	rs1950646	rs2197777	rs2684789	rs873870	rs9804943	rs10888267	rs6553184	rs6.4754	rs4983382	rs4983382	rs10754644	rs10972462	rs6445340	rs9787151	rs2655991	rs2655991	rs7405659	rs2257182	rs2460002	rs901964	rs11701361	rs286595	rs2896452	rs1004564	FORFORET
	Associationd	ABCA7	ABCA7	ACAT1	ADCK1		ADK	AGAFS	HLA-G		AKTIP	AKTIP	ALDH3A2	ANG	ANPEP	ANFER	APSBI APPL2			ARL17B	ARL17B	AKLI7B	ALTER D	BID		C110RF17	C13OBF18		6	C14ORF173													CSORF59	
NP 1	$^{ m Pos/Mb^c}$	1047161	1047161	108207393	78088813	88462550	76446305	01010034	29938258	57721127	53536345	53536345	19581009	21153299	90363995	90363995	105580918	75768225	35932619	44064851	44064851	44064851	19810050	18213057	18233000	8886260	46913416	37575398	92276674	105189504	77574438	77574438	77574438	51151724	52083552	63502633	110577257	25711358	48052838	48027084	45866512	36577930	86102223	20100
ß	Chr.	19	13	: :	14	16	10	0,0	9	16	16	16	17	14	15	CI.	o 5	17	21	17	17	1.7	19	22	22	11.	13	22	15	4.0	14	14	4.	22	19	17	9 9	9 1	21	21	18	S 0	g oc	)
	rs ID	rs3752237	rs3752237	rs227064	rs12431896	rs8058066	rs2395095	rs2011512	rs2523971	rs2896940	rs7189819	rs7189819	rs3760489	rs9322855	rs11073891	rs11073891	rs0455574	rs12947580	rs2834541	rs8079215	rs8079215	rs8079215	rs4284750	rs8919	rs181405	rs2568061	rs2110603	rs11089825	rs3935344	rs4983382	rs2655991	rs2655991	rs2655991	rs6010061	rs7245800	rs9907897	rs2334323	rs7188668	rs4819271	rs9978658	rs1122762	rs12429804	rs2896452	70500000
	Chr.	19	13	11	14	14	10	010	1 (1	16	16	16	17	14	12	e i	o 6	17	17	17	17	1.7	19	22	22	11	2 5	14	14	41.	14	14	4 5	14	14	17			21	21	rO.	x 0	0 00	)
Expression trait	Probe ID <sup>b</sup>	ILMN_1743205	ILMN_1743205	ILMN_1800008	ILMN_1698777	ILMN_1698777	ILMN_2358626	ILMIN_3239130	ILMN_1798308	ILMN_1665982	ILMN_1665982	ILMN_1665982	ILMN_2401641	ILMN_1760727	ILMN_1763837	ILMIN_1763837	ILMIN-17650567	ILMN_3231952	ILMN_3231952	ILMN_3231952	ILMN_3231952	ILMIN_3231952	ILMN_2134224	ILMN_1763386	ILMN_2372413	ILMN_1752988	ILMN 2196550	ILMN_2393450	ILMN_2393450	ILMN_2393450	ILMN_1804396	ILMN_1804396	ILMN_1804396	ILMN_1804396	ILMN_1804396	ILMN_1747347	ILMN_1726989	ILMN 2097790	ILMN_1795836	ILMN_1795836	ILMN_1728742	ILMN_1653205	ILMN_1653205	THINTI TOO TO THE TOTAL TO
Exp	Gene IDa	ABCA7	ABCA7	ACAT1	ADCK1	ADCK1	ADK	AGAFO	AHSA2	AKTIP	AKTIP	AKTIP	ALDH3A2	ANG	ANPEP	ANPEP	APPL2	ARL17B	ARL17B	ARL17B	ARL17B	ARLI7B	ATP13A1	BID	BID	C11ORF17	CISORFIS	C14ORF173	C14ORF173	C14ORF173	C14ORF4	C14ORF4	C14ORF4	C14ORF4	C14ORF4	C17ORF60	CIORF86	CIORES	C21ORF57	C21ORF57	C5ORF4	CSORF59	CSORF59	2000

	Distance / Mbh							29.369																					14 697					100	1001												10000
alues	ಶ್ಚಿ	0.87	0.34		0.42	0.62	C/-T	1.20	0.78	0.37	0.41	1.09	0.01	0.10	1.12	0.23	0.93	0.50	0.54	0.15	0.22	0.31	0.02	0.02	1.20	0.42	0.08	1.16	24.0				,	0.1I	0.48	1.44	0.12	0.09		0.44	0.36	0.67	0.73	0.03	1.39	0.01	Continued on next name
/ - log10 p-values	EGCUT	0.18	0.00		0.86	0.96	7.00	1.57	1.34	0.52	0.03	0.59	0.01	0 33	1.56	0.12	0.78	0.78	0.87	0.26	0.30	0.37	0.01	0.03	0.24	0.80	0.27	1.67	0.22	-			,	0.14	0.12	0.16	0.24	0.10		0.20	0.02	1.28	0.36	0.07	0.28	0.01	0.07
Interaction statistic	Fehrmannf	1.39	0.96		0.00	0.23	0.0	0.36	0.13	0.27	0.97	1.15	0.11	0.07	26.0	0.49	0.75	0.23	0.22	0.19	0.26	0.33	0.23	0.08	1.74	0.13	0.04	0.24	0.71					0.21	0.90	2.16	0.15	0.23		0.72	0.92	0.07	0.95	0.07	1.92	0.10	00:00
Interacti	BSGSe	5.79	6.36	5.81	6.61	7.07	7.00	7.68	6.55	7.01	7.81	6.62	6.12	0.07	# 00 1 00	6.74	7.42	7.42	6.07	6.93	6.41	80.0	5.62	5.09	90.9	5.71	5.56	6.31	7.00 7.00 7.00	7.43	7.02	6.13	80.9	5.46	6.15	6.67	5.75	6.36	5.65	5.74	4.75	0.00	7.54	7.56	6.33	6.34	9.74
	Associationd	C8ORF59	CABC1		INPP5E	CAST	CAST	CAST					CAT	CCDC88B	VAMP8	CD55					CD 93					CDCI6	CEACAM21			ANAPC13		CHPT1		CLECIZA	a E E	CFIP			CFVL								
SNP 2	$Pos/Mb^{c}$	86102223	227174210	82128660	139266496	96000269	96000269	96000269	96000269	96000269	96000269	96000269	96000269	96000269	96000269	96000269	238120177	170192890	224093101	195531841	34447586	64125142	85816334	207502534	157182040	7992632	196721395	125145394	23074375	238899903	136500554	74439542	77264482	115008038	42066556	158943044	180265266	134247706	235248562	102087844	81937002	10132283	134236688	63121080	67713633	61738094	29180410
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	rs ID	rs2896452	rs3738725	rs684040	rs4077515	rs7733671	rs//336/1	rs7733671	rs7733671	rs10802643	rs12650909	rs2203733	rs2641772	rs11032695	rs541207	rs1254900	rs6700168	rs10255470	rs4696726	rs7622580	rs838875	rs1884655	rs10925747	rs2873420	rs4328531	rs4789981	rs/324/44	rs4803481	rs2421050	rs13132719	rs13079012	rs772788	rs2695290	rs867578	rs7313235	rs3903088	rs169130	rs7336017	rs1455268	FSZ45884							
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SNP 1	$Pos/Mb^{c}$	7188323	4353908	139289825	6026661	6778978	81840122	125369113	78255630	78392770	27311111	86107920	70496867	126458593	31149140	59590078	96000269	96000269	96000269	96000269	66175386	17099980	80280117	76033374	23074375	23074375	23074375	23074375	37771578	23076914	23076914	23076914	23076914	104162263	51956250	42066556	13069782	101350298	55861794	38838122	102277782	84471642	10156646	1047161	1047161	145569535	20119902
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Expression trait	Probe ID <sup>b</sup>	ILMN_1653205	ILMN 1731064	ILMN_1712532	ILMN_1712532	ILMN-1717234	ILMN-1717234	ILMN_1717234	ILMN_1717234	ILMN_1717234	ILMN_1717234	ILMN_1717234	ILMN_1717234	ILMIN-1717534	II.MN 1717234	ILMN_1717234	ILMN_1717234	ILMN_1717234	ILMN_1717234	ILMN_1717234	ILMN_1651705	ILMIN_1772208	ILMN_1784863	ILMN_1800540	ILMN_1704730	ILMN_1704730	ILMN_1704730	ILMN_1704730	ILMN 1704730	ILMN-1704730	ILMN_1704730	ILMN_1704730	ILMN_1704730	ILMN_2339796	ILMN 1745949	ILMN_1745949	ILMN_1703754	ILMN_1787808	ILMN_2359945	ILMN-2202940	ILMN_2202940	ILMN-1663142	ILMN_2403228	ILMN 1770290	ILMN_1770290	ILMN_1654545	1LMIN_1682928
Exp	Gene IDa	CSORF59	Caone 12	CARD9	CARD9	CAST	CASI	CAST	CAST	CAST	CAST	CAST	CAST	CAT	CCDCSSB	CCDCSSB	CD55	CD93	CD93	CD93	CD93	CD93	CD93	CD93	CD93	CD93	CDCI6	CEACAM21	CEACAM21	CEP192	CEP63	CES1	CHPT1	CHPT1	CLECIZA	CLECIZA	CNN2	CNN2	CPSF1	CFVL							

	nce / Mb <sup>h</sup>			0.033			0.040						12.255																	66.920	0.052													-					10 736	10.10
	Distance																																																	
values	Metag	0.04	0.15	42.27	0.11	1.03	33.73	00:00	0.34	40.0	1.47	0.36	0.44	09.0	0.44	0.14	0.42	0.44	0.16	0.29	0.58	0.32	0.37	0.03	0.10		0.19		0.01	0.11	0.97	1.12	0.0	1 6	0.79	0.10	0.24	0.41	0.02	0.53	0.11	0.41		0.35	0.81	0.09	0.08	1.06	0.44	0.23
- log10 p-values	EGCUT	0.03	0.36	16.72	0.41	0.74	15.06	0.01	0.00	0.02	1.87	0.83	0.10	0.86	0.41	0.58	0.25	0.29	0.41	0.02	1.17	0.34	0.04	0.11	0.05	0.58	0.22		0.02	0.00	1.45	0.27	1.18 8 2 6 0	0.00	0.47	0.11	0.08	0.59	0.05	1.12	0.04	0.40		0.58	1.20	0.11	0.04	1.03	0.19	0.30
<u> </u>	Fehrmann <sup>f</sup> 1	0.19	0.10	25.20	0.02	0.92	18.76	10.0	0.23	0.20	0.39	0.05	0.87	0.29	0.48	0.00	0.64	0.61	80.0	0.77	90.0	0.37	0.88	0.05	0.32		0.30	0.37	0.09	0.48	0.23	NO.10	0.15	0.64	0.90	0.23	0.56	0.28	80.0	0.05	0.36	0.45		0.20	0.25	0.20	0.29	0.67	0.74	0.97
Interaction statistic	BSGS <sup>e</sup> Fel	5.55	6.18	11.99	5.74	5.67	7.16	5 43	1 0	89.00	5.81	5.53	5.85	5.42	5.44	9.12	5.62	5.31	5.47	6.39	00.9	6.48	5.51	7.64	4.65	4.87	5.31	4.40	5.03	5.92	5.79	0.17	4.81 6.10	0 10 0 00 0 00	86.98	5.56	5.44	5.55	6.36	5.52	6.51	5.56	6.03	5.70	5.43	6.11	5.65	5.63	6.83 6.83	0.01
	Associationd	CPVL			CTNNA1	CoEC	2010	CWF19T.1	CYBBD1	CYBED1	CYBRD1	CYBRD1		CYP27A1	DAB2					COQ10A	DHRS9	DHRS9	DHRS9	DHRS9	LASS5		LASS5		1	LASS5	DNAJB6	בחקם	SCHOOL	ECHDC2	EHD4	EIF2B2					EMR2	EMR2		EPHX2	ERICH1	ERICH1	ERICH1	0	EXOC3	FARIDI
SNP 2	Pos/Mb <sup>c</sup>	29188475 46843631	62406408	45198355	138226767	108679892	_	102027407	172368120		_	172368120	160112881	219650616	39381357	82076988	187475208	32451144	88204888	137810259	169960422	169960422	169893419	169893419	50610976	153134888	50730458	61971140	115214154	51074199	157163614	16320360	64004670 F24025F2	53402552	42192040	75590340	99603119	49359676	129624067	126387391	14879034	14879034	102480759	27400604	578742	607161	578742	182786760	1972548	
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	rs ID	rs245884	rs1473927	rs3761385	rs176382	rs7079264	rs556895	rs12784396	rs888427	rs888427	rs888427	rs888427	rs7591849	rs933994	rs835223	rs1343244	rs2378341	rs7042042	rs2519515	rs10120023	rs7566044	rs7566044	rs2161037	rs2161037	rs11169322	rs2872008	rs7134595	rs1808634	rs4532958	rs12427378	rs3779589	rs1500972	rs4891884	rs11206043	rs1048166	rs175450	rs1269096	rs1553474	rs2197210	rs4471434	rs9305048	rs9305048	rs3007765	rs13269963	rs12115088	rs4735900	rs12115088	rs1517297	rs12188164	rs344303
	Associationd		CRLS1		0	CISC							CYBRD1				DDT		COQ10A							LASS5		LASS5	LASS5			100	ECGFI				EIF5A	EIF5A	EIF5A	EIF5A			EMR2					ERICH1		
SNP 1	$Pos/Mb^{c}$	39202070 188859908	5986234	45230974	69500505	88139983	88117962	11456027	129994690	140698856	12318284	23344590	172368120	36571928	110451383	43111688	24248761	125962645	137810259	106703727	89468283	147132505	29959453	187776431	29161503	50636364	41711815	50730458	50744171	117994348	157216093	93409054	50971266	17675900	53244938	60218334	7221707	7221707	7221707	7221707	23196249	18761714	14879034	127909396	134611176	45337329	31187910	600729	55228462	12/10/200
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	rs ID	rs2835998 rs2131290	rs6139887	rs9979356	rs924943	rs2457684	rs7930237	rs7108734	rs2592948	rs7852475	rs11257679	rs6137908	rs888427	rs6021982	rs7778910	rs9900173	rs5760102	rs4937097	rs10120023	rs12363827	rs1519956	rs1528529	rs2831914	rs7661304	rs11080134	rs11169335	rs338585	rs7134595	rs7312252	rs871257	rs2286842	rs12232308	rs140522	rs5992637	rs10403312	rs6567288	rs7216490	rs7216490	rs7216490	rs7216490	rs2827076	rs6132112	rs9305048	rs1107764	rs10894861	rs5766218	rs726145	rs4735895	rs187076	rs1350104
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Expression trait	Probe ID <sup>b</sup>	ILMN_1682928 ILMN_1813256	ILMN_1737685	ILMN_1761797	ILMN_1804854	ILMN_1696347	ILMN 2242463	II.MN 1651886	II.MN 1712305	II.MN 1712305	ILMN 2087692	ILMN 2087692	ILMN_2087692	ILMN_1704985	ILMN_2128428	ILMN_1811648	ILMN_1690982	ILMN_1797001	ILMN_1783996	ILMN_1783996	ILMN_1733998	ILMN_1733998	ILMN_2384181	ILMN_2384181	ILMN_1755589	ILMN_1755589	ILMN_1755589	ILMN_1755589	ILMN_1755589	ILMN_1755589	ILMN_1793770	ILMN_2349610	ILMN-2109708	II.MN 1671568	II.MN 1720083	ILMN_1713380	ILMN_1794522	ILMN_1794522	ILMN_1794522	ILMN_1794522	ILMN_2353633	ILMN_2353633	ILMN_2353633	ILMN_1709237	ILMN_1731001	ILMN_1731001	ILMN_1731001	ILMN_2104696	ILMN_1789419	ILIMIN 1668069
Exi	Gene ID <sup>a</sup>	CPVL	CRLS1	CSTB	CTNNA1	CISC	CESC	CWF191.1	CYBRD1	CYBRD1	CYBRD1	CYBRD1	CYBRD1	CYP27A1	DAB2	DCAKD	DDT	DDX58	DEM1	DEM1	DHRS9	DHRS9	DHRS9	DHRS9	DIP2B	DIP2B	DIP2B	DIP2B	DIP2B	DIP2B	DNAJB6	D7.55	ECGFI	ECHDG2	EHD4	EIF2B2	EIF5A	EIF5A	EIF5A	EIF5A	EMR2	EMR2	EMR2	EPHX2	ERICH1	ERICH1	ERICH1	ERICH1	EXOC3	FABDI

ationd 488 662 67 65 62 62 62 63	rs ID Chr. rs13406184 2 rs11691600 2	Pos/Mb <sup>c</sup>	Associationd	BSGS <sup>e</sup> Fehrmann	F EG	f Metag	Distance / Mb <sup>h</sup>
2         rsg2356400         44321776           6         rsg480848         19         44321776           6         rsg480848         19         45205055           12         rs17615703         12         14703676           12         rs17615703         12         14703676           12         rs4792199         12         45168526         FLJ20489           12         rs4792199         17         799218         FLJ20489           12         rs4792199         17         799218         FLJ20489           13         rs498440         15         97033129         FLJ20489           14         rs49825634         16         97033129         FLJ20489           17         rs8908905         17         8060450         FVAD5           18         rs828515         19         3660450         FXYD5           19         rs1739818         20         5660445         FXYD5           19         rs228515         19         3660450         FXYD5           19         rs1739818         1         7289039         FXYD5           10         rs228515         19         3660450         FXYD5           <		0001000	0200		000		,
6         re4803848         19         40205050           12         res902634         10         1393951           12         res902634         10         1393951           12         res902634         10         1393951           12         res702790         12         44106526         FLJ20489           12         res72472193         17         799118         FLJ20489           16         res9025644         21         43818790         6         res72472193           16         res9025644         21         43818790         6         res72472193         11         799118         FLJ20489           16         res9060101         6         36667610         FLJ3093         6         6666610         FLJ3093         6         7600148         78000418         7800		36810133	FEZ2	5.78	0.14 0.33	0.16	
6 rs902634 10 133943951 12 rs3782908 12 17033766 12 rs4782908 12 17033766 13 rs47829199 17 7992118 15 rs4782919 17 7992118 16 rs9225634 16 50562195 17 rs888095 17 79903129 18 rs1633221 14 10727627 19 rs288515 19 38660450 FXVD5 19 rs288515 19 38660450 FXVD5 19 rs2285515 19 38660450 FXVD5 10 rs2285515 19 38660450 FXVD5 11 rs811050847 17 7810731 GAA 17 rs81007052 7 723390239 17 rs81007052 17 7810731 GAA 18 rs10073023 10 13809355 12 rs272500 10 13803817 17 rs1160847 17 788038 18 rs2285515 19 38660450 FXVD5 19 rs2285515 19 38660450 FXVD5 10 rs228515 19 38660450 FXVD5 11 rs81007052 17 78100731 GAA 17 rs811050847 17 78100731 GAA 18 rs1007502 17 78108031 GAA 18 rs1007502 10 10809955 11 rs272500 12 6902002 GPR162 12 rs2775210 12 6902002 GPR162 13 rs1007538 12 124369421 14 rs12527241 6 12046803 15 rs126575037 17 38028634 17 rs12547547 17 38028634 18 rs9256669 18 7739937 18 rs12547546 13 80389979 18 rs138888 22 83399979 19 rs128888 22 83399979 11 rs123888 21 rs123851		37001267	FGD2				
12         rss782908         12         11703766         FLJ20489           12         rss782908         12         799218         799218           12         rss782909         17         799218         799218           12         rss782435         1         799218         799218           12         rss782435         1         48188790         799218           6         rss9806101         6         50626195         FLJ3093           1         rss9906101         6         50626195         FLJ3093           1         rss906101         6         5062619         FLJ3093           1         rss906101         6         5062619         FLJ3093           1         rss906101         6         50626045         FLJ3093           1         rss9068005         1         7         134003           1         rs228515         19         3660450         FXYD5           1         rs228515         19         3660450         FXYD5           1         rs101033023         7         7         7813313         GAPT           1         rs101040625         5         5778610         GAPT           <		36999682	FGD2				
12         res782908         12         48166526         FLJ20489           12         res4982440         15         97033129         FLJ20489           16         res9225634         21         4792118         FLJ20489           6         res9225634         21         4792112         4           16         res9225634         21         43818790         7           6         res6006101         6         36667610         FLJ43093           17         res9825615         17         8089038         1           19         res288515         19         36660450         FXYD5           19         res2660450         FXYD5         FXYD5           1         res1023222         1         78107310         GAA           1         res1026323         1         78107310         GAA           1         res1026	8 1	48169526	FLJ20489				68.867
12         rs47921199         17         7992118           12         rs47921199         17         7992118           16         rs704135         16         50620195           17         rs89245634         21         43818790           17         rs898095         17         80890638           19         rs288515         19         3666710           19         rs228515         19         3660450           10         rs228515         19         3660450           11         rs81007652         1         7           12         rs708231         10         3660450           13         rs8100762         1         7           14         rs1007652         1         7           15         rs708031         10         18069057           16         rs8207230         1         18069057           17         rs1445072         1<		167695661					
12	82908	48169526	FLJ20489	5.74	0.19 0.02	0.04	
1		48169526	FI.120489				
6         rs17117712         14         107276627           17         rs89004011         6         3666710         FLJ43093           19         rs890045         17         80890638         17         80890638           19         rs288035         17         3569200         19         3569200           19         rs2285515         19         35660450         FXYD5           10         rs2285515         19         35660450         FXYD5           10         rs2285515         19         35660450         FXYD5           11         rs81007622         7         77100731         GAPT           12         rs708031         10         12803947         GAPT           12         rs7080646         16         30102802         GDPD3           13         rs7198646         16         20084476         12         60460742           14         rs1080663         16         20468039 <t< td=""><td></td><td>50106594</td><td>FL.120718</td><td></td><td></td><td></td><td></td></t<>		50106594	FL.120718				
6         res000.01         6         3667.610         FLJ43093           1         res8880.05         1         8667.610         FLJ43093           1         res8880.05         1         78880.05         1           19         res163.981         2         1340063           19         res28.515         19         3660450         FXYD5           19         res28.515         19         3660450         FXYD5           19         res28.515         19         3660450         FXYD5           1         res1023023         7         7860450         FXYD5           1         res1023023         7         7815333         GAA           1         res10070525         5         5778610         GAPT           7         res20255         2         30102802         GDPD3           1         res704270         10         120805         GDPD3           1         res70864         16         6046074         GPPD3           1         res72650         2         200806         3015805           1         res108646         16         6040070         GPPD3           1         res108666         16<		36667610	FLJ43093				
17         re888005         17         8898005           19         re1843321         1         3669638           19         re184371178         2         1340063           19         re18739483         2         5660450         FXYD5           19         re2285515         19         3660450         FXYD5           19         re2285515         19         3660450         FXYD5           19         re2285515         19         3660450         FXYD5           17         re10230232         7         29390239         FXYD5           17         re10230232         17         73800430         FXYD5           18         re10230232         17         73800430         FXYD5           17         re10230232         17         73800430         GAA           18         re1024026         1         72039023         GAPT           18         re2024256         2         1         6407407           18         res2024260         1         647896         1           18         res202250         1         7968913         GDPD3           18         res2077210         12         7968912         <	rs13214069 6	32705248					3.962
1   rs4971478   2   1340063     1   rs4971478   2   1340063     1   rs4285515   19   36660450   FXYD5     1   rs2285515   19   36660450   FXYD5     1   rs2285515   19   36660450   FXYD5     1   rs11150847   7   78150731     1   rs11150847   7   78150731     1   rs11150847   7   78150731     1   rs2085256   7   78100731     1   rs20808356   17   78150731     1   rs20808356   17   78150731     1   rs20809324   10   126083717     1   rs20809324   10   126083717     1   rs20809324   10   126083717     1   rs20809324   10   126083717     1   rs2080663   10   60460742     1   rs2707010   12   60902002     1   rs2707010   12   60902002     1   rs11057383   10   12436943     1   rs12532999   7   12793993     1   rs12532990   7   12793993     1   rs12532990   7   12793993     1   rs12532990   7   12793993     1   rs12532990   7   13399391     rs12446774   10   538399979     rs138988   22   38339979     rs138988   22   38339979     rs138988   22   38339979     rs12855039   11   rs12847740   13   8012863     rs138889   11   rs12847874   13   8028634     rs138888   22   38339979     rs138888   22   38339979     rs138888   22   38339979     rs138888   22   38339979     rs138888   23   38339979     rs1388855039   11   rs1287500     rs2855039   11   rs285603     rs2855039   11   rs1287500     rs2855039   11   rs285603     rs2855039   11   rs1287500     rs2855039   11   rs28503     rs2855039   11   rs285301     rs2855039   11   rs28530301     rs2855039   11   rs285301     rs28560300000000000000000000000000000000000	1	80827903		CI	21	,	0.063
19   rs1633921   19   35695200     19   rs2285515   19   35660450   FXYD5     19   rs2285515   19   35660450   FXYD5     19   rs2285515   19   35660450   FXYD5     14   rs11150847   17   22939239   FXYD5     15   rs8068856   17   72153130   GAA     17   rs8068856   17   72153130   GAA     18   rs1140847   14   66466742     19   rs2245556   20   35056572     10   rs242556   20   35056572     10   rs242556   16   30102802   GDPD3     11   rs12527241   10   647889     12   rs2777210   12   6902002   GPR162     13   rs2527241   6   1246803     14   rs12527241   6   1246803     15   rs1253299   7   1246803     16   rs125467   17   38028634     17   rs125467   17   38028634     18   rs125467   17   38028634     19   rs125467   17   38028634     19   rs125467   17   38028634     19   rs125467   17   38028634     19   rs125467   17   38028634     10   rs125467   17   38028634     11   rs125467   17   38028634     12   rs13888   22   38339979     13   rs13888   22   38339979     14   rs1107853   17   rs113988     18   rs1107853   17   rs1107853     18   rs1107853   17   rs1107853     18   rs1107853   17   rs1107853     19   rs1107853   17   rs1107853     19   rs1107853   11   rs11078550     11   rs1107853   11   rs11078550     11   rs11078550   10   3717671     rs12567609   11   rs11078550     11   rs11078550   10   3717671     rs1107850   10   3717671	rs12744386 1	24168019	FUCA1				
19   rs17398183   20   5560450   FXYD5     19   rs2285515   19   33660450   FXYD5     19   rs2285515   19   33660450   FXYD5     19   rs2285515   19   33660450   FXYD5     17   rs10150847   7   7810731     17   rs10150847   17   7810731     18   rs2080331   10   128038717     18   rs2285516   20   3605672     19   rs2285526   20   3605672     10   rs242526   20   3605672     11   rs24245270   16   30102802     12   rs2702300   16   30102802     13   rs2707210   12   6902002     14   rs2707210   12   6902002     15   rs2707210   12   6902002     16   rs2707210   12   6902002     17   rs11557241   6   12046803     18   rs27566   18   7139932     19   rs125272487   10   1380382     19   rs12527240   10   1008936     10   rs12547540   11   13903802     10   rs12547540   12   17139323     11   rs12547541   13   82986268     12   rs1257280   13   7139932     13   rs1257280   13   74139932     14   rs1254788   10   53139979     15   rs139888   22   38339979     16   rs139888   22   38339979     18   rs139888   22   38339979     18   rs1257300   11   rs123881     rs1257300   11   rs123888     11   rs123888   22   38339979     12   rs2575030   11   rs1238503     13   rs12575006   11   rs1238503     14   rs123888   22   38339979     18   rs1238850309   11   rs123850309     18   rs123850309   11   rs123850309     18   rs123850309   11   rs123850309     19   rs25750309   11   rs1234673   11   rs123850309     19   rs123850309   11   rs1234673   11   rs123850309     19   rs25750309   11   rs1234673   11   rs123850309     11   rs123888   11   rs123888     12   rs123888   12   rs138389     13   rs123888   13   rs1238503     14   rs123888   13   rs1238503     18   rs123888   13   rs1238503     18   rs123888   13   rs1238503     18   rs123888   11   rs1238503     18   rs1238503   11   rs1238503     19   rs1238503   11   rs1238503     18   rs1238503	8178 13	98328559			0.09 0.41		
19   re2285515   19   36660450   FXYD5     19   re2285515   19   36660450   FXYD5     19   re2285515   19   36660450   FXYD5     14   res1023023   7   29390239     15   res10070522   7   78153330     15   res10070525   5   57786110   GAPT     15   res202031   10   1260572     16   res202031   10   1260572     16   res204270   16   30102802   GDPD3     16   res204270   16   30102802   GDPD3     17   res202550   12   2608476     18   res202500   12   2608476     19   res202500   12   2608476     10   res202500   12   6902002   GPR162     11   res202500   12   6902002     11   res202500   12   1293995     11   res202500   12   1293995     12   res202500   12   1293995     13   res2035399   7   1293993     14   res2030426   3   171399321     15   res20426   3   171399321     16   res20426   3   17139931     17   res123898   22   38339979     18   res2047597   17   3802863     18   res204760   18   38339979     19   res204287   17   38339979     19   res205039   17   1739331     res204287   17   85333971     res204287   17   85333971     res204287   17   85333971     res204287   17   85333971     res205038   12   852367     res205039   11   res205039     res205039   11   res20303     res2050309   11   res20303     res20503000000000000000	rs2285515 19	35660450	FXYD5		0.03 0.48		
19   rs2285515   19 36660450 FXYD5	rs11739594 5	141709563		5.70			
19	rs13067700 3	95331048			0.09 0.51	0.22	
4         rs10230323         7         29390239           17         rs806886         17         75153130           17         rs806886         17         7715153130           5         rs1070202         5         5778110           6         rs1070202         5         5778110           7         rs14747         4         6646772           16         rs245556         20         30102802         GDPD3           16         rs2445672         16         30102802         GDPD3           17         rs1445672         16         30102802         GDPD3           18         rs728606         16         266476         GDPD3           18         rs728606         16         2664789         GDPD3           18         rs277200         12         699200         GPR462           18         rs277220         12         690200         GPR462           19         rs12527241         6         1246803         GPR462           1         rs1253999         7         1246803         GPR462           1         rs125467         16         1246803         GPR462           1         rs125399	rs17036504 2	47567329					
17         res01150847         17         78153330           5         res10070522         1         781010731           6         res10070522         1         12081071           7         res1007052         1         120817           7         res242556         2         30102802           16         res2809024         1         30102802           16         res2809024         1         30102802           17         res144572         1         1089955           12         res704270         1         20084476           12         res2772500         1         20084476           12         res277500         1         6902002           13         res277510         1         2008001           14         res2775210         1         2046803           15         res2707210         1         12046803           1         res12677241         6         12046803           1         res12677241         7         12793793           1         res1267763         1         12136937           1         res166669         1         7         12793793           1	rs1553985 4	76554604			0.08 0.37		
17         rs8068856         17         731007531         GAA           5         rs7082031         10         128038717         GAPT           7         rs2147447         14         66460742         GAPT           16         rs2405262         20         33056572         GAPT           16         rs2405264         16         3016963         GDPD3           12         rs4145072         18         1089995         GDPD3           12         rs4145072         18         1089995         GDPD3           12         rs4145072         12         768891         GDPD3           12         rs2770470         12         768891         GDPD3           12         rs2777210         12         768891         GDPD3           13         rs2777210         12         768891         GDPD3           14         rs12527241         6         1246803         GPR162           15         rs2770710         12         768603         GPR162           1         rs12527241         6         1246803         GPR162           1         rs25663         16         1246803         GPR162           1	rs12602462 17	78146016		13.91	12.99	32.60	0.007
5         res10070562.         5         57788110         GAPT           7         res1082031         10         128038717           7         res1147447         14         66460742           16         res242526         20         30102802           16         res2404270         16         30102802           16         res7380924         16         30102802           12         res719846         16         20084476           12         res178000         12         7968913           12         res2707210         12         6902002           13         res1705721         12         6902002           14         res12057241         6         1046803           1         res12057241         6         1046803           1         res12057241         6         1046803           1         res12057291         7         12793973           1         res12057241         6         1169883           1         res12057241         6         1169883           1         res12057241         1         1739931           1         res12057241         1         38086638	rs10902506 12	132678089					
7         rs7082031         10         128082717           7         rs242556         20         5065672           16         rs7204276         16         3016863           16         rs7204270         16         3016863           12         rs7198646         16         3016863           12         rs7198646         16         2008446           12         rs7198646         16         647889           12         rs7272200         12         20084476           12         rs2772201         12         6902002           13         rs2772201         12         6902002           14         rs1057383         12         124369421           1         rs2775210         12         124369421           1         rs15532999         7         127939793           1         rs15532999         7         127939793           1         rs155467         10         53968268           1         rs1524677         17         53028634           1         rs154677         17         53028634           1         rs1524677         17         53028634           1         rs13	rs7605821 2	235695228			0.01 0.78	0.28	
7 rs.14747 14 66466742 7 rs.14747 14 66466742 16 rs.3809624 16 30102802 16 rs.7204270 16 30102802 17 rs.719846 16 2008476 18 rs.719846 16 2008476 19 rs.719846 16 2008476 10 rs.2775500 12 6902002 10 rs.2777210 12 6902002 11 rs.12557241 6 12046803 11 rs.12557241 6 12046803 11 rs.2557241 6 1139936421 11 rs.2557241 17 1739373 11 rs.2557399 17 1739373 12 rs.27566 18 7050801 11 rs.224867 13 8298268 12 rs.139888 22 38339979 13 rs.139888 22 38339979 14 rs.139888 22 38339979 15 rs.139888 22 38339979 17 rs.119888 22 38339979 18 rs.11078523 17 4523167 18 rs.11078523 17 4523167	rs10070522 5	57786110	GAPT				
7         rs9242556         20         3605677           16         rs7204270         16         30102802         GDPD3           16         rs7204270         16         30102802         GDPD3           12         rs44145072         13         11089955         GDPD3           12         rs1806663         16         6478898         GDPD3           12         rs2772600         12         6902002         GPR162           12         rs2707710         12         6902002         GPR162           1         rs1057383         12         124369421         6         124369431           1         rs12532999         7         12793793         12         12793793           1         rs12533299         7         12793793         11         18726613         16         1166883           1         rs2535209         7         12793793         38         7506011           1         rs155467         17         38028626         3         7506011           1         rs15446746         17         3802863         3         73839979           1         rs14346774         13         3612656         3	rs2950520 7	99827148	GATS	5.47	0.83 0.63	0.87	
16   First	rs2950520 7	99827148	GATS	6.22	0.42		
16   187204270   16   301689955   187104270   16   301689955   187108445   16   20084475   18710860863   16   20084475   19   18710860863   16   20084475   19   187108212   19   187207210   12   2002002	rs2197465 14	48572632					
2         rs4445072         13         11089955           12         rs1880563         16         20084476           12         rs1860563         16         6478898           12         rs27707210         12         7688913           12         rs27707210         12         6902002           13         rs1057333         12         1246803           1         rs1257741         6         1246803           1         rs1257749         7         1246803           1         rs125775613         12793793           1         rs2575613         12793793           1         rs25204246         13         8298268           1         rs6566669         18         7750601           1         rs1557467         7         36519833           1         rs1557467         7         36519833           1         rs1547574         13         8514527           1         rs1547874         13         8514527           2         rs13888         2         38399979           2         rs13888         2         38399979           2         rs13888         2         38399979 <td>rs1015111 4</td> <td>128972357</td> <td></td> <td></td> <td></td> <td></td> <td></td>	rs1015111 4	128972357					
12   rss198646   16   2608476     12   rss272500   12   79685913     13   rs2777210   12   6902002   GPR162     14   rs27077210   12   6902002   GPR162     15   rs2707210   12   6902002   GPR162     1   rs12527241   6   12468639     1   rs1253299   7   12793793     1   rs253299   7   12793793     1   rs256399   7   12793973     1   rs256399   16   11169683     1   rs25950426   18   70506611     1   rs1224677   17   38028634     1   rs124673   10   53192833     1   rs145744   13   85344527     1   rs149886   22   38399979     1   rs1139886   22   38399979     1   rs1139886   22   38399979     1   rs1139886   22   38399979     1   rs11078523   17   4523167     1   rs123868   22   38339979     1   rs139886   24   38339979     1   rs139886   24   38339979     1   rs11078523   17   4523167     1   rs25850399   11   5271671   HBC2		85935282	GNLY		0.02 0.45	0.13	
12         rs2872560         16         6478898           12         rs2772500         12         6902002         GPR162           12         rs2777210         12         6902002         GPR162           1         rs11057383         12         124369421         6902002         GPR162           1         rs11057383         12         124369421         612468039         12793793         12793793           1         rs5725613         16         1126683         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         1279379379         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         127937937         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793         12793793 <t< td=""><td></td><td>111164237</td><td>GPN3</td><td></td><td></td><td></td><td></td></t<>		111164237	GPN3				
12         rs2272500         12         76858513           12         rs2707210         12         6902002         GPR162           12         rs2707210         12         6902002         GPR162           1         rs11057383         12         124369421         rs2757741           1         rs12527741         6         12468039         rs275613           1         rs15527741         6         12468039         rs285618           1         rs255613         1         12793793         rs2856668           1         rs6566669         18         7766011         rs285618           1         rs9575047         17         3805863         GSDMB           1         rs1557467         17         3805863         GSDMB           1         rs1547574         13         8534457         rs154757           1         rs1547574         13         8534957         rs18888           22         rs13888         22         38399979           22         rs13888         22         38399979           11         rs1078523         17         4523167           11         rs245666         19         3571671		6902002	GPR162				
12 rs2707210 12 6902002 GPR162 1 rs2707210 12 6902002 GPR162 1 rs11057383 12 124669421 GPR162 1 rs120572241 6 120468039 1 rs120572241 6 120468039 1 rs120572241 6 120468039 1 rs120572041 6 1169683 1 rs9575097 13 rs2988268 1 rs1224667 13 rs2988268 1 rs1224667 17 rs1224667 17 rs1224677 11 rs1224677 11 rs1224677 13 rs125560 1 rs129888 22 rs139888 23 rs13889979 22 rs139888 23 rs13889979 22 rs139888 23 rs13889979 22 rs138888 23 rs13889979 23 rs138888 23 rs138898979 23 rs138888 23 rs13889979 23 rs138888 23 rs138888 23 rs13889979 23 rs138888 23 rs13889979 23 rs138898 23 rs138898 23 rs13889979 23 rs13889	07210 12	6902002	GPR162				72.784
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1   rs12527241   6   124468039   1   rs12527241   6   124468039   1   rs12532999   7   12793793   1   rs12532999   7   127938793   1   rs12532999   7   127938793   1   rs25613   16   11160683   1   rs656669   18   70560011   1   rs2590426   3   717399321   1   rs1224667   17   38028634   CSDMB   1   rs124677   19   38134627   1   rs139888   22   rs139888   1   rs11078523   1   rs11078523   1   rs1107853   1   rs127671   rs271671   rs271671   rs271671   rs271671   rs271671   rs271671   rs1107853   1   rs271671   r	rs9827054 3	188880113					
1   rs12527241   6   120468039     1   rs12532999   7   12793793     1   rs755613   16   1106683     1   rs756613   16   1106683     1   rs656669   18   71560018     1   rs1224467   13   8028634     1   rs1244574   17   8834833     1   rs1244574   13   8534457     1   rs1244574   13   8534457     1   rs124888   22   8339979     1   rs107883   17   4523167     1   rs1107883   17   4523167     1   rs124666   19   357367     1   rs125666   19   357367     1   rs125666   19   357367     1   rs125666   19   357367     1   rs125666   19   357367     1   rs1257666   19   357367     1   rs1257666   19   357367     1   rs1257666   19   357367     1   rs1257666   10   357367     1   rs1257678   10   3571671     rs1257678   10     rs1257678     rs12688   10     rs12688     rs12688   10     rs12688     r	rs12065581 1	68732819	GPR177				
1         rs42532999         7         12793793           1         rs9575613         11166683           1         rs9575097         13         82986268           1         rs6566669         18         77506011           1         rs9575047         17         38058263           17         rs9520426         3         771399321           17         rs1557467         17         38058634         GSDMB           18         rs1547574         13         8514527         1           1         rs1547574         13         8514527         1           22         rs138898         22         38399979         2           22         rs138888         22         38399979         2           22         rs138888         22         38399979         1           11         rs1078523         17         4523167           11         rs2855039         11         5271671         HBG2	rs12065581 1	68732819	GPR177		_		
1   rs972613   16   1166883   1   rs9775097   13   rs9586669   18   7506011   1   rs95966669   18   7506011   1   rs92900426   3   717399321   1   rs1254674   7   38028634   GSDMB   1   rs12547574   17   38028634   GSDMB   1   rs6492807   13   s916560   22   rs139808   22   rs139808   22   rs139808   22   rs139808   22   rs139808   22   rs139808   11   rs12076823   17   4523167   11   rs1297666   19   3573671   HBG2	065581 1	68732819	GPR177				
1         res9575097         13         82982288           1         res920426         13         70506011           1         res1257467         17         38028634           1         res1248673         10         58192833           1         res12446774         13         8534457           2         res138898         22         38399979           22         res138898         22         38399979           22         res189888         22         38399979           11         res1078523         17         4523167           11         res2850399         11         5771671         HBG2	rs12065581 1	68732819	GPR177				
1   rse556669   18   70506011     1   rse9290426   3   71399321     1   rse11557467   17   38028634     1   rse11557467   17   38028634     1   rse1547574   13   85344527     1   rse6422807   13   9615560     22   rse138898   22   38399979     22   rse139888   22   38399979     1   rse11078523   17   4523167     1   rse129666   19   35728501     1   rse2550399   11   5271671   HBG2	065581 1	68732819	GPR177				
1 rs92204245 3 171393321 GSDMB rs91257467 17 539028634 GSDMB rs125748673 10 55192833 11 rs125748673 11 rs12548673 12 rs139886 22 rs139886 22 rs139888 22 rs139888 22 rs139888 12 rs130888 12 rs139888 12 rs139888 12 rs139888 12 rs257506 19 rs2550399 11 rs12975066 19 rs2550399 11 rs257671 rs2850399 11 rs257676 rs2850399 11 rs257671 rs2850399 11 rs28503999 11 rs2850399 11 rs285039 11	065581 1	68732819	GPR177				
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1 rs1224574 10 53192833 1 rs16245774 13 56344527 22 rs139808 22 38399979 22 rs139808 22 38399979 11 rs1076823 17 4523167 11 rs1076823 17 4523167 11 rs255666 19 3573501	65745 15	101508261					
1   rslo47574   13   8534527   1   rslo492807   13   8534527   13   8534527   13   8534527   13   8534527   13   rslo3888   22   rslo3888   22   83399979   11   rslo75563   17   4523167   11   rslo566   19   35723501   11   rslo566   19   35774671   14   HBG2	101992 1	110266754	GSTM1				
1 re6422807 13 9615560 22 re138898 22 38399979 22 re138898 22 38399979 11 re11078523 17 4523167 11 re1297666 19 35725361 11 re2555639 11 5271671 HBG2	101992	110266754	GSTM1		0.27	0.79	
22 rs138898 22 38399979 22 rs139898 22 38399979 11 rs11078523 17 4523167 11 rs255066 19 35723501 11 rs285039 11 5271671 HBG2	54446 1	110253241	GSTM1				
22 rs139898 22 38399979 22 rs139888 12 38399979 11 rs12078523 17 4523167 11 rs2297566 19 35723501 11 rs2855039 11 5271671 HBG2		77919015					
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11 rs1107823 17 4533167 11 rs12975066 19 35723501 11 rs2855039 11 5271671 HBG2	83949 21	19532546					
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11 rs2855039 11 5271671 HBG2	rs2855039 11	5271671	HBG2				
	rs12042181 1	213088494	LQK1				
11 rs2855039 11 5271671 HBG2	rs12503379 4	141533832	000	6.42	0.01 0.46		
17 4523167	rs16912979 11	2309092	HBGZ		0.01 0.41		0.10

Expression trait Probe ID <sup>b</sup> Chr.	Chr.	$\vdash$	rs ID	Chr.	SNP 1 Pos/Mb <sup>c</sup>	Associationd	rs ID	Chr.	SNP 2 Pos/Mb <sup>c</sup>	Associationd	Interact	Interaction statistic /	$-\log_{10} p$ -values	values Metag	Distance / Mbh
CIII. IS ID CIII. FOS/MD	IS ID CITIC LOS/MD	The contract of the contract o	r Os/ MID		1	Association	15 11		r Os/ MID	Tipos		Lemmann	10051	Meta	Distance / MD
LLMIN_2084825 11 rs12975066 19 35723501 ILMN_2084825 11 rs2855039 11 5271671 HB	19 35723501	19 35723501	35723501 5271671		Н	HBG2	rs2855039	11	5271671 213088494	HBG2 LOK1	5.77	80.0 0.0 0.0	0.13	0.05	
11 rs2855039 11 5271671	rs2855039 11 5271671	11 5271671	5271671		HBG	1 21	rs12503379	4	141533832		5.98	0.00	0.46	0.10	
ILMN-3266186 12 rs2109029 16 6036851	rs2109029 16 6036851	16 6036851	6036851		1001	-	rs4760636	12	48173352	HDAC7	5.75 0.75	5	G H	0	
17 rs1942719 18 71237270	rs1942719 18 71237270	12 13143613	71237270		D D		rs7213057	17	80378939	HEXDC	5.81	1.61	0.34	1.22	
6 rs4899635	rs4899635 14	14		77532672			rs7192	9	32411646	HLA-DRB6	5.94	0.90	0.16	0.52	
rs12435486 14	rs12435486 14	0 4		98670849			rs7837237	οœ	28876221	HMBOX1	6.54	0.92	1.11	1.34	
8 rs2837803 21	rs2837803 21	21		42112794			rs4732890	000	28751381	HMBOX1	6.62	0.05	1.01	0.46	
8 rs4765451 12 1	rs4765451 12 1	12 1	_	127237464			rs8180944	œ	28904086	HMBOX1	5.80	0.39	3.13	2.52	
8 rs587639 8 132725731	8 132725731	8 132725731	132725731				rs7837237	oo i	28876221	HMBOX1	6.58	0.55	0.34	0.44	103.850
8 rs8180944 8 28904086	8 28904086	8 28904086	28904086		Ц;	HMBOXI	rs4553956	1 m	189533772				0.03	2.20	
28904086 13 110897444	28904086 13 110897444	28904086 13 110897444	110897444		-	HMBOAL	rs/810884	~ oc	28904086	HMBOX1	5.45	0.67	0.26	0.52	
5 rs6894268 5 1	52	52	. –	179032488			rs4700810	'n	178991794		15.38	8.55	3.01	10.37	0.041
1 rs555812 16	16	16		88882257			rs4654783	1	22439520	HSPC157	5.51				
1 rs6063164 20	20	20		46486900			rs4654783	-1	22439520	HSPC157	6.51				
1 rs662739 12 121229893	12 121229893	12 121229893	121229893		(		rs4654783		22439520	HSPC157	6.61				
ILMN_3394087 1 rs7088558 10 101884937 C	10 101884937	10 101884937	101884937		ב כ	CWF19L1	rs4654783	1.5	22439520	HSPC157	6.48	01.0	0	000	
16 rs765044 19 2560423	rs765044 19 2560423	19 2560423	2560423		3	4	rs1554999	1 1 1	3115628	11.32	. r. . r. . r. . r.	0.69	0.23	0.43	
9 rs8044524 16 8	rs8044524 16 8	4 16 8	œ	81603771			rs1127152	6	139335599	INPP5E	5.58	1.46	0.84	1.55	
7 rs757355 12 47970693	rs757355 12 47970693	12 47970693	47970693				rs849341	-1	28288174		8.16	0.02	0.26	0.05	
21 rs2186344 21 39606769	rs2186344 21 39606769	21 39606769	39606769		X	KCNJ15	rs424299	11	5570771		5.64	0.65	0.13	0.33	
19 rs649216 19 55324635	rs649216 19 55324635	19 55324635	55324635		Σ,	KIR2DL1	rs6419960	4 0	189055298	.0	4.74	0.46	0.89	0.77	
1LMN-1811104 3 rs4349034 13 84597119	rs4349034 13	13	-	84597119			rs727905	n m	119119433	KTELCI	5.53 8.53	0.08	08.0	0.37	
22   rs4822006 22 41519362	rs4822006 22 41519362	22 41519362	41519362		Н	L3MBTL2	rs1294338	·	233438952	IVI EFFO	80.10	0.33	0.04	0.00	
4 rs7042087 9	9	9	_	132602868			rs7658240	4	17588950	LAP3	5.72	0.24	0.47	0.31	
1 rs1891432 1 2			CI	203877662			rs10900520		203780591		19.16	18.60	11.22	29.24	0.097
TEMN 9419914 17 "=1945052 19 989/1059	120	120		2897 T022			rs000/003	чĸ	170608360	LULUALI	6.00	и 6	0.40	0 37	
19 rs3859532 19	rs3859532 19	19		54827248		LILRAS	rs714789	18	71561497		6.13	0.23	0.03	0.02	
15 rs11247226 15 1	rs11247226 15 1	15 1	1	101120963		LINS1	rs1278387	10	127804531		5.89		0.13		
19 rs6009951 22 5	rs6009951 22	1 22		51151350			rs8101804	19	18496107	LRRC25	5.68	0.11	0.35	0.15	
6 rs977785 6	rs977785 6	9 ;		6588881		LY86	rs1543675	I	78946879		5.61	0.13	0.15	0.07	
ILMN_1815205 12 rs2168029 12 69734641	rs2168029 12 69734641	12 69734641	69734641			LYZ	rs11981725	٠.	154137150	1.7.7	5.95	0.15	0.03	0.03	
12 EST/1820 10 (72/0904 19 rs9168099 19 69734641	EST(1020 10 (1210904 12 co.2168090 12 60734641	19 69734641	69734641			1.7.2	rs2105029	7 0	130319560	717	6.71	0.43	0.03	0.10	
7 187783715 7	rs7783715 7	1 1-	,	1923385		MADILI	rs6414306	. m	127011798		5.62	0.25	0.88	0.59	
6 rs7983718 13 1	rs7983718 13	13		103203146			rs1096699	9	43528441	MAD2L1BP	5.93	0.63	1.11	1.09	
20 rs974607 21	rs974607 21	21	•	29435869			rs6060034	20	33351864	MAP1LC3A	5.78	1.18			
3   rs10869600 9 7	rs10869600 9	6		78225815			rs13069559	က	152187431	MBNL1	7.96	0.79	0.27	0.54	
3 rs11053043 12	3 12	3 12		9932070			rs13069559	က	152187431	MBNL1	6.70	0.08	2.21	1.37	
3 rs1164596 13	rs1164596 13	13		97100681			rs13069559	က	152187431	MBNL1	7.38	1.43	0.63	1.34	
3 rs11981513 7	rs11981513 7	7	7 94648239	94648239			rs13069559	က	152187431	MBNL1	7.71	0.43	5.36	4.58	
3 rs16864367 3 1	rs16864367 3 1	. 3	3 152234166	152234166			rs13079208	က	152116652		13.49	16.25	24.74	41.56	0.118
3 rs2030926 6 11	rs2030926 6 11	6 11	11	114067127			rs13069559	က	152187431	MBNL1	7.10	0.91	5.80	5.53	
3 rs218671 17	17	17		6604708			rs13069559	က	152187431	MBNL1	7.63	0.62	5.82	5.23	
ILMN_2313158 3 rs2213360 22 34291750 ILMN_2313158 3 rc2305802 10 16038535	252	252		34291750			rs13069559	ကက	152187431	MBNL1 MBNL1	6.05	0.52	0.72	0.70	
3 rs2614467 14	14	14		99770138			rs13069559	ာက	152187431	MBNL1	5.74	4.13	2.22	5.30	
										•				Continu	Continued on next page

7	EAPTERSTOIL CLASS				T INTO				DIVI 2		THEST	meracion statistic	a = 10810 P values	"values	
Gene ID <sup>a</sup>	Probe ID <sup>b</sup>	Chr.	rs ID	Chr.	$Pos/Mb^{c}$	Associationd	rs ID	Chr.	$Pos/Mb^{c}$	Association <sup>d</sup>	$BSGS_{e}$	$Fehrmann^{f}$	$\mathtt{EGCUT}^{\mathrm{f}}$	$Meta^g$	Distance / Mb <sup>h</sup>
MBNL1	ILMN_2313158	3	rs4392535	4	41513423		rs13069559	8	152187431	MBNL1	8.39	0.02	4.33	3.02	
MBNL1	ILMN_2313158	3	rs4735830	œ	895841		rs13069559	3	152187431	MBNL1	6.74	0.32	4.21	3.38	
MBNL1	ILMN_2313158	6	rs4939558	18	46278591		rs1522374	က	152235530		7.72	0.03	0.27	0.07	
MBNL1	ILMN_2313158	က	rs6128397	20	57253132		rs16864367	m	152234166		7.22	1.34	1.15	1.73	
MBNL1	ILMN_2313158	က	rs7710738	n	22101322		rs13069559	m	152187431	MBNL1	7.92	2.55	7.89	9.28	
MBP	ILMN_2331544	18	rs6079849	20	15462611		rs2051344	18	74715653	MBP	6.26	0.10	0.03	0.05	
MBP	ILMN_2398939	18	rs139568	22	42210985		rs2051344	18	74715653	MBP	5.56	0.03	0.23	0.02	
MBP	ILMN_2398939	18	rs2051344	18	74715653	MBP	rs1125539	m	155204939		5.79	0.02	0.76	0.27	
MBP	ILMN_2398939	18	rs2051344	18	74715653	MBP	rs2619046	ю	55097534		6.03	0.15	0.50	0.26	
MBP	ILMN_2398939	18	rs4805021	19	33436367		rs2051344	18	74715653	MBP	5.82	0.03	0.47	0.14	
MBP	ILMN_2398939	18	rs8092433	18	74747424		rs4890876	18	74732087		5.40	7.06	21.91	28.73	0.015
MEGF9	ILMN_2290118	6	rs13039689	20	51922071		rs966396	6	123453281	MEGF9	4.63	1.13	1.33	1.71	
MFN2	ILMN_1651385	-	rs7989895	13	109401737		rs4846085	1	12050634	MFN2	5.76	0.61	0.25	0.41	
MGC13057	ILMN_1787526	2	rs12718598	7	50428445	MGC13057	rs11725347	4	171860973		5.81	0.13	0.30	0.14	
MGC13057	ILMN_1787526	7	rs674608	18	69070772		rs12718598	4	50428445	MGC13057	5.57	0.07	1.03	0.50	
MGC13057	ILMN_1787526	61	rs8058318	16	82628245		rs12718598	7	50428445	MGC13057	7.05	0.11	0.12	0.05	
MGC72104	ILMN_1688318	20	rs845787	20	26197931	MGC72104	rs2660665	œ	137526799		4.17	0.05	0.08	0.03	
MGST3	ILMN_1751956	-	rs740441	17	55779644		rs4147592	1	165600146	MGST3	5.45	0.57	0.27	0.40	
MPZL2	ILMN_1752932	11	rs1805	11	118076069	MPZL2	rs11771552	7	154708716		5.90	0.01	0.23	0.04	
MPZL2	ILMN_1752932	11	rs7316716	12	19953193		rs1805	11	118076069	MPZL2	5.64	0.97	1.08	1.35	
MRPL36	ILMN_1800197	10	rs17469061	10	8436432		rs750495	10	1782046	MRPL36	68.9	0.34	0.18	0.19	
MRPL43	ILMN_2258774	10	rs6564769	16	80641040		rs2863095	10	102746503	MRPL43	5.71	0.26			
MRPL52	ILMN_1713966	14	rs1950857	14	26710271		rs3811188	14		MRPL52	6.56	0.14	0.44	0.22	
MRPS10	ILMN_1663664	9	rs10955512	00	110202230		rs722269	9	42194916	MRPS10	7.48	0.46	0.70	0.64	
MRPS10	ILMN_1663664	9	rs11698155	20	15063214		rs2395803	9	42158596	MRPS10	6.85	0.31	0.63	0.46	
MRPS10	ILMN_1663664	9	rs1420537	16	52453567		rs13217993	9	42164401	MRPS10	6.21	0.41	0.25	0.28	
MTMR15	ILMN_2152178	15	rs7178375	15	31215935	MTMR10	rs12431444	14	42068689		5.18	1.87	1.87	2.86	
MX1	ILMN_1662358	21	rs459498	21	42795027		rs11160227	14	95514596		6.31	0.46	0.52	0.50	
MXI	ILMN_1662358	21	rs459498	21	42795027		rs4973801	m (	26706382		5.83	0.11	0.50	0.23	
MXI	ILMN_1662358	121	rs459498	21	42795027		rs8130120	. 51	29363604	9000	6.78	0.29	0.92	0.65	13.431
MYBPC3	ILMN-1781184	11:	rs10134030	14	61593110		rs1317149	11:	47486885	MYBPC3	5.56	0.13	0.46	0.23	
MYBECS	ILMIN-1781184	10	rs/322/08	51.	109090001	110000	rs/124081		47529947	MYBPC3	00	40.0	0.00	0.02	
MYOMI	ILMIN_1680344	8 9	rs4798075	8 2	3247256	MYOMI	rs2/3/422	x y	134485237	MADD1	6.02 8.02	9.00	0.15	0.40	90 000
AAAN	ILMN 1668605	5 4	rs2707575	10	147638723		rs6826085	2 4	76870229	NAAA		0.20	0.03	0.04	5.00
NAAA	ILMN_2391512	. 4	rs2071856	22	37770630		rs6826085	. 4	76870229	NAAA	5,46	0.27	0.43	0.30	
NAPRT1	ILMN_1710752	œ	rs2123758	œ	144663661	NAPRT1	rs2786014	1	234897243		6.08	0.07	0.48	0.18	
NAPRT1	ILMN_1710752	œ	rs2123758	œ	144663661	NAPRT1	rs3889129	œ	144613680		8.45	15.12	16.08	30.77	0.050
NAPRT1	ILMN_1710752	œ	rs2123758	œ	144663661	NAPRT1	rs4862705	4	187445552		5.62	1.27	0.19	0.81	
NAPRT1	ILMN_1710752	oo ·	rs2123758	00	144663661	NAPRT1	rs6455553	9	167811764		6.12	0.87	0.76	1.01	
NAPRTI	ILMN_1710752	oo o	rs2123758	90 G	144663661	NAPRT1	rs700276	<b>.</b>	146189057		6.86	1.10	20.03	2.77	
NAPKII	ILMIN-1710752	<b>x</b> 0 0	rs2123758	o c	144663661	NAPKII	rs/5/1561	21 0	213386267	E C 4 14	6.03	0.13	0.47	0.23	
NAPRII	ILMIN-1710752	ю о	rs2208123	7 0	103488080		rs2123738	ю о	144663661	NAPELI	00.00 N	0.29	0.00	0.03	
NAPSA	ILMN-1784040	61	rs1405655	61	50882619	NAPSB	rs930280	0 00	98391111	1 101 1111	0 10	0.82	0.10	0.40	
NAPSB	ILMN_2109416	19	rs1405655	19	50882619	NAPSB	rs10882406	10	95976932		5.58	0.67	1.10	1.12	
NAPSB	ILMN_2109416	19	rs1405655	19	50882619	NAPSB	rs7577137	7	234721287		5.58	2.11	0.44	1.71	
NCL	ILMN_2121437	61	rs7563453	61	232301670		rs4973397	61	232291471		7.31	7.51	6.33	12.70	0.010
NDUFA12	ILMN_1737738	12	rs2746971	22	37101890		rs11107847	12	95386791	NDUFA12	3.88	0.39	0.18	0.22	
NMT2	ILMN_1656378	10	rs10906857	10	15239498	NMT2	rs12490878	3	183114008		6.84	0.42	0.34	0.35	
NOD2	ILMN_1762594	16	rs2967636	19	7067773		rs9302752	16	50719103	NOD2	5.90	0.24	0.04	90.0	
NRBF2	ILMN_3237385	10	rs11063498	12	5209048		rs7923609	10	65133822	NRBF2	5.45				

Probe   Prop.   Prop	Expression trait				SNP 1				SNP 2		Interact	Interaction statistic /	- log10 p-values	values	
10         reduction decided         4	Probe ID <sup>b</sup>	Chr.	rs ID	Chr.	$Pos/Mb^{c}$	Associationd	rs ID	Chr.	$Pos/Mb^{c}$	Associationd		Fehrmann <sup>f</sup>	$EGCUT^{t}$	Metag	Distance / Mb <sup>h</sup>
1   10,000	ILMN_3237385	10	rs6025645	20	56157341		rs7923609	10	65133822	NRBF2 NRBF2	5.45				
8         minoson         mino	ILMN_1800897	1	rs4852124	- 61	240680022		rs6588415	1	52334047	MINDE	6.13	0.47	0.02	0.17	
12         nillididadi ilitatis         11 11486050         nillididadi ilitatis         11 11486050         nillididadi ilitatis         11 11486050         0AST         413         0.55         0.00         0AST         0.00         0AST         0.00 <td< td=""><td>ILMN_1787885</td><td>œ</td><td>rs5017351</td><td>11</td><td>25453482</td><td></td><td>rs1005901</td><td>œ</td><td>21964378</td><td>NUDT18</td><td>5.44</td><td>0.03</td><td>0.46</td><td>0.15</td><td></td></td<>	ILMN_1787885	œ	rs5017351	11	25453482		rs1005901	œ	21964378	NUDT18	5.44	0.03	0.46	0.15	
12         mistages         m	ILMN_1658247	12	rs11613438	12	113480510		rs1047944	9	163997467		8.59	1.27	1.55	2.03	
10.   1.00   1	ILMN_1658247	12	rs13311	12	113448652		rs2072133	12	113409260		4.13	4.12	0.81	3.86	0.039
1   17,8555507   2   17,755469   CSPP1   CSP	ILMN_1675640	77.	rs2892233	61	49160255		rs3741981	7.	00000	OASI	4.38	0.87	0.46	0.76	
11   17,220,079   2.1   2.00,024.23   2.00,024.24   2.00	ILMN-2381899	01	rs7192613	16	74286646		rs17512962	01	13169066	OFTN	5.64	0.42	0.06	0.14	
9         FATABOLIS DE CONTRILIS         PATABOLIS DE CONTRILICATION         FATABOLIS DE CONTRILICATION </td <td>ILMN_2307032</td> <td>11</td> <td>rs2829679</td> <td>21</td> <td>26662543</td> <td></td> <td>rs998639</td> <td>11</td> <td>3149249</td> <td>OSBPL5</td> <td>5.00</td> <td>0.36</td> <td>0.00</td> <td>0.07</td> <td></td>	ILMN_2307032	11	rs2829679	21	26662543		rs998639	11	3149249	OSBPL5	5.00	0.36	0.00	0.07	
1         FAZZASTO         1         CONDENS         CONDENS         1         CALL         CALL <td>ILMIN_1742456</td> <td>n 0</td> <td>rs17780195</td> <td>1.7</td> <td>70624189</td> <td></td> <td>rs22/37/0</td> <td>ומ</td> <td>77755469</td> <td>CSTFI</td> <td>5.42</td> <td>0.16</td> <td>0.87</td> <td>0.49</td> <td></td>	ILMIN_1742456	n 0	rs17780195	1.7	70624189		rs22/37/0	ומ	77755469	CSTFI	5.42	0.16	0.87	0.49	
1   0.00000000   1.00000000   1.00000000   1.000000000   1.0000000000	ILMN-1742456	n ,	rs2273770	n ,	77755469	OSTFI	rs7718088	Ω,	179590952		5.42	1.20	80.0	0.62	000
1         1	ILMN_1734542	-	rs10802822	-	240132968		rs1264898	_	111992823	OVGP1	5.43	0.13	1.48	0.88	128.140
5         missons         5         missons         5         missons         5         missons         6         missons         4         0.00         0.	ILMN_1734542	- 1	rs347331	n :	140148107		rs1264894	-	111969719	CVGFI	6.04	0.25	1.21	0.82	
15         FRANKSHOUND         1 JARY 2019         PEX.D         A.18         A.18 <td>ILMN_2313901</td> <td>ı n</td> <td>rs28092</td> <td>io i</td> <td>102149795</td> <td>PAM</td> <td>rs784600</td> <td>- 0</td> <td>40139553</td> <td>HPCAL4</td> <td>5.59</td> <td>0.66</td> <td>0.44</td> <td>0.59</td> <td></td>	ILMN_2313901	ı n	rs28092	io i	102149795	PAM	rs784600	- 0	40139553	HPCAL4	5.59	0.66	0.44	0.59	
12   12   12   12   12   12   12   12	ILMN_1815951	o	rs2438490	c	148726162	PCYOXIL	rs2731939	n	21395989		6.20	0.19	0.26	0.16	
12         Fig405797         15         74,246,642         Fig4328748         12         7364442         PEX 5         5.74         0.34         0.09           11         rest208233         12         49151303         PGLYRP1         rest208237         14         7784444         6.54         0.54         0.05           22         rest208233         19         40151309         PEX 5         6.64         0.57         0.05           22         rest40444         22         31075185         PIK31P1         rest2082341         1         7788697         PKA         6.54         0.03         0.05           22         rest40444         22         32203131         PIK31P1         rest2082841         1         7788697         1         0.03         0.05           22         rest688411         15         16102848         2         310877884         2         31087788         0.03         0.05           22         rest688411         15         161028466         rest7884         2         31087886         1         0.05         0.05         0.05           11         rest868841         15         16103884         1         2.144767         PPP2RRA         6.54	ILMN_1660232	12	rs10444467	12	128052636		rs4329748	12	7364442	PEX5	5.85	0.09	0.71	0.32	120.688
13         18131090         22         401511030         PGTAPRA         5.64         0.87         0.36           21         18131090         22         140151030         PGCS9467         1.4         2195267         PGAPA         6.51         0.65         0.65           22         1847072         22         3167518         PHKRP         182038876         PGAPA         6.51         0.69         0.60           22         1847072         22         3167518         PHKRP         182038876         PGAPA         6.51         0.60         0.00           22         18470672         22         3199917         PHKRP         6.53         0.00         0.00           22         18470672         22         3199917         PHKRP         6.33         0.00         0.00           22         18470674         22         21918284         17         0.00         0.00           22         18470684         18         18470787         18         1847078         18         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00         0.00	ILMN_1660232	12	rs7495797	15	27246462		rs4329748	12	7364442	PEX5	5.74	0.34	0.00	0.13	
11         pt.12982333         19         46.52466         PCLYRP1         rs12082367         14         212982367         6.51         0.03         0.05           22         rs4414404         22         3157156         PRINT         rs40049831         1         76708086         PHCA         5.51         0.03         0.09           22         rs440440         22         3157156         PISD         rs506531         1         1788697         PGD         0.09         0.09           22         rs440440         22         33234931         PISD         rs50404851         1         1.0182681         PKD         0.00	ILMN_1797893	13	rs131969	22	49151303		rs7328733	13	33126737	PFAAP5	5.64	0.87	0.36	0.67	
21         residand 2         11         12007368         PHK3IP1         residand 2         11         12007368         PHKAB         11         12007368         PHKAB         11         12007368         PHKAB         11         12007368         PHKAB         12         12007377         12	ILMN_1704870	19	rs12982353	19	46529456	PGLYRP1	rs1263806	14	21982957		6.51	0.03	0.65	0.24	
2.2         ried/14/14/40         2.         314/75/18/2         products         1         61728/69         1         61728/69         1         1         61728/69         1         1         61728/69         1	II.MN 1812552	-	rs493642	=	123097386		rs10736812	-	76708086	PHCA	10	0.36	0 0	0.70	46 389
2.2         ind/10072         2.         2026333         PISD         ind/100833         14         30368867         5.2         0.62         0.87         0.87           2.2         ind/10072         2.         32364031         PISD         ind/10072         2.         3036918         PISD         ind/10072         2.         3036040         0.0         1.0         0.0         <	11.MN 1719986	66	ro4141404	000	31675185	PIK3ID1	2000000	-	61798507		100	00.0	0.00	0 03	
2.2         Fight 10.2         2.2         STATION 2.2         2.2 </td <td>11 Men 1703034</td> <td>1 0</td> <td>10111111</td> <td>1 0</td> <td>99969191</td> <td>T TOTAL</td> <td>12000041</td> <td></td> <td>000000000000000000000000000000000000000</td> <td></td> <td>00.0</td> <td>000</td> <td>0.00</td> <td>0000</td> <td></td>	11 Men 1703034	1 0	10111111	1 0	99969191	T TOTAL	12000041		000000000000000000000000000000000000000		00.0	000	0.00	0000	
2.2         F. 180.1877.2         2.2         3.199.117         F. 1.5         F. 1.5         F. 1.1         O. 0.0         0.1.9           2.2         1.875.187.2         2.2         3.139.187         F. 1.5         1.1         1.1         1.1         1.1         1.1         1.1         0.00         0.1.2         0.04           2.         1.875.104         5         3.824.3431         F. 1.5         1.1         1.1         1.1         0.00         0.1.2         0.04           1.1         1.891.1019         2.         3.824.3431         F. 1.250.006         4.44         0.05         0.05         0.04           1.1         1.891.019         2.         3.826.0048         F. 1.2120009         1.21247167         PPPERS         4.44         0.03         0.04           1.1         1.818.0037         2.         1.2447167         PPPERS         5.61         0.05         0.04         0.04           1.1         1.818.0037         3.         1.2120009         1.212447167         PPPERS         5.62         0.05         0.05         0.04         0.04         0.04         0.04         0.04         0.04         0.04         0.04         0.04         0.04         0.04         0.0	ILMIN_1,93934	7 0	2100153	7 0	10100270	LISD	FSIO490313	# ·	0.000000		0.70	0.02	0.0	0.00	
2         ref.15572         2         3524834         ref.15572         7         4.12         0.05         0.04           9         ref.15572         2         15087816         2         35248347         PISD         0.06         0.04           9         ref.15579         0         46587855         ref.27804         9         140847108         PPKBA         5.15         0.05         0.04           1         ref.1231403         15         16839047         ref.28046         9         140847108         PPKBA         5.15         0.05         0.04           1         ref.1231403         15         16839047         ref.1210009         1         212447167         PPPRBA         5.15         0.03         0.04           1         ref.12403256         12         135050044         ref.1210009         1         212447167         PPPRBA         5.65         0.03         0.03           1         ref.12403256         12         135050044         ref.1210009         1         212447167         PPPRBA         5.65         0.03         0.03           1         ref.10409231         1         121447167         PPPRBA         5.75         0.08         0.03	ILMIN_I 793934	7.7	rsp518752	7.7	31999127	FISD	rs954627	-	18236681		7.11	0.00	1.19	0.48	
2         res6869411         5         ISSERSIGO4         res407884         2         219182481         PNKD         6:35         0.16         0.704           1         res1163998         6         4527100         res428064         9         14487108         0.31         0.73         0.73           14         res1163998         6         4527109         res22664         res1116887         1         755990         PPPPRRA         5.63         0.72         0.43           14         res129365         1         2659664         res12120009         1         212447167         PPPPRRA         5.63         0.72         0.43           1         res122355         13         66222691         res12120009         1         212447167         PPPPRRA         5.61         0.03         0.13           1         res8622694         1         107417238         res1120009         1         212447167         PPPPRRA         5.61         0.03         0.13           1         res862267         1         107417238         res1120009         1         212447167         PPPPRRA         5.61         0.03         0.14           1         res1022846         1         12147167         PPP	ILMN_1793934	7.7	rs715572	7.7	33234931		rs6518754	7.7	32097775	PISD	4.12	0.05	0.42	0.15	1.137
9         res163998         16         4557109         res92804         9         140487108         PPFIBP2         4.44         0.31         0.37           14         res1291019         20         49668256         res92864         19         140487108         6.15         5.15         0.33         0.33           14         res12910109         20         5836086         res1120000         1         212447167         PPPRR5A         5.63         0.72         0.48           1         res1283256         12         13560804         res12120009         1         212447167         PPPRR5A         5.67         0.08         0.36           1         res188325         14         9504042         res12120009         1         212447167         PPPRR5A         5.65         0.30         0.38           1         res6028334         14         9504042         res12120009         1         212447167         PPPRR5A         5.65         0.39         0.31           1         res60188325         14         9504042         res12120009         1         212447167         PPPRR5A         5.73         0.08           1         res60188328         16         150487167         PPPRSA	ILMN_1774604	7	rs6869411	S	158781604		rs4672884	7	219182481	PNKD	6.35	0.16	0.04	0.04	
11         re9911019         20         49688255         res475840         PFPRBP2         444         0.29         0.33           14         re9104409         2         49688255         res47864         5.830880         6.836886         1.1         755994609         1.2         21447167         PPPRBA         5.61         0.029         0.42           1         res10390170         2         1.65399647         res12120009         1.21447167         PPPPRBA         5.61         0.05         0.03           1         res622334         1.1         10747238         res12120009         1.21447167         PPPPRBA         5.61         0.03         0.03           1.1         res622091         1.212447167         PPPPRBA         5.65         0.13         0.05         0.13           1.1         res622093         1.4         107474767         res11600999         1.22447167         PPPPRBA         5.65         0.13         0.06         0.13           1.1         res6010823         1.4         1.212447167         PPPPRBA         5.65         0.13         0.04         0.13           1.1         res76714847         res1160099         1.1         212447167         PPPPRBA         1.44 <td< td=""><td>ILMN_1662587</td><td>6</td><td>rs11639998</td><td>16</td><td>4527109</td><td></td><td>rs928046</td><td>6</td><td>140487108</td><td>PNPLA7</td><td>5.15</td><td>0.31</td><td>0.78</td><td>0.56</td><td></td></td<>	ILMN_1662587	6	rs11639998	16	4527109		rs928046	6	140487108	PNPLA7	5.15	0.31	0.78	0.56	
14         rs12914603         15         58350896         rs11168875         14         36198146         PPP2RAG         5.81         0.12         0.44           1         rs12914603         15         5835064         rs11156875         14         36198146         PPP2RAG         5.63         0.72         0.48           1         rs12422255         12         125596064         rs12120009         1         21447167         PPP2RAG         5.63         0.05         0.95           1         rs682334         11         107417238         rs12120009         1         21447167         PPP2RAG         5.63         0.05         0.36           1         rs682334         11         107417238         rs12120009         1         212447167         PPP2RAG         5.63         0.05         0.36           1         rs767367         1         12447167         PPP2RAG         5.73         0.06         0.30           1         rs8019823         14         2504088         1         12447167         PPP2RAG         5.73         0.06         0.30           1         rs8019823         14         2504088         1         12447767         PPP2RAG         5.64         0.016	ILMN_1675656	11	rs911019	20	49668255		rs4758001	11	7559930	PPFIBP2	4.44	0.29	0.33	0.26	
1         rss1020009         1         212447167         PPP2R5A         5.63         0.72         0.48           1         rss1032055         2         166399467         rss12120009         1         212447167         PPP2R5A         5.63         0.72         0.95           1         rss1889083         13         16222691         rss12120009         1         212447167         PPP2R5A         5.65         0.13         0.05           1         rss1889083         13         107417238         rss12120009         1         212447167         PPP2R5A         5.65         0.13         0.05           1         rss1891778         9         271444775         rss12120009         1         212447167         PPP2R5A         5.65         0.13         0.05           1         rss20818355         16         2386776         rss1100099         1         212447167         PPP2R5A         5.72         0.06         0.13           1         rss20818355         16         23867776         rss11049773         16         12638607         PRDX5         7.34         0.13         0.14           1         rss208048         18         43893854         rss1170058         1         47708744	ILMN_1662617	14	rs12914603	15	58350896		rs11156875	14	35619816	PPP2R3C	5.81	0.12	0.42	0.19	
1         rs182902355         13         123559664         rs12120000         1         212447167         PPP2R5A         5.67         0.08         0.05           1         rs184902355         13         66222691         rs12120000         1         212447167         PPP2R5A         5.67         0.08         0.03           1         rs662334         11         10741238         rs12120000         1         212447167         PPP2R5A         5.65         0.08         0.03           1         rs755777         6         135030045         rs12120009         1         212447167         PPP2R5A         5.65         0.05         0.05           1         rs757777         6         122447167         PPP2R5A         5.72         0.05         0.30           1         rs8019823         14         95040482         rs12020099         11         212447167         PPP2R5A         5.73         0.05         0.11           1         rs8019823         14         4508386         15         15863800         11         1408380         0.31         0.31         0.31           2         rs802823         14         15         15862860         1         17088084         1	ILMN_1738784	1	rs10930170	73	166399467		rs12120009	-	212447167	PPP2R5A	5.63	0.72	0.48	99.0	
1         res689083         13         66222691         res121200009         1         212447167         PPP2R5A         5.61         0.36         0.13           1         res683083         13         66222691         res121200009         1         212447167         PPP2R5A         5.65         1.60         0.28           1         res7757871         6         135030045         res12120009         1         212447167         PPP2R5A         5.65         1.60         0.36           1         res7757871         6         135030045         res121200099         1         212447167         PPP2R5A         5.65         0.36         0.36           1         res1282355         16         42867776         res11600990         1         212447167         PPP2R5A         5.65         0.36         0.36           1         res1282355         16         42867776         res11701058         21         47776382         C210RF57         5.60         0.03         0.03           2         res1282357         2         4286774         res11701058         21         47776382         C210RF57         4.81         0.03         0.04         0.05           6         res28805648         18 <td>ILMN_1738784</td> <td>1</td> <td>rs12423255</td> <td>12</td> <td>123595064</td> <td></td> <td>rs12120009</td> <td>-</td> <td>212447167</td> <td>PPP2R5A</td> <td>5.72</td> <td>0.08</td> <td>0.95</td> <td>0.46</td> <td></td>	ILMN_1738784	1	rs12423255	12	123595064		rs12120009	-	212447167	PPP2R5A	5.72	0.08	0.95	0.46	
1         rs652334         1         107417238         rs12120009         1         212447167         PPP2R5A         5.65         1.69         0.28           1         rs7571778         9         27144475         rs12120009         1         212447167         PPP2R5A         5.95         0.16         0.06           1         rs7571778         9         27144475         rs12120009         1         212447167         PPP2R5A         5.95         0.16         0.06           1         rs28019823         14         95040482         rs1100099         1         212447167         PPP2R5A         5.72         0.16         0.03           1         rs28019823         2         2887776         rs1000990         1         212447167         PPP2R5A         5.73         0.06         0.11           2         rs2801923         2         47931653         C210RF57         rs1107058         2         4777782         6         7.34         0.05         0.11         0.03           6         rs2802954         1         4778744         PSMB1         rs277947         4.81         0.44         0.21           6         rs602886         1         1         170823379	ILMN_1738784	1	rs1889083	13	66222691		rs12120009	-	212447167	PPP2R5A	5.61	0.36	0.13	0.17	
1         res7757871         6         135030045         res12120009         1         212447167         PPP2R5A         5.95         0.37         0.06           11         res7757871         6         271444475         res12120009         11         212447167         PPP2R5A         5.95         0.37         0.08           11         res8019823         14         95040482         res11600990         11         64082807         PRDX5         6.43         0.81         0.14           15         res288372         21         47931653         C210RF57         res16407346         6.43         0.63         0.03           2         res28839372         21         47031653         C210RF57         res1600934         PSMB1         5.60         0.19         0.03           2         res28839372         21         42062843         6         17080084         PSMB1         5.14         0.00         0.03           6         res6060830         18         43983354         PSMB1         res282643         6         17080084         PSMB1         5.14         0.00         0.20           6         res6060830         20         30347824         PSMB1         res2826415         6	ILMN_1738784	1	rs682334	11	107417238		rs12120009	Т	212447167	PPP2R5A	5.65	1.69	0.28	1.21	
1         resp8719278         9         27144475         res12120009         1         210442867         PPP2R5A         5.72         0.16         0.30           16         res2188355         16         23867776         res1060990         1         6442887         PRDX5         6.43         0.14         0.14           21         res2188355         16         23867776         res1060990         1         612639800         7.34         0.15         0.13           21         res2188355         16         23867776         res1049273         16         1263980         7.34         0.53         0.11           21         res2080371         21         47931653         C210RF57         18         3149746         PSMB1         5.79         0.05         0.14           6         res6060330         20         31347816         res12207114         6         17682379         PSMB1         5.74         0.05         0.44           6         res6060330         20         31347846         res1220844         PSMB1         5.74         0.44         0.21           7         12         12852843         6         17685423         1         17682379         PSMB1         5.44	ILMN_1738784	Т	rs7757871	9	135030045		rs12120009	1	212447167	PPP2R5A	5.95	0.37	90.0	0.12	
11         res6019823         14         95040482         res11600990         11         64082807         PRDX5         6.43         0.81         0.14           16         res1029231         21         473467776         res0402739         16         1263900         7.34         0.53         0.01         0.03           21         res283972         21         47931653         C21ORF57         res928437         21         4777340         5.60         0.19         0.03           21         res2839372         21         45068862         C21ORF57         res1207114         PARBH         5.79         0.03         0.044           6         res4890648         18         43983954         res13207114         FSMBH         5.79         0.00         0.04           6         res608030         20         30047822         pre608089         1         2777444         PSMBH         5.74         0.00         0.26           6         res608080         20         30047823         res12207144         PSMBH         5.74         0.04         0.26           1         res7299449         12         137287957         res1220714         1702877957         4.58         0.08         0.08	ILMN_1738784	1	rs7871178	6	27148475		rs12120009	1	212447167	PPP2R5A	5.72	0.16	0.30	0.16	
16         res188355         16         22867776         res1049279         16         12639800         7.34         0.53         0.11           21         res108355         21         42038653         C210RF57         res049377         18         34938653         6.019         0.59         0.19           21         res283972         21         4803865         C210RF57         res048377         4.81         0.09         0.44           6         res3802648         18         43803854         res048343         6         17080384         res0406038         0.79         0.00         0.26           6         res0606030         20         3034782         res0406455         6         17087744         PSMB1         5.14         0.04         0.26           6         res0606030         20         3034782         res0206415         6         17087744         PSMB1         5.14         0.04         0.05           12         res0606030         20         3034782         res1020714         6         17087744         PSMB1         5.14         0.04         0.05           12         res0606030         20         3034782         res1030714         res1020744         PSMB1	ILMN_1711606	11	rs8019823	14	95040482		rs11600990	11	64082807	PRDX5	6.43	0.81	0.14	0.44	
21         res1029321         21         47931653         C21ORF57         18         31497346         5.60         0.19         0.03           6         res280923         21         47931653         C21ORF57         18         41777344         PSMB1         5.76         0.19         0.04           6         res380507         11         121774705         res928843         6         170877444         PSMB1         5.74         0.00         0.26           6         res4800648         18         43983854         res928433         6         17089784         PSMB1         5.14         0.00         0.21           6         res6028843         6         res6028843         6         17089784         PSMB1         5.14         0.00         0.21           6         res6028843         6         res6028843         6         17089034         PSMB1         5.14         0.00         0.21           12         res6028846         17089034         1         12277976         6         17089034         1.03         0.03         0.44           12         res615622         1         1         170877444         PSMB1         1.084874         0.00         0.02         0.44<	ILMN_1713603	16	rs2188355	16	23867776		rs10492793	16	12639800		7.34	0.53	0.11	0.25	11.228
21         rs2839372         21         48068862         rs11701058         21         4775382         C210RF57         4.81         0.69         4.47           6         rs386267         11         121774705         rs13207114         6         17087744         PSMB1         5.79         0.04           6         rs488626843         2         3034782         rs6928445         6         17082379         PSMB1         5.14         0.00         0.26           6         rs6060830         20         3034782         rs780714         6         17082379         PSMB1         0.04         0.05           6         rs6060803         2         3034782         rs7106083         6         17082379         7         4.58         0.04         0.02           12         rs6060803         2         3034782         rs7106083         1         2721825         PSMB1         6.14         0.00         0.03           12         rs608020         1         76588123         rs11036212         1         5221825         PTDSS1         5.00         0.03         0.08           12         rs631562         1         1         7221825         PTDSS1         5.70         0.03	ILMN_1675038	21	rs1029231	21	47931653	C21ORF57	rs958127	18	31497346		5.60	0.19	0.03	0.04	
6         res862667         11         12177476         res13207114         6         170877444         PSMB1         5.79         0.44         0.24           6         res60936         20         30347832         res0295415         6         170823379         PSMB1         5.14         0.04         0.26           6         res60930         20         30347832         res295415         6         170823379         PSMB1         5.14         0.04         0.21           6         res60930         20         30347832         res276964         1         22579797         5.44         0.44         0.21           12         res635367         14         9478823         res1030714         6         170823379         PSMB1         5.42         0.32           12         res631562         17         7658423         res1030714         1         5221825         PTDSS1         5.00         0.03         0.43           12         res631562         17         765842348         res10020773         4         17526853         QDPR         5.75         0.02         0.03           13         res631562         1         76521825         PTDSS1         5.70         0.02	ILMN_1675038	21	rs2839372	21	48063862		rs11701058	21	47776382	C21ORF57	4.81	0.69	4.47	4.06	0.287
6         re4890648         18         43983644         PSMB1         FSMB1         5.14         0.00         0.26           6         re5028643         6         170890384         PSMB1         FSMB1         FS.14         0.00         0.26           6         re5028643         6         170829384         6         170829384         6         170829384         6         170829384         6         170829384         6         6.45         1.35         0.02           1         re3729346         1.2         1.3727816         re31207114         6         17087744         PSMB1         5.42         1.35         0.64         0.02           1.2         re3253467         1.4         9478823         re31036212         1.1         521825         PTDSS1         5.00         0.03         0.48           1.2         re431562         1.7         76598123         re11036212         1.1         5221825         PTDSS1         5.00         0.08         0.08           1.2         re431562         1.2         1.2         7023872         QDPR         5.70         0.03         0.04           1.2         re3107702         1.2         1.2         1.2         1.2	ILMN_1789176	9	rs3862607	11	121774705		rs13207114	9	170877444	PSMB1	5.79		0.44		
6         res0060830         20         3034783         PSMB1         5.44         0.44         0.1           6         res060830         20         3034783         PSMB1         res99545         6         17087344         PSMB1         4.58         0.44         0.64           6         res729749         12         137727816         res12207114         6         17087744         PSMB1         5.45         0.64         0.64           12         res2383 67         14         5658123         res10320711         1221825         PTDSS1         5.00         0.03         0.08         0.08           12         res631562         17         7658123         res1036212         11         5221825         PTDSS1         5.00         0.03         0.08         0.08           12         res631562         17         7658123         res1036212         11         5221825         PTDSS1         5.70         0.02         0.08           12         res031562         1         1226854248         res10036212         11         70238726         QDPR         5.75         0.02         0.03         0.08           12         res041730         2         33375704         res106384	ILMN_1789176	9	rs4890648	18	43983954		rs6928843	9	170890384	PSMB1	5.14	00.0	0.26	0.04	
6         rs6928843         6         170890384         PSMB1         rs2769959         1         22579957         4.58         1.95         0.64           12         rs7239674         12         131727816         rs12207114         6         17087744         PSMB1         5.42         1.95         0.64           12         rs235367         14         9.5478823         rs1038212         11         5221825         PTDSS1         5.00         0.03         0.48           12         rs4669205         17         76584246         rs1008212         11         5221825         PTDSS1         5.70         0.03         0.48           12         rs4669206         17         76584246         rs100820773         4         17526682         QDPR         5.70         0.03         0.48           12         rs2417728         6         106348246         rs10020773         4         17526682         QDPR         5.70         0.03         0.40           12         rs2417738         19         44407788         RARACI         rs7836367         12         7023576         6.42         0.25         0.03         0.48           11         rs4937702         16         55526551	ILMN_1789176	9	rs6060930	20	30347832		rs9295415	9	170823379	PSMB1	5.44	0.44	0.21	0.27	
6         res7299749         12         137727816         res13207114         6         170877444         PSMB1         5.42         1.18         0.32           12         res2396774         1         1.2085243         res1036212         11         5221825         PTDSS1         5.90         0.08         0.08           12         res631602         1         76598123         res11036212         11         5221825         PTDSS1         5.90         0.08         0.08           12         res631602         1         76598138         res11036212         11         5221825         PTDSS1         5.90         0.08         0.08           4         res631602         1         765982438         res11036212         11         5221825         PTDSS1         5.70         0.08         0.08           1         res041730         2         33375704         res10020773         1         7723726         QDPR         6.55         0.25         0.08           1         res042279         1         27023726         QDPR         6.38         0.03         0.31           1         res0422579         1         32136436         RCNI         res14740645         6.42         0.04	ILMN_1789176	9	rs6928843	9	170890384	PSMB1	rs2769689	1	225797957		4.58	1.95	0.64	1.78	
12         res255367         14         99478823         res1036212         11         5221825         PTDSS1         5.00         0.03         0.48           12         res631562         11         12685423         res11036212         11         5221825         PTDSS1         5.70         0.02         0.03           12         res631562         11         126854248         res11036212         11         5221825         PTDSS1         5.70         0.02         0.03           12         res494676         6         1063428246         res10020773         4         17526682         QDPR         5.75         1.03         0.05           19         res1075728         19         4467788         RABACI         res7051628         11         7016117         6.55         0.25         0.05           16         res9087702         16         5526551         AKTIP         res166344         15         20638488         RCNI         6.32         0.03         0.31           11         res1087913         12         RCNI         res1087448         RCNI         4.32         0.04         0.09           1         res1087579         11         res1087645         102740645         0.	ILMN_1789176	9	rs7299749	12	131727816		rs13207114	9	170877444	PSMB1	5.42	1.18	0.32	98.0	
12         res4669205         17         76598123         res11036212         11         5221825         PTDSS1         5.90         0.08         0.08           12         res431562         11         126852438         res1036212         11         5221825         PTDSS1         5.70         0.02         0.04           14         res4946705         6         105348246         res10020773         4         17526882         QDPR         5.77         0.02         0.40           12         res247704         8         12         7023576         QDPR         6.42         0.25         0.08           16         re3931702         16         53526551         AKTIP         res1863464         15         26938488         RCNI         6.32         0.03         0.31           11         res1087702         11         32136436         RCNI         res136436         RCNI         4.32         0.03         0.31           11         res925779         11         32136436         RCNI         res1341899         1         102740645         6.30         0.04         0.04         0.06	ILMN_1743049	12	rs2353567	14	95478823		rs11036212	11	5221825	PTDSS1	5.00	0.03	0.48	0.15	
12         re631562         11         122656438         re11036212         11         5221825         FTDSS1         5.70         0.02         0.02         0.04           12         re3401730         22         33375704         re7305307         12         70235726         6.55         0.25         0.08         0.08           19         re1075728         19         42462788         RABACI         re7305307         12         70235726         6.55         0.25         0.08           19         re1075728         19         42462788         RAFILP         re1863344         15         20433488         6.38         0.03         0.31           11         re10877913         12         4114715         RFMIL         re18633448         15         2043488         RCNI         6.38         0.03         0.31           11         re4922579         11         32136436         RCNI         re11047468         RCNI         4.32         0.41         0.09           11         re4922579         11         22136436         RCNI         re110474045         0.04         0.04         0.26	ILMN_1743049	12	rs4969205	17	76598123		rs11036212	11	5221825	PTDSS1	5.90	08.0	80.0	0.38	
4         res4946705         6         106348246         res10020773         4         17526682         QDPR         5.75         1.03         1.25           12         res421730         22         33375704         res736507         12         70235726         6.55         0.28         0.28         0.084           19         res045788         19         45462788         RABACI         res1863464         15         226938488         6.38         0.03         0.31           11         res0831702         16         55526551         AKTIP         res1863464         15         226938488         6.38         0.03         0.31           11         res10875911         12         213343486         RCNI         res192579         11         32136436         RCNI         8         141174488         0.58         0.03         0.03           11         res4922579         11         32136436         RCNI         res11417468         RCNI         6.38         0.04         0.04         0.06	ILMN_1743049	12	rs631562	11	126852438		rs11036212	11	5221825	PTDSS1	5.70	0.05	0.40	0.11	
12         rs241730         22         33375704         rs7305307         12         70235726         6.55         0.25         0.08           19         rs1075728         16         43262788         RAFAP         rs765344         15         26938488         6.38         0.03         0.31           11         rs1087702         16         5352651         AKTIP         rs4892879         11         32136436         RCNI         6.38         0.03         0.31           11         rs4922579         11         32136436         RCNI         rs11416997         8         11177468         4.32         0.41         0.09           11         rs4922579         11         32136436         RCNI         rs1341899         1         102740645         5.40         0.04         0.26	ILMN_1672443	4	rs4946705	9	106348246		rs10020773	4	17526682	QDPR	5.75	1.03	1.25	1.55	
19         rs1075728         19         42467788         RABACI         rs7951628         11         120161117         6.42         0.28         0.84           16         rs9931702         16         53526551         AKTIP         rs1863364         15         26938488         6.42         0.28         0.31           11         rs1927313         12         41147155         rs1427557         11         32136436         RCN1         rs11177468         4.32         0.41         0.09           11         rs4922579         11         32136436         RCN1         rs1341899         1         102740645         5.40         0.04         0.26	ILMN_1803197	12	rs241730	22	33375704		rs7305307	12	70235726		6.55	0.25	0.08	0.09	
16         re9931702         16         5552555         AKTIP         rs1863464         15         296934488         6.38         0.03         0.31           11         rs102879131         12         41147155         RCN1         rs19292579         11         32136436         RCN1         5.23         0.58         0.37           11         rs4922579         11         32136436         RCN1         rs11166957         8         14177468         4.32         0.41         0.09           11         rs4922579         11         32136436         RCN1         rs1341899         1         102740645         5.40         0.04         0.26	ILMN_2207363	19	rs1075728	19	42462788	RABACI	rs7951628	11	120161117		6.42	0.28	0.84	0.59	
11         rs1087931         12         41147155         RCM1         rs4922579         11         32136436         RCM1         6.23         0.58         0.37           11         rs4922579         11         32136436         RCM1         rs1166957         8         14177468         4.32         0.41         0.09           11         rs4922579         11         32136436         RCM1         rs1341899         1         102740645         5.40         0.04         0.26	ILMN_1756999	16	rs9931702	16	53526551	AKTIP	rs1863464	15	26938488		6.38	0.03	0.31	0.08	
11         rs4922579         11         32136436         RCN1         rs11166957         8         141177468         4.32         0.41         0.09           11         rs4922579         11         32136436         RCN1         rs1341899         1         102740645         5.40         0.04         0.26	ILMN_1800276	11	rs10879131	12	41147155		rs4922579	11	32136436	RCN1	5.23	0.58	0.37	0.47	
11 rs4922579 11 32136436 RCN1 rs1341899 1 102740645 5.40 0.04 0.26	ILMN_1800276	11	rs4922579	11	32136436	RCN1	rs11166957	œ	141177468		4.32	0.41	0.09	0.17	
	ILMN_1800276	11	rs4922579	11	32136436	RCN1	rs1341899	1	102740645		5.40	0.04	0.26	0.02	

Ex	Expression trait				SNP 1				SNP 2		Interac	Interaction statistic	$' - \log_{10} p$ -values	values	
Gene ID <sup>a</sup>	Probe ID <sup>b</sup>	Chr.	rs ID	Chr.	$Pos/Mb^{c}$	Associationd	rs ID	Chr.	$Pos/Mb^{c}$	Associationd	$BSGS^{e}$	$Fehrmann^{f}$	$\mathtt{EGCUT}^{\mathrm{f}}$	Metag	Distance / Mb <sup>h</sup>
RERE	ILMN_1802380	1	rs4982958	14	24987865		rs301819	1	8501786	RERE	5.66	0.61	1.23	1.17	
RERE	ILMN_1802380	1	rs7697290	4	135248366		rs301819	-	8501786	RERE	5.74	0.14	0.10	90.0	
RERE	ILMN-2327795		rs11085829	19	13174312		rs301819		8501786	RERE	5.12	0.21	0.33	0.21	
127E	ILMIN-2327795	٦;	rs3852011	n ;	112844086		rs301819	٠,	987.1068	KEKE	5.71	0.08	09.0	0.26	
RNASE6	ILMN-1780533	14	rs11628398	14	21182800	RNASE6	rs7324365	13	100601327		5.48	0.42	0.21	0.26	
RNASE6	ILMN-1780533	14	rs6603134	61.	8106521		rs11628398	14	21182800	KN ASE6	5.11	60.0	0.22	0.08	
RNF167	ILMIN-1/94/26	1 -	TS238230	1 -	48/5556	TO TELEVISION OF	rs4884857	13	24008512		4. r	i	9	0	
RNF 107	ILMIN_1794726	7.	rs400688	7.7	4839930	KINF 107	rs11/06900	o -	30348908		0.00	0.71	0.40	40.0	
PAPER	ILMIN-11/30347		ESTIO/121	1 -	40121049		182019303	٠.	201303242		0.67	1.40	0.30	0.15	
DDI 10	ILMIN_11/30347	1 91	LESOLVIOIL	- 7	00640500		182019303	- 9	201303242		4.02	1.40	14.41	11.70	0
PDI 23 A D7	ILMIN-2413218	2 6	rs5525955	91	80320056		rs2903611	010	114450038	PDI.93AD7	4 r. 2 r. 2 r.	0.73	14.41	17:17	0.133
RPL36AL	II.MN 2189933	4 4	re3007033	14	50103816	RPI.36AI.	rs17495030	40	138038093	IL LESSAL	2.00	0.13	90.0	0.00	
RPI.36AL	II.MN 2189936	14	rs4900928	4 -	50020817	RPL36AL	re1502991	0 60	66137260		. v	0.00	0.00	20:0	
PDI.8	II.MN 1764791	F OX	25005878	F OX	145084615	PDI 8	re1610856	-	23.4585790		00.7	20:00	0.10	0.0	
2 T T T	II.MN 1764721	α	rs4143674	000	4741304		re2958482	ı ox	145984615	RDI.8	4 33	0.13	0.0	0.22	
SEC. 23	11.MN 3297880	) e	rs4889214	9	80913946		rs696221	) et	10342876	SEC. 12	6.5			1	
SEMAAA	II.MN 1702787	-	rs17085428	) ic	95388015		rs7695	- 0	156147326	SEMAAA	2 20	0.50	1 73	1 17	
SESNS	II.MN 1694027	· =	rs12147460	7	104412137		rs684856	· =	94906111	SESNS		20.0	5.50	11.0	
SESNS	II.MN 1694027	: :	rs355391	1 12	46591793		rs684856	: =	94906111	SESNS	5.67	0.31	0.06	0.10	
SESN3	ILMN 1694027	=	rs684856	=	94906111	SESNS	rs7004947	00	134606425		5.60	0.21	0.51	0.31	
SH3BGBL9	II.MN 1762764	9	rs10838191	-	43893658		rs1354034	or	56849749	PPRP	20.00	0.70	0.12	0.00	
SH3BGRL2	ILMN 1762764	9	rs2545385	1 10	66383979		rs1354034	o cc	56849749	PPBP	5.97	0.20	0.51	0.30	
SH3BGRL2	ILMN 1762764	9	rs6845304	4	88280502		rs1354034	07	56849749	PPBP	5.23	0.32	0.71	0.53	
SH3GLB2	ILMN_2158336	6	rs1034120	21	18196922		rs17455517	6	131785369	SH3GLB2	7.40	0.22	0.18	0.13	
SIRPG	ILMN_1771801	20	rs1535883	20	1612819	SIRPG	rs6842739	4	60489510		5.74	0.29	0.18	0.17	
SLC22A18	ILMN_2382505	11	rs11673260	19	52181798		rs367035	11	2923826	SLC22A18	5.47	0.09	0.24	0.09	
SLC22A18	ILMN_2382505	11	rs367035	11	2923826	SLC22A18	rs3110874	-1	153224179		5.70	0.15	0.10	90.0	
SLC22A18	ILMN_2382505	11	rs367035	11	2923826	SLC22A18	rs3772054	7	241678528		6.15	0.39	0.13	0.19	
SLC41A3	ILMN_2356111	က	rs1912136	11	24616743		rs6771703	က	125801067	SLC41A3	5.88	1.10	0.82	1.24	
SLC45A4	ILMN_1745778	œ ;	rs6985508	00	142337734	SLC45A4	rs7701916	io i	174598073		5.95	0.86	0.07	0.40	
SLC46A3	ILMN_1658639	13	rs949805	17	55602091		rs7981190	13	29259349	SLC46A3	5.52	0.00	0.58	0.26	
SMG7	ILMIN-1706553	- 6	rs8035259	15	97403923	2000	110711353	<b>⊣</b> (	183489203	SMG7	6.52	0.17	0.09	0.06	
COMIC	ILMIN-1775550	0 7	rsollosio	0,0	4101000	SMCA	rs110//010	V =	1100000000	a OTIMO	0.00	60.0	0.02	70:0	
SNEGO	ILMIN-5509549	7 -	rs1100021		46950108		rs/0303/	7 -	17201400	SNDGO	6.60	00.0	1.03	0 40	
SNORD14A	II.MN 1799381	: :	rs2634462	2 =	17339127		rs6486334	: :	17015557	7577777	7.31	13.11	10.96	23.22	0.324
SNORD89	ILMN_3238662	2	rs10445863	2	115929241		rs750783	2	101889306	SNORD89	6.08				14.040
SNORD89	ILMN_3238662	2	rs11605822	11	122986326		rs750783	2	101889306	SNORD89	5.96				
SNORD89	ILMN_3238662	7	rs2135064	IJ	26778066		rs750783	7	101889306	SNORD89	6.33				
SNUPN	ILMN_1733932	15	rs8134646	21	46376528	SNUPN	rs7185362	16	81888905		6.45	0.13	1.41	0.83	
SNUPN	ILMN_2364535	12	rs8134646	21	46376528	SNUPN	rs1472075	en ;	193706323		5.59	0.34	00.00	90.0	
SPATA5L1	ILMN_1729179	15	rs1131620	61	41117869		rs4774580	15	45652086	SPATA5L1	5.44	1		0	
STARDIO	ILMN_I717052	11	rs2221406	21.2	104947517		rs1000620	11	75616105	CTVVI.	.0 0 0 0	0.67	0.12	0.03	
SULF2	II.MN 2345142	50	rs11700063	20	46153148	STILES	rs939294	- 4	180439236		0.00	0.46	0.24	0.30	
SULT1A4	ILMN_2336133	16	rs1463965	2 2	74332954		rs3785354	16	28550667	TUFM	7.05	0.01	0.05	0.00	
SULT1A4	ILMN_2336133	16	rs2836657	21	40119768		rs3785354	16	28550667	TUFM	5.83				
SURF6	ILMN_1778032	6	rs6099626	20	56013994		rs3118663	6	136281753	SURF6	6.14	0.26	0.16	0.14	
SYTL2	ILMN_2336609	11	rs1375719	13	103410782		rs485485	11	85495269	SYTL2	5.47	0.28	0.31	0.24	
THBS3	ILMN_1804663		rs1939875	11	95422867		rs4072037	п	155162067	THBS3	5.55	0.03	0.15	0.03	
THBS3	ILMN_1804663		rs8014956	14	20687978		rs2049805		155194980	THBS3	5.65	0.31	0.76	0.55	
TIFED	ILMIN-1/81457	4	rsz8z3z45	7.7	10/40023		rs1320993	7	108104099	IIFKL	0.22	0.07	0.40	Continu	U.15

Probe   Dr.   Probe   Dr.   Probe   Dr.   Probe   Dr.   Prob   Dr.   Probe   Dr.   P	Ch.         p 1D         Ch.         Po.MAP         Association         Po.MAP         Ch.         Po.MAP         Association         Po.MAP         Po.MAP<	Expr	Expression trait			01	SNP 1			0.1	SNP 2		Interact	Interaction statistic /	$-\log_{10} p$ -values	values	
INAN   1994	INAN-1784428   19   000000000   10   000000000   10   00000000		Probe ID <sup>b</sup>	Chr.	rs ID	Chr.	$Pos/Mb^{c}$	Associationd	rs ID	Chr.	$Pos/Mb^{c}$	Associationd	BSGSe	$Fehrmann^f$	$\mathtt{EGCUT}^{\mathrm{f}}$	Metag	\
LINKLIFFERENCE   19	INAN_1766420		ILMN_1804148	7	rs1940400	11	132389627		rs17725246	7	44581986	TMED4	5.70	90.0	1.34	0.70	
LINAL   President   10   Artification   10	ILANAL 1766422   10   10   10   10   10   10   10	149	ILMN_1786426	19	rs2839013	21	47248981		rs8106959	19	36219525	TMEM149	8.11	0.16	0.48	0.26	
INAN_1756426	ILANIAL/TYGGOD   10 00000000	149	ILMN_1786426	19	rs5762235	22	27925288		rs8106959	19	36219525	TMEM149	6.79				
INAN_1756426   19   restriction   19   restrictio	ILANI, 1766422   19   18001090   10   3921022   FARRILIO   181401090   10   30474310   181401090   10   3021022   FARRILIO   181401090   10   30	149	ILMN_1786426	13	rs6090518	50	45207005		rs8106959	19	36219525	TMEM149	11.09	0.76	:	1	
HANALITYSISTER   19   185100820   19   3021022   TARRILIO   110877501   1288891040   8   9   9   9   9   9   9   9   9   9	ILINA 17766122   15   1510106200   19   30210020   17   17101020   19   1510106200   19   30210020   10   30210020   10   30210020   10   30210020   10   30210020   10   30210020   10   30210020   10   30210020   10   30210020   10   30	49	ILMN_1786426	13	rs807491	61	36268923	SNX26	rs7254601	61	36147315	TMEM149	12.16	81.55	45.78	145.78	0.122
INVALIDATION   1	ILAN   17766420   10   18106200   10   36210620   1   181064610   1   181064620   1   18106620	94.	ILMIN_1786426	6 6	rs&106959	5 5	36219525	TMEM149	rs1081889	01	1990259		0.17	1.00	3.09	0.00	
ILINALIZAGIZACIA   1	IMAN_1786426   19   18100090   19   304210025   TMEML149   15150258   12   12888576   19   18100090   19   304210025   TMEML149   15150258   14   4   50420258   15   50   50   50   50   50   50   50	49	ILMN 1786426	61	rs8106959	61	36219525	TMEM149	rs10937361	0.00	188359436		0.00	3.61	0.00	200,00	
ILAN	ILMN.1786426   19   resittotes   19   resittot	149	ILMN_1786426	13	rs8106959	13	36219525	TMEM149	rs1401098	12	128884559		7.37	2.41	1.00	2.52	
ILMN 1786426   19   188100909   19   36210225   TNEM140   114719304   14   10022008   6.21   3.72   3.72   5.80   0.75	ILMN.1786426   19   restriction   19   restrictio	49	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs1557335	18	64268976		6.95	0.08	0.07	0.03	
ILMN 1786426   19   F48100099   19   36210255   TNEM149   TABA4335   4   13317864   1   1   1300009   1   1   1   1300009   1   1   1   1   1   1   1   1   1	ILMN   1786426   19   meltioneste   19   30219025   ThEM   14   meditioneste   19   meltioneste   10   mel	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs17719594	14	90932598		6.93	3.06	0.77	2.87	
ILANIA   17864456   19   1881000505   19   30210502   TAREMIA   178245148   13377543   13377543   1301000505   19   30210502   TAREMIA   122531408   13   177102273   13   13   13   13   13   13   13	ILANIA   1786426   19   seltiologo   19   30219025   THEM   14   14701972   2   4   5   5   5   5   5   5   5   5   5	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs1843357	œ	13822381		6.21	3.72	3.33	6.00	
ILANIA   1786445   19   188100050   19   30210552   TMEBA149   18723800   19   14701972   17701922   18700050   19   30210552   TMEBA149   18721824   19   17702420   19   18700050   19   30210552   TMEBA149   18721824   19   175000400   19   18700050	ILMN.1786426   19   res8100999   19   38210922   TNEMA49   rea751390   7   14719272   6.70   1.07   1.05	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs2351458	4	113317583		7.30	0.04	9.61	8.00	
ILMN.1764426   19   sels106050   19   30210525   TMEN149   ser71721   11   117756426   19   sels106050   19   30210525   TMEN149   ser71724   11   sels106050   19   30210525   TMEN149   ser71724   19   sels106050   19   30210525   TMEN149   sels106050   19   30210525   TMEN149   sels106050   10   30210525   TMEN149   sels106	ILMN.1786426   19   rs8100999   19   36219522   TMEM449   rs477381   15   171792273   5   5   9   0.99   0.39	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs2539000	<u>-</u>	147619772		6.70	1.57	1.52	2.27	
ILMN.1764426   19   me8100000   19   30510055   TMEM149   me771228   11   129050460   8.85   8.55	ILANN.1786426   19   rest	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs2731711	ю	171792273		5.92	0.19	0.33	0.19	
ILANIA   1786426   19   rest	ILANN.1786426   19   ras106650   19   36210525   TMEM149   rec020582   6   161889374   8   55   5   5   5   5   5   5   5	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs471728	11	129595460		8.89	0.90	3.62	3.51	
ILANI   1786426   19   mest	ILANN 17786426   19   rest 100999   19   392119525   TMEMM449   reg 20136328   1   1   1   1   1   1   1   1   1	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs6718480	2	233879066		8.55	3.31	5.15	7.36	
ILIANI   17766426   19   resilicioco   19   36210522   TMEMI449   rev214940   19   24286424   19   36210522   TMEMI449   rev214940   19   24286424   19   36210522   TMEMI449   rev514940   19   24286424   19   36210522   TMEMI449   rev514940   19   24286424   24286424	ILMN 17766426         19         rest 10699         19         36219525         TMEM149         rest 107404         1         36219525         TMEM149         rest 107404         1         40         0.07         3.14           ILMN 17766426         19         rest 10699         19         36219525         TMEM149         rest 104904         1         242864942         6         6         2         3.0         6         9         6         9         9         9         9         9         4         0         0         7         1         4         0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         7         3.0         0         0         7         3.0         0         0         0         0         0         0         0         0         0         0         0         0	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs6926382	9	161683974		5.80	3.06	8.80	10.72	
LIANIATTROGAZE         19         rest106999         19         33219255         TMEMI49         rest10400         1         242888492         3         6.22         3.86         6.90         9         2.0           ILIANIATTROGAZE         1         rest24056         13         32289025         TMEMI49         rest24025         1         22682405         3         34.90         6.44         0.10         5.75         4.47           ILIANIATTROGASELI         7         rest24056         13         7.2890005         TMEMIA         5.90         6.44         0.10         5.75         4.47           ILIANIATROGASELI         7         rest2405723         1         rest2405733         1         rest240576         1         7.2890005         <	LMN_1786426         19         R82109255         TMEM149         reg109428         13         214789429         6.24         3.56         6.57           LMN_1786456         19         res1009559         19         36219025         TMEM149         reg109428         13         21478942         6         0.10         0.10         0.10           LMN_1786469         19         res104868         13         7289003         TMEM149         reg1048831         7         reg1048831         7         reg1048831         7         reg104863         7         12689348         IRED         5.79         0.10         0.11           LMN_178460         11         reg1048831         7         reg1048630         7         12689348         IRED         5.79         0.11         0.11           LMN_178460         11         reg104823         11         131038107         7         12689348         IREP         5.72         0.10         0.11           LMN_178460         11         reg1048831         12         12689348         18         1775814         7484475         18         18         18         18         18         18         18         18         18         18         18         18	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs7213338	17	80357420		5.49	0.07	3.14	2.10	
LIANI T796426         19         res100999         19         res201095         11         res201095         10         res201095         res201095         11         res201095         res201095         11         res201095         res201095         11         res201095         res201095         res201095         res201095         <	LINN 1781045         19         FASTOGOGO         TREMI149         FASTOGOGO         TRABEL AND TABLES         13         72800065         19         72800065         19         72800065         11         72800065         11         72800065         11         72800065         11         72800065         11         72800065         11         72800065         11         72800065         11         72800065         11         72800065         11         72800065         11         72800065         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         72800066         12         7280066         12         7280066         12         7280066         12         7280066         12         7280066         12         7280066         12         7280066         12         7280066         12         728006	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs914940	1	242889492		6.22	3.36	96.9	9.20	
LIMALITORAGE         1         PLAGAGE         1         20002733         THERMORA         5.00         0.44         0.12         0.32           LIMALITORAGE         1         Initial Action         1         Initial Action         1         Initial Action         2         20002324         1         2000242         1         0.01         0.01         0.02           LIMALITORAGE         7         INAGAGE         7         12869948         IRFS         5.01         0.01         0.01         0.07           LIMALITORAGE         7         1100000000         7         12869948         IRFS         0.01         0.01         0.07           LIMALITORAGE         11         11770632         7         12869948         IRFS         0.01         0.01         0.07           LIMALITORAGE         11         11770632         1         11708800         13         1776814         TRAPPCS         110000000         1         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         1776814         177	LINN_1770649         I mil22408         13         75890603         re4149226         1         20027233         TNIEMM6A         5.60         0.04         0.12           LINN_17706492         1         mil22408         13         58058246         1         6508706         5.61         0.01         0.01           LINN_188811         7         mil55746         9         4859303         mil1048630         7         128699348         RRF6         5.61         0.01         0.01           LINN_188811         7         mil57404         9         4859304         mil1708494         0.01         0.01         0.01           LINN_188466         11         mil1708494         19         7758194         TRAPPC         51607004         5.62         0.01         0.01           LINN_188466         10         mil175840         19         7758194         TRAPPC         mil175894         10         7758194         10         7758194         10         7758194         10         7758194         10         7758194         10         7758194         10         7758194         10         7758194         10         7758194         10         7758194         10         7758194         10         7758194 <td>149</td> <td>ILMN_1786426</td> <td>19</td> <td>rs8106959</td> <td>19</td> <td>36219525</td> <td>TMEM149</td> <td>rs9509428</td> <td>13</td> <td>21473952</td> <td></td> <td>9.44</td> <td>0.10</td> <td>5.75</td> <td>4.47</td> <td></td>	149	ILMN_1786426	19	rs8106959	19	36219525	TMEM149	rs9509428	13	21473952		9.44	0.10	5.75	4.47	
ILMN. 1708482	LMN 1709483         11         risiday715         19         560503246         risiday715         10         560503246         11         risiday715         10         4859333         risiday715         10         48593348         IRF5         5.79         0.04         0.15           ILMN 188811         7         risiday72         7         23528927         7         128693948         IRF5         5.52         1.03         0.13           ILMN 188811         7         risiday60         11         risiday60         13         risiday62         14         risiday62         14         risiday62         14         risiday62         14         risiday62         15         risiday62         15         risiday62         15         risiday62         15         risiday62         15         risiday62         15         risiday62         10         risiday62         15         risiday62         15         risiday62         14         risiday	63A	ILMN_1719649	П	rs1254086	13	72890603		rs4149226	1	226027323	TMEM63A	5.60				
LMN.198811         7         rst557146         9         48859303         rul0488630         7         128693948         IRFD         5.61         0.11         0.15         0.07           LMN.198811         7         rst509732         20         48859303         rul0488630         7         128693948         6.52         1.03         0.07           LMN.1814650         11         rst776672         7         2353897         7         1.28693848         5.52         1.03         0.07           LMN.1814650         11         rst7766124         7         2353897         0.28         0.00         0.38         0.01         0.28           LMN.227639         19         rst7169840         19         7758144         786144         7.78         1.0000000         1.03         0.07         0.03         0.06         0.07         0.03         0.01         0.07         0.02         0.03         0.04         0.05         0.03         0.04         0.05         0.03         0.04         0.05         0.03         0.04         0.05         0.03         0.04         0.05         0.03         0.04         0.05         0.03         0.04         0.05         0.04         0.05         0.04	LMN.1088311         7         railogy as a second month of the control	80	ILMN_1708482	11	rs1548475	19	58058246		rs4963126	11	656845	TMEM80	5.79	0.64	0.12	0.32	
LMN.137043         7         1199733         2         22287303         ra11770192         7         128498348         IRF5         5.52         10.3         0.17         0.02           LMN.137043         7         1199783         1         130531675         ra11770192         7         128498348         IRF5         5.52         10.3         0.07         0.02           LMN.137043         11         11278760         13         130531675         13         13185744         0         22         0.03         0.01         0.05           LMN.227039         19         17758194         TRAPPC5         11         118887887         TRAPPC4         5.57         0.03         0.07         0.08           LMN.227039         19         17758194         TRAPPC5         11765890         1         273219791         0.03         0.03         0.04         0.05           LMN.227039         19         17758194         TRAPPC5         17758194         TRAPPC5         17758194         TRAPPC5         17758194         TRAPPC5         17758194         17758194         17758194         17758194         17758194         17758194         17758194         17758194         17758194         17758194         17758194         <	ILMN.1632811         7         resignosts         7         2         2         2         3		ILMN_1683811	-1	rs1537146	6	4859303		rs10488630	7	128593948	IRF5	5.61	0.11	0.15	0.07	
LMN_1213043         7         ray775042         7         23428285         11         118887887         TRAPPCA         5.61         0.28         0.40         0.29           LMN_1214450         11         rai775870         13         13018317         TRAPPCA         rai3916881         11         118887887         TRAPPCA         5.61         0.28         0.40         0.29           LMN_2272639         19         rai775849         19         7758194         TRAPPCA         5.105000         0.37         0.21         1.60         0.01         0.36         0.01         0.36         0.01         0.36         0.01         0.36         0.01         0.37         0.21         0.01         0.37         0.01         0.37         0.01         0.36         0.01         0.36         0.01         0.36         0.01         0.36         0.01         0.36         0.01         0.37         0.01         0.37         0.01         0.37         0.01         0.36         0.01         0.36         0.01         0.36         0.01         0.36         0.01         0.03         0.01         0.01         0.01         0.01         0.01         0.01         0.01         0.01         0.01         0.01         0.01	ILMN.1731043         7         re3775043         7         re3775043         7         re3775043         7         re3775043         7         re3775043         7         re3775043         7         re3775572         7         re3775554         1         re3775554         1         re3775554         1         re3775554         1         re377554         1         re37754         1         re377554         1         re3775544         1         re3775544         1		ILMN_1683811	-1	rs199793	20	22287303		rs10488630	-1	128593948	IRF5	5.52	1.03	0.17	0.62	
ILMN L814650         11         re1278650         13         133334675         re3218681         11         118887887         TRAPPCS         re3216881         11         118887887         TRAPPCS         re3216881         11         118887887         TRAPPCS         re3216881         11         118887887         TRAPPCS         re3105804         19         rf788194         19         7758194         TRAPPCS         re1023095         8         132022567         TRAPPCS         10         7758194         18         7758194         19         7778194         19         7778194         18         7758194         18	ILMN_1814660         11         rs1278760         13         rs137887687         13         rs137887687         13         rs13788769         13         rs1375840         13         rs13183467         rs1319840         13         rs1375840         13         rs137544         13         rs137549         14         rs137544         14         rs137544         14         rs137544         15         14         rs1375840         13         rs137544         14         rs137544         14         rs137544         14         rs137544         14         rs1375840         15         rs1375840         15         rs1375840         15         rs1375840         15         rs1375840         15         rs1375840         15         rs1375840         16         rs1375840         17         rs1375840         14         rs1375840         15         rs138550         15         rs1375840         15         rs1385550         15         rs1375840         17         rs1		ILMN_1731043	-1	rs7776572	-1	23528927		rs11770192	-1	23498358		8.23	3.19	1.89	4.09	0.031
ILMN 2372639         19         F778194         TRAPPCS         1 11888787         TRAPPC4         5.52         0.93         0.01         0.36           ILMN 2372639         19         F778194         TARAPPC5         rsi2005064         1 10888787         TRAPPC4         5.52         0.21         1.00           ILMN 2372639         19         rsi7159840         19         7778194         TRAPPC5         rsi2005064         1         24232971         6.52         0.21         1.07         0.03         0.03         0.03         0.03         0.05 <th< td=""><td>ILMN 2372639         11         Fail 1759840         1         Fail 18887887         TRAPPC4         5.52         0.93         0.01           ILMN 2372639         19         rail 1759840         19         7758194         TRAPPC5         rail 0500064         1         118887887         TRAPPC4         5.92         0.37         0.01           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 375744         6         1.00         0.37         0.03         0.01           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 38229         1         42232971         0.03         0.03         0.04           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 38229         1         7546442         0.03         0.04         0.65           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 38329         1         754940         0.04         0.65           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 3826638         1         75494442         7.58         0</td><td>,C4</td><td>ILMN_1814650</td><td>11</td><td>rs1278760</td><td>13</td><td>113531675</td><td></td><td>rs3916581</td><td>11</td><td>118887887</td><td>TRAPPC4</td><td>5.61</td><td>0.28</td><td>0.40</td><td>0.29</td><td></td></th<>	ILMN 2372639         11         Fail 1759840         1         Fail 18887887         TRAPPC4         5.52         0.93         0.01           ILMN 2372639         19         rail 1759840         19         7758194         TRAPPC5         rail 0500064         1         118887887         TRAPPC4         5.92         0.37         0.01           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 375744         6         1.00         0.37         0.03         0.01           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 38229         1         42232971         0.03         0.03         0.04           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 38229         1         7546442         0.03         0.04         0.65           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 38329         1         754940         0.04         0.65           ILMN 2372639         19         rail 159840         19         7758194         TRAPPC5         rail 3826638         1         75494442         7.58         0	,C4	ILMN_1814650	11	rs1278760	13	113531675		rs3916581	11	118887887	TRAPPC4	5.61	0.28	0.40	0.29	
ILMN 2372639         19         7758194         TRAPPCS         residences         5         7         0.21         1.00         1.07           ILMN 2372639         19         residences         19         7758194         TRAPPCS         residences         6         92         0.37         0.58         0.08           ILMN 2372639         19         residences         19         7758194         TRAPPCS         residences         0.2         0.17         0.0	ILMN 2372639         19         restricted         19         7758194         TRAPPCS         restricted         5 166970604         5 166970604         6 166470604         6 166470604         10 17 10 10         1	,C4	ILMN_1814650	11	rs1793823	11	131018917		rs3916581	11	118887887	TRAPPC4	5.52	0.93	0.01	0.36	12.131
LIMN.2372039         19         778194         TRAPPCS         1817153890         19         778194         TRAPPCS         181753890         19         778194         TRAPPCS         181753890         19         778194         7781	LIMN 237039         19         7758194         TRAPPCS         18102099         8         13202297         7.59         0.37         0.37           LIMN 237039         19         17758194         TRAPPCS         18130399         1         24229791         6.59         0.37         0.37           LIMN 237039         19         1817159840         19         7758194         TRAPPCS         181303299         1         24229791         6.51         0.37         0.37           LIMN 237039         19         1817159840         19         7758194         TRAPPCS         18498328         17         5449457         6.51         0.39         0.47           LIMN 237039         19         1817159840         19         7758194         TRAPPCS         12964397         7         7.08         0.30         0.33           LIMN 237039         19         1817159840         19         7758194         TRAPPCS         18769026         17         1.08	j C	ILMIN-2372639	61	rs17159840	13	7758194	TRAPPCS	rs10059004	ဂ	166970604		5.97	0.21	1.60	1.07	
ILMN_2370839         19         FFALLD9840         19         FTARPPCS         FEARPPCS         F	ILMN 2372639         19         7758194         TRAPPC5         181378714         0         100444902         0.13         0.13         0.13         0.13         0.13         0.13         0.13         0.13         0.13         0.13         0.13         0.13         0.13         0.14         0.		ILMIN-2372639	61	rs17159840	13	7758194	TRAPPCS	rs1023095	xo o	132022957		6.92	0.37	0.87	0.68	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	LIMN 2372639         19         7758194         TRAPPC5         raf135399         1         24233971         6.43         0.03         0.47           LIMN 2372639         19         raf1159840         19         7758194         TRAPPC5         raf1753599         1         2433473         6.38         0.03         0.03           LIMN 2372639         19         raf159840         19         7758194         TRAPPC5         raf780359         17         7.08         0.04         0.03           LIMN 2372639         19         raf159840         19         7758194         TRAPPC5         raf780935         7         4069096         6.27         0.04         0.05           LIMN 2372639         19         raf109840         19         7758194         TRAPPC5         raf109955         7         7         6.71         0.04         0.05           LIMN 2372639         19         raf24624         19         7758194         TRAPPC5         17758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194         7758194 <td>3 5</td> <td>ILMIN_2372639</td> <td>61.</td> <td>rs1/159840</td> <td>1.9</td> <td>7758194</td> <td>TRAPPOS</td> <td>rs1375714</td> <td>٥٠</td> <td>156404902</td> <td></td> <td>6.79</td> <td>0.12</td> <td>0.18</td> <td>0.08</td> <td></td>	3 5	ILMIN_2372639	61.	rs1/159840	1.9	7758194	TRAPPOS	rs1375714	٥٠	156404902		6.79	0.12	0.18	0.08	
LIMN 2372639         19         Fill 198940         19         7788194         TRAPPCS         Figl 178940         19         7788194         TRAPPCS         Figl 178940         19         7788194         TRAPPCS         Figl 1884328         17         6.05         0.21         0.50         0.51         0.52         0.51         0.52         0.51         0.52         0.52         0.51         0.52 <t< td=""><td>ILMN 2372639         19         778194         TRAPPCS         1758194         TRAPPCS         1758194         TRAPPCS         1758194         TRAPPCS         12964431         6.53         0.20         0.24           ILMN 2372639         19         1778194         TRAPPCS         rs731362         12         12964431         6.53         0.04         0.65           ILMN 2372639         19         rs7758194         TRAPPCS         rs77159840         19         7758194         TRAPPCS         rs7715994         0.04         0.04         0.04         0.04         0.04         0.04         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.03         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.05         0.04         0.05</td><td>0 1</td><td>ILMIN_2372639</td><td>2 5</td><td>rs17159840</td><td>5 5</td><td>7758194</td><td>TRAPPCS</td><td>rs1393299</td><td>٦ -</td><td>242329791</td><td></td><td>0.43</td><td>0.03</td><td>0.47</td><td>0.00</td><td>i i</td></t<>	ILMN 2372639         19         778194         TRAPPCS         1758194         TRAPPCS         1758194         TRAPPCS         1758194         TRAPPCS         12964431         6.53         0.20         0.24           ILMN 2372639         19         1778194         TRAPPCS         rs731362         12         12964431         6.53         0.04         0.65           ILMN 2372639         19         rs7758194         TRAPPCS         rs77159840         19         7758194         TRAPPCS         rs7715994         0.04         0.04         0.04         0.04         0.04         0.04         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.03         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.04         0.05         0.05         0.04         0.05	0 1	ILMIN_2372639	2 5	rs17159840	5 5	7758194	TRAPPCS	rs1393299	٦ -	242329791		0.43	0.03	0.47	0.00	i i
ILMN 2372639         19         ***17159840         19         ***1758194         TRAPPCS         ****173362         1         *****17159840         19         *****1759840         19         ******17159840         19         ******1759840         19         ************************************	ILMN 2372639         19         riflogate         1758194         TRAPPC5         riflogate         1         riflogate<	3 5	ILMIN-2372639	2 -	rs17159840	2 -	7750104	TRAPPOS	rs17763599	1 0	2309415		0.38	0.21	0.24	0.10	0.389
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	ILMN 2372639         19         raf1159840         19         7758194         TRAPPCS         raf7604997         4         9947811         5.86         0.20         0.36           ILMN 2372639         19         raf1159840         19         7758194         TRAPPCS         raf780935         7         4669096         6.73         0.20         0.36           ILMN 2372639         19         raf8109840         22         2240855         14669096         7.78         0.15         0.33           ILMN 2372639         19         raf840768         22         2740855         147159840         19         7758194         775819         871819         775819         8718194         7758194         775819         775819	5 5	ILMN 2372639	61	rs17159840	61	7758194	TRAPPCS	rs7313362	12	129644342		7.08	0.00	0.65	0.25	
ILMN 2372639         19         rs/17159840         19         7758194         TRAPPC5         rs/800936         7         1460026         6.73         0.15         0.33         0.16           ILMN 2372639         19         rs/37159840         19         r/758194         TRAPPC5         r/8439550         7.78         0.24         0.07         0.08           ILMN 2372639         19         r/8380708         2         22740856         1         r/758194         TRAPPC5         7.73         0.24         0.07         0.08           ILMN 2372639         19         r/8260461         2         1.272864         19         r/768194         TRAPPC5         7.73         0.55         0.78         1.01           ILMN 2372639         19         r/826464         19         r/762978         r/817199840         16         3.087666         6.71         0.14         0.02         0.03         0.01           ILMN 2372639         19         r/876464         19         r/762978         r/8129140         16         3.087666         7.34         0.04         0.03         0.04         0.03         0.04         0.05         0.02         0.01         0.01         0.04         0.04         0.03         0.03 </td <td>ILMN 2372639         19         7758194         TRAPPCS         rs7800935         7         7         755194         TRAPPCS         rs7800935         7         7         7         7         7         8560639         7         7         7         9         7758194         TRAPPCS         rs7800926         7         7         0.24         0.13         0.33           ILMN 2372639         19         rs380708         2         2.740855         2         2.740856         19         7758194         TRAPPCS         7.75         0.24         0.07           ILMN 2372639         19         rs7246264         19         7762978         1         7758194         TRAPPCS         7.73         0.85         0.75           ILMN 2372639         19         rs7246264         19         7762978         rs12291440         1         7768196         7.73         0.14         0.05           ILMN 2372639         19         rs7246264         19         7762978         rs12291440         1         7762978         7.73         0.14         0.02           ILMN 2372639         19         rs7240264         19         7762978         rs1289771         6         4126457         7RBM1         7.74</td> <td>C5</td> <td>ILMN_2372639</td> <td>19</td> <td>rs17159840</td> <td>19</td> <td>7758194</td> <td>TRAPPC5</td> <td>rs7694997</td> <td>4</td> <td>9947811</td> <td></td> <td>5.86</td> <td>0.20</td> <td>0.36</td> <td>0.22</td> <td></td>	ILMN 2372639         19         7758194         TRAPPCS         rs7800935         7         7         755194         TRAPPCS         rs7800935         7         7         7         7         7         8560639         7         7         7         9         7758194         TRAPPCS         rs7800926         7         7         0.24         0.13         0.33           ILMN 2372639         19         rs380708         2         2.740855         2         2.740856         19         7758194         TRAPPCS         7.75         0.24         0.07           ILMN 2372639         19         rs7246264         19         7762978         1         7758194         TRAPPCS         7.73         0.85         0.75           ILMN 2372639         19         rs7246264         19         7762978         rs12291440         1         7768196         7.73         0.14         0.05           ILMN 2372639         19         rs7246264         19         7762978         rs12291440         1         7762978         7.73         0.14         0.02           ILMN 2372639         19         rs7240264         19         7762978         rs1289771         6         4126457         7RBM1         7.74	C5	ILMN_2372639	19	rs17159840	19	7758194	TRAPPC5	rs7694997	4	9947811		5.86	0.20	0.36	0.22	
ILMN 2372639         19         rs37159840         19         rs778194         TRAPPC5         rs350538         14         55439550         673         0.24         0.07         0.08           ILMN 2372639         19         rs380708         22404854         rs47159840         19         7758194         TRAPPC5         7.73         0.85         0.78         1.01           ILMN 2372639         19         rs8016995         21         45128454         rs41719840         19         7758194         TRAPPC5         7.73         0.85         0.78         1.01           ILMN 2372639         19         rs724264         19         7762978         rs1219340         16         3.048765         7.74         0.14         0.05         0.05           ILMN 2372639         19         rs724264         19         7762978         rs1283778         1         7.41         0.14         0.26         0.13           ILMN 1272639         19         rs724264         19         7762978         rs283577         4         12         8744938         1         10         1         1         1         1         1         1         1         1         1         1         1         1         1	ILMN 2372639         19         rs78159840         19         7758194         TRAPPC5         rs765638         14         85439550         TAPP         7758194         TRAPPC5         7758194         TRAPPC5         7758         0.24         0.07           ILMN 2372639         19         rs8040614         2         22740855         11272861         19         7758194         TRAPPC5         7.75         0.85         0.78           ILMN 2372639         19         rs7246264         19         7762978         rs7159840         19         7778194         TRAPPC5         7.73         0.85         0.78           ILMN 2372639         19         rs7246264         19         7762978         rs10251440         16         30408765         7.74         0.14         0.26           ILMN 2372639         19         rs7246264         19         7762978         rs10251440         16         30408765         7.74         0.14         0.26           ILMN 2372639         19         rs726278         19         7762978         rs10251440         16         14264577         7.41         0.04         0.01           ILMN 1087971         6         rs10822747         6         12644350         TRBM1         5.	Q5	ILMN_2372639	19	rs17159840	19	7758194	TRAPPC5	rs7800935	7	146690926		6.27	0.15	0.33	0.16	
ILMN 2372639         19         res000995         2         2740855         res17198840         19         7758194         TRAPPC5         7.58         7.58         1.01           ILMN 2372639         19         res0010995         2.1         45122464         19         7758194         TRAPPC5         7.58         0.55         0.55         0.56           ILMN 2372639         19         res04054         19         7762978         res1718840         19         7768194         TRAPPC5         8.10         0.51         0.55         0.56           ILMN 2372639         19         res7246264         19         7762978         res12921440         16         3040876         7.34         0.14         0.26         0.13           ILMN 2372639         19         res7246264         19         7762978         res12921440         16         3040876         7.34         0.14         0.26         0.13           ILMN 2372639         19         res7246264         19         7762978         res12921440         16         3040876         7.34         0.14         0.26         0.13           ILMN 1088231         6         res104569         1         7.65         0.08         0.09         0.09	ILMN 2372639         19         re380708         22 2740855         re17159840         19         7758194         TRAPPC5         7.58         0.58         0.78           ILMN 23722639         19         re3040514         20         11272861         re17159840         19         7758194         TRAPPC5         7.73         0.85         0.78           ILMN 23722639         19         re7246264         19         7762978         re17159840         19         7758194         TRAPPC5         8.10         0.51         0.55           ILMN 2372639         19         re7246264         19         7762978         re12291440         1         7758194         TRAPPC5         8.10         0.51         0.56           ILMN 2372639         19         re7246264         19         7762978         re12291440         1         7762978         7762978         7762978         7762978         7762978         7762978         7762978         7762978         7762978         7762978         7762978         7762977         7762977         7762978         7762977         7762977         7762977         7762977         7762977         7762977         7762977         7741         0.36         0.90           ILMN 1088231         6	Ö5	ILMN_2372639	19	rs17159840	19	7758194	TRAPPC5	rs856638	14	85439550		6.73	0.24	0.07	80.0	
ILMN 12372639         19         res040516945         21         45122444         19         7758194         TRAPPC5         7.73         0.85         0.78         1.01           ILMN 12372639         19         res040514         228504503         19         7758194         TRAPPC5         6.71         0.55         0.78         1.01           ILMN 12372639         19         res040514         18         7758194         7758194         TRAPPC5         6.71         0.51         0.55         0.78         1.01           ILMN 12372639         19         res04264         19         7762978         res1221440         16         30408765         6.71         0.14         0.05         0.05           ILMN 12372639         19         res04264         19         7762978         res043388         RAPGEF1         7.04         0.05         0.05         0.05           ILMN 1288231         6         res12412964         10         108256422         res2389771         6         41264577         TREMI         5.92         1.20         0.16         0.01         0.01         0.01         0.01         0.01         0.01         0.01         0.01         0.01         0.02         0.05         0.05	ILMN 2372639         19         re3816995         21         4512864         19         7758194         TRAPPCS         7778194         7778194         778194         7778194         778194         778194         778194         778194         778194         778194         7778194         7778194         778194         7778194         7778194         7778194         7778194         7778194         77819         7778194         7778194         7778194         7778194         777819         777819         7762978         7772978         7772978         7772978         7772978         7772978         7772977	Q5	ILMN_2372639	19	rs380708	22	22740855		rs17159840	19	7758194	TRAPPC5	7.58				
ILMN_2372639         19         refold 50.4         20         11272861         res/172863         8.10         0.55         0.56	ILMN 12372639   19   rsf246264   19   7762978   rs1073672   rs10736340   19   77762978   rs1073672   rs10736340   19   rs1073672   rs10736340   19   rs1073672   rs10736340   19   rs1073672   rs10736340   19   rs1073672   rs1036264   19   7762978   rs10736264   19   7762978   rs1036264   19   7762978   rs1036264   19   7762978   rs1036264   19   7762978   rs1036264   10   rs103624   10   rs1036	Ç	ILMN_2372639	13	rs3916995	21	45128454		rs17159840	19	7758194	TRAPPC5	7.73	0.85	0.78	1.01	
ILMN.2372639         19         rs724254         19         7762978         rs10176572         2         228504503         6.71         0.14         0.02         0.02           ILMN.2372639         19         rs724264         19         7762978         rs1887778         9         134635088         RAPGEFI         7.05         0.04         0.02         0.02           ILMN.2372639         19         rs7246264         19         7762978         rs1887778         9         134635088         RAPGEFI         7.05         0.04         0.02         0.02           ILMN.1268231         6         rs10862977         1         1824577         rs2339771         6         41244577         TREMI         5.92         0.13         0.09           ILMN.1688231         6         rs10862976         1         1824577         TREMI         5.92         0.20         0.01         0.02           ILMN.1688231         6         rs1086374         6         41244577         TREMI         5.92         0.20         0.03           ILMN.1786200         10         rs2032447         6         26044369         TRIM38         6.46         0.04         0.01         0.01           ILMN.178620         1 <td>LIMN.2372639         19         7762978         re7240264         19         7762978         re7240266         10         7762978         re7240269         7762978         12887778         9         134635088         RAPGEFI         7.34         0.14         0.02           ILMN.2372639         19         re7240264         19         7762978         re2395771         6         41264577         7741         0.08         0.08           ILMN.1688231         6         re10862975         12         185286422         re2395771         6         41264577         TREMI         5.42         0.11         0.25           ILMN.178502         10         18286422         1         7.18868416         1.20         1.20         0.17         0.01         0.07         0.13           ILMN.178502         11         re3088778         11         7.20         1.20         1.20         0.07         0.07         0.13           ILMN.288977         11         re10863049         17         7.18860449         7.1847708         1.20         0.07&lt;</td> <td>Ğ2</td> <td>ILMN_2372639</td> <td>19</td> <td>rs6040514</td> <td>20</td> <td>11272861</td> <td></td> <td>rs17159840</td> <td>19</td> <td>7758194</td> <td>TRAPPC5</td> <td>8.10</td> <td>0.51</td> <td>0.55</td> <td>0.56</td> <td></td>	LIMN.2372639         19         7762978         re7240264         19         7762978         re7240266         10         7762978         re7240269         7762978         12887778         9         134635088         RAPGEFI         7.34         0.14         0.02           ILMN.2372639         19         re7240264         19         7762978         re2395771         6         41264577         7741         0.08         0.08           ILMN.1688231         6         re10862975         12         185286422         re2395771         6         41264577         TREMI         5.42         0.11         0.25           ILMN.178502         10         18286422         1         7.18868416         1.20         1.20         0.17         0.01         0.07         0.13           ILMN.178502         11         re3088778         11         7.20         1.20         1.20         0.07         0.07         0.13           ILMN.288977         11         re10863049         17         7.18860449         7.1847708         1.20         0.07<	Ğ2	ILMN_2372639	19	rs6040514	20	11272861		rs17159840	19	7758194	TRAPPC5	8.10	0.51	0.55	0.56	
LLMN_2372639         19         F7724274         19         T762374         16         30408765         7.34         0.14         0.26         0.13           LLMN_2372639         19         F87246264         19         T762378         18887778         9         13463308         RAPGEF1         7.34         0.14         0.26         0.13           LLMN_2372639         19         F87246264         19         7762378         18887778         114633088         RAPGEF1         7.41         0.08         0.09         0.06           LLMN_188231         6         F812412964         10         108256422         183393771         6         41264577         TREMI         5.92         1.20         0.11         0.25         0.01           LLMN_188231         6         F825257180         7         158804316         F8264369         TREMI         5.92         1.20         1.23         1.69           LLMN_178560         10         F82573079         T8273079         T8273079         T87AN1         6.06         0.01         0.07         0.18         0.06           LLMN_178560         11         F8168678         11         2747634         MVBPC3         F8273079         T87AN3         6.01	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Q2	ILMN_2372639	19	rs7246264	19	7762978		rs10179572	C1 ;	228504503		6.71	0.14	0.02	0.02	
ILMN_12372639   19   Fi274264   19   7762278   Fi2863344   19   7762278   Fi2863364   10   7762278   Fi2863364   10   762278   Fi2863271   10   762278   Fi2863271   10   762278   Fi2863271   10   762278   Fi2863278   10   762278   Fi2863271   10   762278   Fi2863278   10   762278   Fi2863278   10   762278   Fi286328   10   762278   Fi286328   10   762278   Fi286328   10   762278	ILMN 1282316   19   7702974   19   7702975   12   18738577   19   7702975   19		ILMIN_2372639	61	rs7246264	61	7762978		rs12921440	16	30408765	-	7.34	0.14	0.26	0.13	
ILMN   1868231   6   res1242964   19   res02395771   6   41264577   TREMI   7.41   0.30   0.10   0	ILMN.1688231   5   12   12   12   12   13   13   13   13		ILMIN_2372639	61	rs/246264	61	7762978		rs1887778	n o	134635088	KAPGEFI	60.7	0.08	0.86	0.40	
ILMN-1688231   6   re12012084   1   108256422   re2395771   6   41264577   re1201201   re2395771   6   41264577   re1201201	ILANI-1082231   Colored Colo	ŝ	ILMN-2372639	61	rs/246264	5 5	7762978		rs963354	nu	41964677	TDEMI	7.41	0.36	0.90	0.69	
ILMN-1697971   6   124   125	ILANIA   100   1		ILMIN-1000231	9	1510002910	9 0	1000149393		122333111	0 4	41264577	TDEMI	т 4 с	1.30	24.0	1.60	
ILANI-178960   10   17   17   17   17   17   17   1	ILMN-1785060   10   re968726   17   27194634   rs10748526   10   re10887738   11   rs1080998   11   rs1080998   11   rs12800998   11   r	~	ILMN 1697971	9 0	1812412904	1 1	158808416		rs2333771	<b>0</b> (4	26044369	TRIMAS	0.97	1.50	1.60	1.03	
Table   Tabl	ILANI-1718621   1   re10838738   1   47663449   MYBPC3   re12800938   1   2317951   TSPAN32   re220007   re12800938   1   2317951   TSPAN32   re320007   re12800938   1   2317951   TSPAN32   re128007   re12800938   re12800938	. 7	ILMN 1785060	9 9	182321180	- 1-	27194634		rs2032447	-	80044303	TCDAN14	6.00	0.04	0.91	90.0	
ILMN_2389970         11         rs12800998         11         2317951         TSPAN32         rs620607         6         137947208         5.51           ILMN_3223126         22         rs140522         22         50971266         ECGF1         rs1198819         2         238746880         6.34	ILMN_2389970   11   rs12800998   11   2317951   TSPAN32   rs620667   6   137947208   rs140522   22   50971266   ECGF1   rs198819   2   238746880   ILMN_3223126   rs470119   22   50966914   Frs4783126   16   85147633	32	ILMN_1718621	11	rs10838738	11	47663049	MYBPC3	rs12800998	11	2317951	TSPAN32	5.01				45.345
22   rs140522 22 50971266 ECGF1   rs1198819 2 238746880	22         rs140522         22         50971266         ECGF1         rs1198819         2         238746880           22         rs470119         22         50966914         ECGF1         rs4783126         16         85147633	32	ILMN_2389970	11	rs12800998	11	2317951	TSPAN32	rs620607	9	137947208		5.51				
	22   rs470119 22 50966914 ECGF1   rs4783126 16 85147633		ILMN_3223126	22	rs140522	22	50971266	ECGF1	rs1198819	7	238746880		6.34				

Table S1 - continued from previous page

_	_	_					_	_	_	_	_	_	_	_	_	_	_	_	_					_	_	_
	ice / Mbh			1.643	0.088																					
	Distance /																									
values	Metag	0.52	1.10	0.03	4.95	0.46	0.57		0.19	0.41	0.31	0.17	0.04	1.21	0.16	0.57	0.26	1.47	0.09	1.22	0.35	2.25	1.63	0.15	0.46	0.05
/ - log10 p-values	$\mathtt{EGCUT}^{\mathrm{f}}$	0.42	1.29	0.14	5.14	0.15	0.69		0.19	0.74	0.48	0.17	0.19	1.15	0.02	0.54	0.17	1.38	0.13	1.35	0.61	1.43	0.17	0.36	0.27	0.01
Interaction statistic,	${ m Fehrmann}^{ m f}$	0.59	0.48	0.03	0.94	0.84	0.39		0.33	0.16	0.23	0.31	0.03	0.73	0.46	0.53	0.48	0.81	0.19	0.57	0.18	1.64	2.38	0.09	0.67	0.26
Interacti	BSGS <sub>e</sub> I	5.91	6.01	5.71	5.09	5.64	5.44	5.72	5.77	6.44	5.74	6.44	5.82	6.12	4.83	5.60	5.71	5.88	5.88	6.34	5.85	4.86	5.48	5.79	5.29	6.04
	Associationd					VNN2	VNN2	VNN2	VNN2	VNN3	VNN3	VNN3	VNN3	VNN3	VNN3			VSTM1	WDR48	WDR48	WDR48	WDR6		ZFP90	ZNF500	ZXX
SNP 2	Pos/Mb <sup>c</sup>	83600397	214514361	75151717	45974668	133077063	133072650	133072650	133072650	133067782	133067782	133067782	133067782	133067782	133067782	71024750	123098249	54553697	39091812	39067925	39044116	49194331	93119799	68573945	4799041	143093824
S	Chr.	16	1	17	19	9	9	9	9	9	9	9	9	9	9	18	10	19	က	က	က	8	15	16	16	7
	rs ID	rs7201194	rs7512594	rs7225546	rs2276470	rs1883613	rs1883617	rs1883617	rs1883617	rs2267952	rs2267952	rs2267952	rs2267952	rs2267952	rs2267952	rs4552100	rs7895870	rs10500316	rs6778963	rs883349	rs7619193	rs11715581	rs12591171	rs1182968	rs2290560	rs2242601
	Associationd	UBASH3A	UBASH3A	USP36												VSTM1	VSTM1			RAPGEF1			XAF1			
SNP 1	$Pos/Mb^{c}$	43855067	43855067	76794981	46063167	105252718	9116155	49927332	16834510	151662184	73006453	75547169	83262064	16594253	51692548	54553697	54553697	30261219	188927822	134635088	102624790	123371708	6673170	37040648	48283177	8935312
00	Chr.	21	21	17	19	7	20	22	11	7	œ	6	14	21	13	19	19	22	4	6	13	11	17	21	22	20
	rs ID	rs1893592	rs1893592	rs2279308	rs1264226	rs10435352	rs13044386	rs134447	rs216495	rs10278073	rs1443946	rs348462	rs7157055	rs2823165	rs9596457	rs10500316	rs10500316	rs9625870	rs1388935	rs1887778	rs9554833	rs12362253	rs1533031	rs909446	rs4823723	rs6056281
	Chr.	21	21	17	19	9	9	9	9	9	9	9	9	9	9	19	19	19	n	n	n	8	17	16	16	-1
Expression trait	Probe ID <sup>b</sup>	ILMN_2338348	ILMN_2338348	ILMN_1697227	ILMN_1743646	ILMN_1678939	ILMN_1678939	ILMN_1678939	ILMN_1678939	ILMN_1804935	ILMN_1804935	ILMN_1804935	ILMN_1804935	ILMN_2387680	ILMN_2387680	ILMN_1763455	ILMN_1763455	ILMN_1763455	ILMN_1762103	ILMN_1762103	ILMN_1762103	ILMN_1669484	ILMN_2370573	ILMN_1684628	ILMN_1700238	ILMN_1701875
Exi	Gene ID <sup>a</sup>	UBASH3A	UBASH3A	USP36	VASP	VNN2	VNN2	VNN2	VNN2	VNN3	VNN3	VNN3	VNN3	VNN3	VNN3	VSTM1	VSTM1	VSTM1	WDR48	WDR48	WDR48	WDR6	XAF1	ZFP90	ZNF500	ZYX

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Table S2: Estimation of additive and non-additive variance components from pedigree information Taken from previous analysis in Powell et al  $2013^{21}$ 

		Additi	ve	Non-add	itive
Gene	Probe	Variance	s.e.	Variance	s.e.
NAPRT1	ILMN_1710752	0.37	0.03	0.14	0.05
TMEM149	$ILMN\_1786426$	0.41	0.04	0.09	0.04
MBNL1	ILMN_2313158	0.18	0.03	0.11	0.04
TRAPPC5	$ILMN_2372639$	0.32	0.04	0.13	0.05
CAST	ILMN_1717234	0.31	0.03	0.10	0.04

Table S3: Concordance of sign of epistatic variance components between discovery and replication datasets

Test	Interactions	Dataset	$\overline{n}$	Expected	Observed	<i>p</i> -value
1 <sup>a</sup>	All	EGCUT	434	217.00	306	$6.69 \times 10^{18}$
		Fehrmann	434	217.00	278	$5.04 \times 10^{09}$
		Both	434	108.50	221	$5.56\times10^{31}$
	Significant	EGCUT	30	15.00	25	$3.25\times10^{04}$
		Fehrmann	30	15.00	24	$1.43\times10^{03}$
		Both	30	7.50	22	$3.76 \times 10^{08}$
$2^{\mathrm{b}}$	All	EGCUT	434	54.25	92	$4.22 \times 10^{07}$
		Fehrmann	434	54.25	79	$6.18 \times 10^{04}$
		Both	434	6.78	30	$2.55 \times 10^{11}$
	Significant	EGCUT	30	3.75	19	$9.46 \times 10^{11}$
		Fehrmann	30	3.75	19	$9.46 \times 10^{11}$
		Both	30	0.47	18	$2.23 \times 10^{25}$
$3^{c}$	All	EGCUT	434	27.12	34	$1.65 \times 10^{01}$
		Fehrmann	434	27.12	35	$1.35 \times 10^{01}$
		Both	434	1.70	2	$6.89 \times 10^{01}$
	Significant	EGCUT	30	1.88	8	$3.92 \times 10^{04}$
		Fehrmann	30	1.88	9	$6.22\times10^{05}$
		Both	30	0.12	1	$1.11 \times 10^{01}$
$4^{\mathrm{d}}$	All	EGCUT	1133	566.50	775	$7.10 \times 10^{36}$
		Fehrmann	1133	566.50	726	$1.90 \times 10^{21}$
		Both	1133	283.25	562	$1.39 \times 10^{70}$
	Significant	EGCUT	73	36.50	55	$1.69 \times 10^{05}$
		Fehrmann	73	36.50	55	$1.69 \times 10^{05}$
		Both	73	18.25	46	$7.86\times10^{12}$

<sup>&</sup>lt;sup>a</sup> The sign of the most significant epistatic variance component in discovery is the same as the corresponding variance component in the replication data.

<sup>&</sup>lt;sup>b</sup> The largest epistatic variance component in the discovery is the same as in the replication with the same sign in both.

 $<sup>^{\</sup>rm c}$  The sign of all four epistatic variance components are identical in the discovery and the replication.

<sup>&</sup>lt;sup>d</sup> The sign of all epistatic variance components in the discovery with p < 0.05 are the same as the corresponding variance components in the replication data.