Table S1. The non-overlapping MA and MO GWA studies drawn from the 2013 IHGC GWA meta-analysis.

	Cases		Controls	
Study	**MA**	**MO**	**MA**	**MO**
deCODE		537		34,617
ERF	141		1,216	
Finnish MA	1,032		3,513	
German MA	997		1,105	
German MO		1,208		2,564
HUNT		1,175		1,097
LUMINA MA	820		4,774	
LUMINA MO		1,118		2,016
NTR&NESDA	103		2,260	
TWINS UK	235		3,837	
WGHS	1,177		18,108	
Total	4,505	4,038	34,813	40,294

Table S2. Biological functions significantly enriched for genes that overlap between MA and MO				
Category	**Disease or Function annotations**	***P*-value**	**# of Genes**	**Overlapping Genes**
Inflammatory Disease	Chronic inflammatory disorder	4.1×10^{-5}	30	*AIF1, ARIH1, ART1, ATF6B, C4A/C4B, CHRNA10, CORT, CYP19A1, DHX16, EGFL8, G0S2, GABBR1, GABRA4, HDAC7, HPGD, HSD11B1, MICA, MSH5, PLA2G2A, PRRC2A, RNF39, SPP1, STAT6, STK19, TNXB, TRIM26, TRPM8, TSPO, UFL1, WNT5A*
Connective Tissue Disorders, Immunological Disease, Inflammatory Disease, Skeletal and Muscular Disorders	Rheumatoid arthritis	4.7×10^{-5}	24	*AIF1, ARIH1, ART1, ATF6B, C4A/C4B, CYP19A1, DHX16, EGFL8, G0S2, GABRA4, HDAC7, MICA, MSH5, PLA2G2A, PRRC2A, RNF39, SPP1, STAT6, STK19, TNXB, TRIM26, TSPO, UFL1, WNT5A*
Organismal Injury and Abnormalities	Bleeding	6.6×10^{-5}	17	*C1GALT1, C4A/C4B, CHRNA10, CYP19A1, ENG, FAIM, GABRA4, HDAC7, HEY2, JAG1, LRP1, NPHS2, PLA2G2A, SPP1, TIE1, VPS26A, ZFPM2*
Cardiovascular Disease, Developmental Disorder, Hereditary Disorder, Organismal Injury and Abnormalities	Tetralogy of Fallot	1.0×10^{-4}	3	*HEY2, JAG1, ZFPM2*
Gastrointestinal Disease, Hepatic System Disease, Organismal Injury and Abnormalities	Congestion of liver	1.2×10^{-4}	2	*ENG, HEY2*
Connective Tissue Disorders, Skeletal and Muscular Disorders	Arthropathy	1.3×10^{-4}	29	*AIF1, ARIH1, ART1, ATF6B, C4A/C4B, CYP19A1, DHX16, EGFL8, G0S2, GABRA4, HDAC7, HPGD, LRP1, MICA, MMP16, MSH5, PLA2G2A, PRRC2A, RNF39, SCN9A, SPP1, STAT6, STK19, TIE1, TNXB, TRIM26, TSPO, UFL1, WNT5A*
Immunological Disease	Systemic autoimmune syndrome	2.0×10^{-4}	30	*ABCF1, AIF1, ARIH1, ART1, ATF6B, C4A/C4B, C6orf48, CYP19A1, DHX16, EGFL8, G0S2, GABBR1, GABRA4, HDAC7, HSD11B1, IKZF3, MICA, MOG,*

				MSH5, PLA2G2A, PRRC2A, RNF39, SPP1, STAT6, STK19, TNXB, TRIM26, TSPO, UFL1, WNT5A
Connective Tissue Disorders, Inflammatory Disease, Skeletal and Muscular Disorders	Arthritis	2.3×10^{-4}	28	*AIF1, ARIH1, ART1, ATF6B, C4A/C4B, CYP19A1, DHX16, EGFL8, G0S2, GABRA4, HDAC7, LRP1, MICA, MMP16, MSH5, PLA2G2A, PRRC2A, RNF39, SCN9A, SPP1, STAT6, STK19, TIE1, TNXB, TRIM26, TSPO, UFL1, WNT5A*
Cancer, Tumor Morphology	Mass of tumor	2.6×10^{-4}	3	*ENG, JAG1, TGFA*
CardiovascularDisease, Developmental Disorder	Patent ductus arteriosus	3.4×10^{-4}	3	*HPGD, PLA2G2A, TFAP2B*
Endocrine System Disorders, Gastrointestinal Disease, Immunological Disease, Metabolic Disease	Insulin-dependent diabetes mellitus	3.5×10^{-4}	16	*ABCF1, AIF1, C6orf48, DHX16, GABBR1, HSD11B1, IKZF3, MICA, MOG, MSH5, PRRC2A, RNF39, STAT6, STK19, TNXB, TRIM26*
Protein Synthesis	Quantity of prolactin (PRL) in blood	5.3×10^{-4}	3	*CORT, CYP19A1, GABBR1*
Connective Tissue Disorders, Inflammatory Disease, Skeletal and Muscular Disorders	Rheumatic Disease	6.3×10^{-4}	29	*AIF1, ARIH1, ART1, ATF6B, C4A/C4B, CYP19A1, DHX16, EGFL8, G0S2, GABRA4, HDAC7, LRP1, MICA, mir-10, MMP16, MSH5, PLA2G2A, PRRC2A, RNF39, SCN9A, SPP1, STAT6, STK19, TIE1, TNXB, TRIM26, TSPO, UFL1, WNT5A*
Cardiovascular System Development and Function, Cell Morphology, Embryonic Development	Branching morphogenesis of vasculature	6.5×10^{-4}	3	*APH1A, C1GALT1, TIE1*
Cardiovascular Disease, Organismal Injury and Abnormalities	Atresia of tricuspid valve	7.0×10^{-4}	2	*HEY2, ZFPM2*
Behavior	Avoidance	7.0×10^{-4}	2	*OPN4, TRPM8*
Cancer, Gastrointestinal Disease	Primary gastric cancer	7.0×10^{-4}	2	*SPP1, WNT5A*
Cancer	Breast or ovarian carcinoma	7.2×10^{-4}	29	*ADAMTS8, APH1A, C4A/C4B, C6orf25, CTNNAL1, CYP19A1, DTNA, FAM107B, FRYL, GART,*

				GOLGB1, GPR20, HOXD3, HSD11B1, IFI27, mir-10, MS4A4A, NFATC4, OXCT2, PAFAH1B2, PSTPIP2, RALY, SPP1, SSC5D, TAGLN, TGFA, TMEM150B, TNXB, ZFPM2
Neurological Disease	Absence seizure	7.7×10^{-4}	4	*CA14, GABBR1, GABRA4, TSPO*
Neurological Disease	Epileptic encephalopathy	7.7×10^{-4}	5	*CA14, GABBR1, GABRA4, SCN9A, TSPO*
Endocrine System Disorders, Gastrointestinal Disease, Metabolic Disease	Diabetes mellitus	8.9×10^{-4}	28	*ABCF1, AIF1, ATP2A2, C6orf48, CA14, CYP19A1, DHX16, FXYD2, GABBR1, GABRA4, HPGD, HSD11B1, IKZF3, MICA, mir-10, MOG, MSH5, PRRC2A, PSMD11, RNF39, SCN9A, SLC30A8, SPP1, STAT6, STK19, TNXB, TRIM26, TSPO*

Table S3. Canonical pathways significantly enriched for genes that overlap between MA and MO

Pathway	***P*-value**	**Overlapping Genes**
Notch Signaling	7.8×10^{-4}	*MFNG, APH1A, HEY2, JAG1*
Superpathway of Geranylgeranyldiphosphate Biosynthesis I (via Mevalonate)	3.2×10^{-2}	*PLA2G1B, TBXAS1, PLA2G2A*
L-carnitine Biosynthesis	3.2×10^{-2}	*ALDH9A1*
GABA Receptor Signaling	3.7×10^{-2}	*GABRA4, GABBR1, ALDH9A1*
5-aminoimidazole Ribonucleotide Biosynthesis I	4.3×10^{-2}	*GART*
Geranylgeranyldiphosphate Biosynthesis	4.3×10^{-2}	*FNTB*
MIF-mediated Glucocorticoid Regulation	5.0×10^{-2}	*PLA2G1B, PLA2G2A*

Table S4. Networks significantly enriched for genes that overlap between MA and MO			
Top Diseases and Functions	***P*-value**	**# of focus Genes**	**Genes[a]**
Cardiovascular Disease, Organismal Injury and Abnormalities, Cardiac Stenosis	1×10^{-51}	27	*Ap1*, ***ATF7***, ***ATP2A2***, ***CEP70***, *Creb*, ***CYP19A1***, ***DLX3***, ***FHL5***, ***GABBR1***, ***GABRA4***, ***GIP***, *Gpcr*, ***GPN3***, ***GPR20***, ***GPR139***, ***GPR182***, ***HEY2***, *Histone h3*, *Histone h4*, ***HOXD3***, ***MAF***, ***MAP3K12***, ***MICA***, ***MSH5***, *NFkB(complex)*, ***PLA2G1B***, ***PLA2G2A***, *RNA polymerase II*, ***SP1***, ***SPP1***, ***STAT6***, *STAT5a/b*, ***SUV39H2***, ***TAGLN***, ***USP8***
Hereditary Disorder, Neurological Disease, Connective Tissue Disorders	1×10^{-25}	16	***ADCK3***, *AP4B1*, *AP4M1*, ***AP4S1***, ***BRSK1***, ***C1GALT1***, *C1GALT1C1*, ***CTNNAL1***, ***FAIM***, *HSD17B7*, ***HVCN1***, ***IFT81***, *IFT88*, ***MND1***, *NEK1*, *NOX5*, *POLE*, *POP4*, *POP7*, *PRSS1*, ***RBBP9***, *RPP14*, ***RPP21***, *RPP30*, *RPP38*, *RPP40*, ***SERPINB8***, ***SH2D3A***, *SLC29A1*, ***STK10***, ***STK19***, *STRADA*, *TEAD3*, *UBC*, ***ZNF566***
Lipid Metabolism, Small Molecule Biochemistry, Molecular Transport	1×10^{-25}	16	*ACSBG1*, *ACSL5*, ***AIF1***, *APITD1/APITD1-CORT*, ***ARIH1***, ***ATF6B***, ***BRMS1L***, *C1orf86*, *CREBZF*, *CUTC*, ***FRYL, IDI1***, *IDI2*, *KIRREL*, *LCP1*, *LZTFL1*, *MBTPS2*, ***MRPS21***, ***NPHS2, PSTPIP2***, *RMI2*, *SARS2*, *SLC27A2*, *SLC27A3*, *SLC27A4*, ***SLC27A6***, *SNTG1*, *STX2*, ***STXBP3***, ***SUV420H2***, ***TTC8***, ***TTLL12***, *UBC*, ***UFL1***, *USP44*
Cellular Movement, Connective Tissue Development and Function, Amino Acid Metabolism	1×10^{-25}	16	*ALDH16A1*, *ALDH3B1*, *ALDH3B2*, *ALDH4A1*, *ALDH7A1*, ***ALDH9A1***, ***APBB1IP***, ***ARPC3***, *ARPC1A*, *ARPC5L*, *CORO1B*, ***DFFA***, ***DHX16***, ***DLGAP1***, *GMFB*, ***GOLGB1***, ***INPP5A***, *INPP5B*, *KIAA1671*, *NAP1L5*, *PARVG*, ***RAB13***, ***RAB11FIP4***, *RAB11FIP5*, *SLC19A1*, ***SP100***, ***STRN3***, ***SWAP70***, ***TFAP2B***, *TRABD2B*, ***TRIM26***, *UBC*, *WNT10B*, *WNT5A*, ***WNT5B***
Cellular Assembly and Organization, Cancer, Endocrine System Disorders	1×10^{-24}	16	*ACAN*, ***ADAM20***, *ADAMTS8*, *ATP5C1*, ***C6orf25***, ***CA14***, ***CCM2L***, ***CDK5R1***, ***CORT***, *CTAGE1*, *DLG4*, ***DNAJA1***, *DNAJC22*, *DQX1*, *GPR89A/GPR89B*, *HSPA8*, *KLHDC8B*, ***MARCH10***, *MITF*, ***MPZL1***, ***NME9***, ***NPFF***, *PLEKHH3*, *PTPN11*, *SATB1*, *SSTR2*, *SUMO4*, ***TGFA***, ***TIE1***, *UBC*, *USP35*, *USP40*, ***USP50***, ***WFDC3***, ***ZNF337***
Post-Translational Modification, Endocrine System Disorders, Hereditary Disorder	1×10^{-21}	14	***AAAS***, *CFTR*, *CHD3*, ***CHURC1-FNTB***, ***CLCC1***, *CLOCK*, *ESYT1*, *ESYT2*, ***ESYT3***, ***FAM216A***, *GAN*, *ISG15*, *KDM1A*, ***KIAA0922***, *NAE1*, ***NAT14***, *NPHP4*, *PGR*, *PRKACA*, *RABAC1*, *RAD23A*, *RAD23B*, ***RMDN2***, ***RNF39***, *RPA3*, ***SLC45A4***, ***TBATA***, ***TMEM194A***, ***TRMT5***, *UBA3*, *UBC*, *UBE2F*, *UBE2M*, *UIMC1*, ***ZNF260***

Hematological Disease, Molecular Transport, Cancer	1×10^{-21}	14	***ANXA2R***, *BTAF1*, *BTF3L4*, *CCNT2*, *DNAJB9*, *DNAJC14*, *DNAJC15*, *DUSP11*, ***EAF2***, *ELAVL1*, *ELL3*, ***FAM71C***, *FKBP9*, ***GART***, ***GLTSCR1L***, ***KCTD9***, ***LSM11***, *LSM14A*, *MTMR4*, *MTMR9*, *NELFA*, ***PPTC7***, ***PRR3***, *PTPLB*, *SLC11A2*, ***SLC38A6***, ***SLC48A1***, *SNRNP48*, *TBC1D5*, *TCEA2*, ***VPS29***, ***VPS26A***, *VPS26B*, ***WDR47***, *ZCRB1*
Developmental Disorder, Organismal Injury and Abnormalities, Reproductive System Disease	1×10^{-21}	14	*ALOX15B*, ***AMHR2***, *AR*, ***C12orf76***, *C4A/C4B*, *C5AR2*, *CCND1*, *CCRN4L*, ***CDC40***, *DEPDC1*, *F2RL3*, *FFAR1*, *GPR125*, ***GPR182***, *GPRC5A*, ***INSM2***, ***KCNMB1***, *KHDRBS1*, *KISS1R*, ***MANBA***, *Muc1*, *NCOA1*, *p160*, ***POU5F2***, *PPARG*, *PSMC3IP*, ***PTPN21***, ***RALY***, ***SPATA13***, *SRC*, *SUZ12*, ***TBXA2R***, *TBXAS1*, *TM7SF2*, ***TRPM8***
Energy Production, Kidney Failure, Organismal Injury and Abnormalities	1×10^{-21}	14	***ABCF1***, *ALKBH6*, ***APH1A***, *ARL17A/ARL17B*, *ATP1A1*, *ATP1B1*, *CHD4*, ***DTNA***, ***FAM107B***, ***FNTB***, *FUK*, *FUT6*, *FUT10*, ***FXYD2***, ***HDAC7***, *HHLA2*, *HNF1A*, *HNF4A*, ***HSD11B1***, ***IKZF2***, ***IKZF3***, ***INTS5***, *MRO*, *PAFAH2*, *POLR2A*, ***PRR13***, *SLC26A1*, *SLC38A4*, ***SLX4IP***, *SUMO2*, *TMEM140*, *UTP11L*, ***ZBTB45***, *ZNF155*, *ZNF300*
Inflammatory Disease, Inflammatory Response, Respiratory Disease	1×10^{-20}	14	*acetylcholine*, *ADAM8*, ***ASTN2***, *CHRNA2*, *CHRNA4*, *CHRNA6*, *CHRNA9*, ***CHRNA10***, *CHRNB1*, *CHRNB2*, *CHRNB3*, *CHRND*, *CHRNE*, *CHRNG*, ***EGFL8***, ***ENG***, ***IRF2BP2***, *ME1*, *MIR155HG*, ***MS4A4A***, *MTMR11*, *PIGF*, *PRDM1*, ***PRRC2A***, ***PSMD11***, ***RAD9B***, ***RPS27***, ***SIRT4***, ***SSR3***, *ST14*, ***TCTN1***, *TIMM8B*, *TP53*, ***TSPO***, *ZFP36*
Cell Cycle, Cell Death and Survival, Cellular Assembly and Organization	1×10^{-20}	14	*ANKRD13D*, *APBB2*, *APBB3*, *APP*, ***CDCA2***, *CIART*, *DNAJC4*, *EGFR*, ***FBLIM1***, *FILIP1*, ***FXYD6***, *ganglioside GD1a*, *ganglioside GM2*, *gangli osideGT1*, *GLB1L*, ***HPGD***, *HSF1*, ***JAG1***, ***LRP1***, ***LYRM7***, ***MMP16***, *MMP17*, *NUDT9*, *PHACTR4*, *PP2D1*, ***PPP1CC***, ***PPP1R10***, *PPP1R32*, *PPP1R14B*, ***PROM2***, *PRR16*, ***RAB5C***, ***RIN2***, *SH3BGRL3*, *SSH3*
Cellular Development, Skeletal and Muscular System Development and Function, Tissue Development	1×10^{-16}	12	***ANKRD13A***, ***ARHGAP20***, *ASCC1*, *CNTN1*, *ECM2*, *EDIL3*, ***ELF1***, *FXN*, ***G0S2***, ***IFI27***, *LMOD1*, *mir-133*, *mir-143*, *mir-145*, *MYL4*, *MYLPF*, *MYOCD*, ***NFATC4***, *NOM1*, ***PAFAH1B2***, *PASK*, *PPP1CA*, *PPP1R18*, *PPP1R12C*, *PTPN7*, ***SCN9A***, ***SLC7A14***, *SMARCA4*, *SMOOTH MUSCLE ACTIN*, *SPOCD1*, *SRF*, ***SRFBP1***, ***TMOD3***, *Ubiquitin*, ***ZNF628***
Cell Signaling, Molecular Transport, Vitamin and Mineral Metabolism	1×10^{-16}	12	*ABL1*, *ADORA3*, *ADRBK1*, ***BMP8B***, *BRINP1*, *CCR8*, *CELSR3*, *CHRD*, ***COG3***, ***DCLRE1C***, ***EIF5A2***, *FPR1*, ***FREM2***, *GIPR*, ***GIT2***, *GPR45*, *GRPR*, *HDAC1*, *HRH1*, *HRH2*, *LTB4R*, *MDM2*,

			NACC2, NPY1R, ***OPN4****, OPRD1,* ***PCBP2****,* ***RRBP1****, Skor1, ST5,* ***STON2****, TACR1,* ***TARBP2****, TGIF2,* ***ZFPM2***
Hematological Disease, Hereditary Disorder, Organismal Injury and Abnormalities	1×10^{-16}	12	*AGO2,* ***ANAPC7,*** *ARFGAP3,* ***ART1****,* ***C6orf48****, Cbp/p300-Hd-Taf4-Taf9b-Tbp,* ***DPF3****, EP300, HOXA10,* ***HOXD4****, HTT, Laminin,* ***MFNG****, mir-10, miR-100-5p (and other miRNAs w/seed ACCCGUA), miR-10a-5p (and other miRNAs w/seed ACCCUGU),* ***MOG****, NDUFA3, NFkB (family), p300-CBP, PARP, PARP3, PARP4, PARP6, PARP8, PARP11, PARP15, PARP16,* ***REG3A****, RELA, SEPP1,* ***SSC5D****, TIPARP,* ***TNXB****,* ***TRIP10***
[a] Focus genes (overlapping MA and MO) are shown in bold.			

Table S5. Networks constructed by combining significant canonical pathways and biological functions			
Top Diseases and Functions	***P*-value**	**Focus Genes**	**Genes**[a]
Carbohydrate Metabolism, Lipid Metabolism, Molecular Transport	1×10^{-32}	14	*Acot1, ACOX2,* ***ATF6B****, BAAT, BMP5,* ***ENG****,* ***FAM107B****,* ***FNTB****,* ***G0S2****, HNF4A, HNF4Î±dimer, HOXA10,* ***HSD11B****1,* ***JAG1****, LGALS1, LR1, MECR,* ***MFNG****, MMP14, MMP15,* ***MMP16****, MMP17, MMP26,* ***MS4A4A****,* ***PLA2G12B****, PLA2G1B,* ***PLA2G2A****, PLA2G2D, PRDM1, PZP, RXRA, sPla2, SSC5D,* ***TNXB****,* ***TRPM8***
Cellular Movement, Connective Tissue Development and Function, Amino Acid Metabolism	1×10^{-32}	13	***ALDH16A1****, ALDH1B1, ALDH3B1, ALDH3B2, ALDH4A1, ALDH7A1, ALDH9A1,* ***ARIH1****,* ***DHX16****,* ***GART****, GOLGB1,* ***IFI27****, IFI44, MAGEL2, MAN2C1, MRPL13, MTPAP, NDUFA1,* ***NFATC4****,* ***PAFAH1B2****,* ***PRRC2A****, PSMD11,* ***RALY****, SLC19A1,* ***TBXAS1****, TFAP2B, TRABD2B,* ***TRIM26****, UBC, UBLCP1,* ***VPS26A****, VPS26B, WNT10B,* ***WNT5A****, WNT5B*
Connective Tissue Disorders, Neurological Disease, Organismal Injury and Abnormalities	1×10^{-25}	14	*ADRBK1,* ***AIF1****,* ***C1GALT1****, C1GALT1C1,* ***C6orf25****,* ***CORT****,* ***CTNNAL1****, EMR2,* ***FAIM****,* ***FRYL****, GPR107, GPR108, GPR115, GPR126, GPR155, GPR176, GPR89A/GPR89B, HEATR6, MTMR8,* ***NPHS2****, NT5C, NUDT11,* ***OPN4****, PGAM4, PPAPDC2,* ***PPTC7****,* ***PSTPIP2****, PTPN11,* ***RNF39****, SSTR2,* ***STK19****, THTPA, TPTE, UBC,* ***UFL1***
Neurological Disease, Behavior, Immunological Disease	1×10^{-23}	13	***ABCF1****, ACAN,* ***ADAMTS8****, APP,* ***CA14****, cholesterol,* ***EGFL8****, ETV4,* ***GABBR1****,* ***GABRA4****, Gpcr,* ***GPR20****, GPR62, GPR75, GPR97, GPR110, GPR111, GPR144, GPR152, GPR156, GPR157, GPR162, GPR171, GPR174, GPRC5D, GPRC6A,* ***HDAC7****,* ***HOXD4****,* ***HPGD****, HTT,* ***IKZF3****, MITF,* ***MOG****, TIMM8B,* ***TSPO***
Cardiovascular System Development and Function, Organ Morphology, Skeletal and Muscular System Development and Function	1×10^{-22}	12	*ACP5, AHSP,* ***ATP2A2****, BTG3, CD69****,* ***CYP19A1****, DUSP16, ESRRA, HAND1,* ***HEY2****, HIST1H3C, Histone h3, Histone h4,* ***HOXD3****, HPSE,* ***IDI1****, IL9, KIR3DL1, LRWD1,* ***MICA****,* ***MSH5****, Mx1/Mx2, NFkB (complex), Pln, PSG5, REL/RELA/RELB, Scd2, SLN,* ***SPP1****,* ***STAT6****, TACC2,* ***TAGLN****,* ***TIE1****, TNFRSF4,* ***ZFPM2***
Molecular Transport, Organ Morphology, Skeletal and Muscular System Development and Function	1×10^{-7}	5	*ANK3,* ***APH1A****, APH1B, ATP1A1, ATP1A2, ATP1A3, ATP1B1, ATP1B2, ATP1B3, D1Pas1,* ***DTNA****, DUSP2, EPCAM, FXYD1,* ***FXYD2****, FXYD7, KCNJ10, KCNJ12, MAGEE1, MAPK3, MAPK4, MLC1, MTMR2, Na-k-atpase, PTPN7, SCN1A, SCN4A,* ***SCN9A****, SLC15A1, SNTA1, SNTB1, SNTB2,* ***TGFA****, voltage-gated sodium channel, YME1L1*
[a] Focus genes (overlapping MA and MO) are shown in bold.			