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# Supplemental Data

# Meta-analysis of Dense Genecentric Association Studies

# Reveals Common and Uncommon Variants

# Associated with Height

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**Table S1. Descriptive Characteristics of Cohorts Contributing Individual-Level Genotype Data**

| Study | N total* | N EuA* | N AA* | N His-panic* | N East Asian* | Recruitment design | Year of collection | Age | Ref (PMID) |
|---|---|---|---|---|---|---|---|---|---|
| ARIC† | 12048 | 9236 | 2812 | 0 | 0 | Community-based | 1985-2006 | 45-64 | 20400780 |
| CARDIA† | 2333 | 1302 | 1031 | 0 | 0 | Community-based | 1985-2003 | 18-30 | 20400780 |
| CFS† | 450 | 237 | 213 | 0 | 0 | Community-based | 1990-2008 | 20-90 | 20400780 |
| CHS† | 4172 | 3510 | 662 | 0 | 0 | Community-based | 1988-2005 | >65 | 20400780 |
| FHS† | 2289 | 2289 | 0 | 0 | 0 | Community-based | 1948-present | 20 to >80 | 20400780 |
| JHS† | 1588 | 0 | 1588 | 0 | 0 | Community-based | 1999-2005 | 35-84 | 20400780 |
| MESA† | 5447 | 2222 | 1550 | 1150 | 525 | Community-based | 1999-2009 | 45-84 | 20400780 |
| EpiDREAM | 8918 | 8918 | 0 | 0 | 0 | Clinical Trial Screen | 2001-2006 | >18 | 20372875 |
| CCCS | 1859 | 1859 | 0 | 0 | 0 | Clinical Trial | 2002-2003 | 45-92 | 16531616 |
| PHFS | 853 | 722 | 131 | 0 | 0 | Patient based | 2003-2008 | 43-88 | 20124441 |
| Penn ALI | 233 | 122 | 111 | 0 | 0 | Cohort | 1999-present | 14-96 | 18766098 |
| PennCATH | 1582 | 1582 | 0 | 0 | 0 | Case-control | 1998-2003 | 28-98 | 17258089 |
| PennCAC | 1923 | 1417 | 506 | 0 | 0 | Case-control | 1998-2008 | 18-75 | 15289378 |
| CH Study | 1116 | 0 | 0 | 0 | 0 | Case-control | 2002-2009 | 44-92 | 20124441 |
| KORA | 1048 | 1048 | 0 | 0 | 0 | Population-based | 1984-1990 | 25-72 | 15618061 |
| MEDAL | 4116 | 3929 | 187 | 0 | 0 | Clinical Trial | 2002-2006 | 49-92 | 17113426 |
| MERLIN - | 1836 | 1836 | 0 | 0 | 0 | Clinical Trial | 2004-2006 | >18 | 2029892 |

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|---|---|---|---|---|---|---|---|---|---|
| TIMI 36 | | | | | | | | | |
| WHII | 5261 | 4889 | 372 | 0 | 0 | Occupation- based | 1985-1989 | 35-55 | 1674771 |
| SHARE | 264 | 264 | 0 | 0 | 0 | Population-based | 2004-2007 | >18 | 11071182 |
| DARE | 162 | 162 | 0 | 0 | 0 | Case-control | 2003-2008 | >18 | N/A |
| SMART | 490 | 490 | 0 | 0 | 0 | Patient recruitment | 1996 | 18-80 | 10608355 |
| INVEST | 915 | 732 | 183 | 0 | 0 | Clinical trial | 1997-2003 | >50 | 14657064 |
| PEAR | 397 | 234 | 163 | 0 | 0 | Clinical trial | 2005-2010 | 17-65 | 19249413 |
| CLEAR | 1463 | 1463 | 0 | 0 | 0 | Case-control | 2005 | 37 to 89 | 16474172 |
| WHI | 4417 | 3815 | 397 | 113 | 92 | Multiple | 1993-1998 | 50-79 | 9492970 |
| Total | 65180 | 53394 | 9906 | 1263 | 617 | | | | |

*Number of individuals >21 years old with height and genotype information available for this study. AA denotes African Americans and EuA denotes European ancestry. †Members of the National Heart Lung Blood Institute (NHLBI), Candidate gene Association Resource (CARe). Abbreviations: Atherosclerosis Risk In Communities (ARIC); Coronary Artery Risk Development in Young Adults (CARDIA); Cleveland Family Study (CFS); Cardiovascular Health Study (CHS); Framingham Heart Study (FHS); Jackson Heart Study (JHS); Multi-Ethnic Study of Atherosclerosis (MESA); Diabetes Reduction Assessment with Ramipril and Rosiglitazone Medication (EpiDREAM); Cleveland Clinic CHARISMA Study (CCCS); University of Pennsylvania Heart Failure Study (PHFS); University of Pennsylvania Acute Lung Injury (Penn-ALI); University of Pennsylvania Catheterization study program (PennCATH); University of Pennsylvania Coronary Artery Calcification Study (PennCAC); Cincinnati Heart Study (CH Study); Cooperative Health Research in the Region of Augsburg Study (KORA); Multinational Etoricoxib and Diclofenac Arthritis Long-term (MEDAL) programme; Metabolic Efficiency With Ranolazine for Less Ischemia in Non−ST-Elevation Acute Coronary Syndromes (MERLIN)-Thrombolysis in Myocardial Infarction (TIMI) 36; Whitehall II study (WHII); Study of Health and Atherosclerosis risk in multiple Ethnicities(SHARE); Drug-Induced Arrhythmia Risk Evaluation (DARE); Second Manifestations of ARTerial disease SMART) ; INternational VErapamil SR Trandolapril Study (INVEST); Pharmacogenomics Evaluation of Antihypertensive Responses (PEAR); Carotid Lesion Epidemiology And Risk (CLEAR) and Women's Health Initiative (WHI).

**Table S2. Descriptive Characteristics of Cohorts Contributing Summary-Level Statistics**

| Study | N total* | N EuA* | N AA* | N His-panic* | N East Asian* | N South Asian* | N Native Amer.* | Study design | Year of collection | Age | Reference (PMID) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| BWHHS | 3382 | 3382 | 0 | 0 | 0 | 0 | 0 | Population-based | 1999-2001 | 60-79 | 16045529 |
| CLEAR | 987 | 987 | 0 | 0 | 0 | 0 | 0 | Case-control | 2005 | 37-89 | 16474172 |
| BOSS, EHLS, BDES | 1570 | 1570 | 0 | 0 | 0 | 0 | 0 | Population-based | 1988-present | >21 | 9801018, 1923372, 20008889 |
| EpiDREAM | 8005 | 0 | 1244 | 3277 | 224 | 2761 | 499 | Clinical Trial Screen | 2001-2006 | >18 | 20372875 |
| GRAPHIC | 1826 | 1826 | 0 | 0 | 0 | 0 | 0 | Community recruited | 2003-2005 | 21-61 | 18443236 |
| NHCTW | 143 | 0 | 0 | 0 | 143 | 0 | 0 | Occupational | 1997 | >18 | 12747513 |
| PROCARDIS | 6271 | 6271 | 0 | 0 | 0 | 0 | 0 | Case Control | 1998-present | 34-82 | 15266304 |
| AIBIII | 458 | 458 | 0 | 0 | 0 | 0 | 0 | Occupational | | | 16324215 |
| ASCOT | 1229 | 1229 | 0 | 0 | 0 | 0 | 0 | Prospective RCT | 1998-2000 | 40-79 | 11403364 |
| BRIGHT | 1803 | 1803 | 0 | 0 | 0 | 0 | 0 | Cases only | 1996-2003 | 21-84 | 12826435 |
| AGNES | 782 | 782 | 0 | 0 | 0 | 0 | 0 | Cases only | 2008 – 2012 | >21 | 20622880 |
| AMC-PAS | 713 | 713 | 0 | 0 | 0 | 0 | 0 | Cases only | 1993-2006 | 20-50 | 19164808 |
| GIRaPH | 1368 | 1368 | 0 | 0 | 0 | 0 | 0 | Cohort | 1999 | 18-82 | 15554949 |
| LURIC | 2662 | 2662 | 0 | 0 | 0 | 0 | 0 | Case-control | 1997 to 2002 | >18 | 19164808 |
| PROMIS | 3242 | 0 | 0 | 0 | 0 | 3242 | 0 | Case-Control | 2005-present | 30-80 | 19404752 |
| AMISH | 1369 | 1369 | 0 | 0 | 0 | 0 | 0 | Community based | 2002-2010 | 21-75 | 18440328 17261661 |
| GEOS | 924 | 924 | 0 | 0 | 0 | 0 | 0 | Case-Control | 1992-2008 | 15-49 | N/A |
| EPIC-NL | 5188 | 5188 | 0 | 0 | 0 | 0 | 0 | Case-Cohort | 1993-1997 | 20-70 | 19483199 |
| UCP | 2675 | 2675 | 0 | 0 | 0 | 0 | 0 | Nested Case-Control | 2000-2008 | 21-80 | 20712525& 19145769 |
| NORDIL/MDC | 2500 | 2500 | 0 | 0 | 0 | 0 | 0 | Clinical Trial & Population based | 1992-present & 1991-1996 | 45-74 | 8173702, 8429286 |
| BHS | 728 | 521 | 207 | 0 | 0 | 0 | 0 | Population based | 1972 – 2005 | 0-39 | 11876192 |
| GEOSTAT | 627 | 627 | 0 | 0 | 0 | 0 | 0 | Clinical Trial | 2005-2007 | >40 | 20207952 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Total | 48649 | 37052 | 1451 | 3277 | 367 | 6003 | 499 |

*Number of individuals >21 years old with height and genotype information available for this study. Abbreviations: EuA, European ancestry; AA, African American; British Women's Heart and Health Study (BWHHS); Beaver Dam Eye Study (BDES), Epidemiology of Hearing Loss Study (EHLS) and Beaver Dam Offspring Study (BOSS); Genetic Regulation of Arterial Pressure of Humans in the Community (GRAPHIC); Newly Hired Chinese Textile Workers (NHCTW) Study; Precocious Coronary Artery Disease (PROCARDIS); Allied Irish Bank Workers Study III (AIBIII); Anglo-Scandinavian Cardiac Outcomes Trial (ASCOT); British Genetics of Hypertension (BRIGHT); Arrhythmia Genetics in the Netherlands (AGNES); Academic Medical Center Amsterdam Premature Atherosclerosis Study (AMC-PAS);Genetic Identification of Riskfactors in Familial Hypercholesterolemia (GIRaPH); Ludwigshafen Risk and Cardiovascular Health Study (LURIC); PROMIS (Pakistan Risk of Myocardial Infarction Study); AMISH (Amish genetic studies of Lancaster County, PA);;GEOS (Genetics of Early Onset Stroke); European Prospective Investigation into Cancer and Nutrition in the Netherlands (EPIC-NL); Utrecht Cardiovascular Pharmacogenetics (UCP); Nordic Diltiazem (NORDIL) Study and Malmo Diet and Cancer (MDC) Study; Bogalusa Heart Study (BHS) and GEOSTAT a genetic sub-study of Secondary Prevention of Acute Coronary Events—Reduction Of Cholesterol to Key European Targets (SPACE ROCKET).

**Table S3. Sex-Specific Association with Adult Height in Phase III**

| Locus Rank | Chr | Candidate gene | SNP* | Effect allele | Male only European ancestry meta-analysis up to 38,086 Effect | Male only European ancestry meta-analysis up to 38,086 P | Female only European ancestry meta-analysis up to 39,094 Effect | Female only European ancestry meta-analysis up to 39,094 P | $P_{Het}$ (M vs F) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 7q22 | *CDK6* | rs4272 | A | - | $3.1x10^{-18}$ | - | $7.2x10^{-19}$ | 0.91 |
| 2 | 6p21 | *HMGA1* | rs1150781 | C | + | $7.4x10^{-12}$ | + | $2.4x10^{-22}$ | 0.063 |
| 3 | 12q15 | *HMGA2* | rs867633 | A | - | $1.1x10^{-19}$ | - | $2.6x10^{-13}$ | 0.16 |
| 4 | 20q11 | *MMP24* | rs2425019 | A | - | $1.5x10^{-12}$ | - | $2.1x10^{-15}$ | 0.65 |
| 5 | 17q23 | *MAP3K3* | rs8081612 | T | + | $2.6x10^{-9}$ | + | $1.6x10^{-12}$ | 0.50 |
| 6 | 17q24 | *GH1-GH2* | rs7921 | A | + | $1.4x10^{-9}$ | + | $3.4x10^{-12}$ | 0.62 |
| 7 | 1p36 | *MFAP2* | rs2284746 | C | - | $4.1x10^{-13}$ | - | $1.9x10^{-8}$ | 0.30 |
| 8 | 15q26 | *IGF1R* | rs2871865 | C | + | $6.1x10^{-9}$ | + | $3.5x10^{-11}$ | 0.66 |
| 9 | 7p22 | *GNA12* | rs1636255 | A | - | $4.1x10^{-13}$ | - | $4.5x10^{-7}$ | 0.14 |
| 10 | 17q23 | *TBX2* | rs9892365 | A | + | $2.2x10^{-6}$ | + | $2.9x10^{-13}$ | 0.09 |
| 11 | 12q22 | *SOCS2* | rs3782415 | T | - | $4.8x10^{-6}$ | - | $1.2x10^{-12}$ | 0.95 |
| 12 | 9q22 | *PTCH1* | rs10512248 | T | - | $9.0x10^{-8}$ | - | $2.3x10^{-8}$ | 0.75 |
| 13 | 14q11 | *NFATC4* | rs12590407 | T | - | $2.4x10^{-8}$ | - | $1.2x10^{-7}$ | 0.41 |
| 14 | 15q26 | *ACAN* | rs16942341 | T | - | $2.3x10^{-6}$ | - | $1.6x10^{-9}$ | 0.37 |
| 15 | 2q24 | *NPPC* | rs2679178 | T | - | $3.8x10^{-6}$ | - | $1.6x10^{-9}$ | 0.43 |
| 16 | 6p21 | *PPARD* | rs3734254 | T | + | $4.0x10^{-6}$ | + | $4.1x10^{-9}$ | 0.25 |
| 17 | 20q11 | *MYH7B* | rs2425012 | A | - | $3.6x10^{-9}$ | - | $1.0x10^{-5}$ | 0.90 |
| 18 | 19q13 | *IL11* | rs4252548 | T | - | $9.6x10^{-7}$ | - | $1.6x10^{-7}$ | 0.64 |
| 19 | 3q26 | *GHSR* | rs572169 | T | + | $3.4x10^{-6}$ | + | $4.7x10^{-8}$ | 0.59 |
| 20 | 2p23 | *POMC* | rs1866146 | A | - | $1.4x10^{-7}$ | - | $3.3x10^{-6}$ | 0.58 |
| 21 | 5p14 | *NPR3* | rs1173736 | A | - | $1.2x10^{-5}$ | - | $1.2x10^{-7}$ | 0.46 |
| 22 | 5p13 | *GHR* | rs6180 | A | + | $3.3x10^{-5}$ | + | $9.6x10^{-8}$ | 0.21 |
| 23 | 15q22 | *SMAD3* | rs35874463 | A | - | $1.7x10^{-4}$ | - | $1.6x10^{-8}$ | 0.57 |
| 24 | 11p15 | *SPTY2D1* | rs11024739 | A | - | $2.7x10^{-5}$ | - | $2.7x10^{-7}$ | 0.52 |
| 25 | 11p15 | *KCNQ1* | rs2075870 | A | - | $6.3x10^{-7}$ | - | $3.0x10^{-5}$ | 0.52 |
| 26 | 1p21 | *COL11A1* | rs4338381 | A | - | $9.0x10^{-7}$ | - | $3.4x10^{-5}$ | 0.060 |
| 27 | 9q21 | *PCSK5* | rs11144688 | A | - | $2.5x10^{-3}$ | - | $5.9x10^{-9}$ | 0.88 |
| 28 | 2p23 | *GCKR* | rs780094 | T | - | $1.0x10^{-5}$ | - | $1.5x10^{-5}$ | 0.14 |
| 29 | 1q41 | *TGFB2* | rs900 | A | - | $1.3x10^{-3}$ | - | $5.2x10^{-8}$ | 0.22 |
| 30 | 20q11 | *CDK5RAP1* | rs291700 | T | - | $2.9x10^{-7}$ | - | $4.0x10^{-4}$ | 0.51 |
| 31 | 2p12 | *EIF2AK3* | rs867529 | C | + | $1.7x10^{-4}$ | + | $1.5x10^{-6}$ | 0.33 |
| 32 | 19p13 | *INSR* | rs8108622 | A | + | $5.0x10^{-4}$ | + | $5.6x10^{-7}$ | 0.49 |
| 33 | 6q25 | *ESR1* | rs488133 | T | - | $3.4x10^{-6}$ | - | $1.5x10^{-4}$ | 0.89 |
| 34 | 2q37 | *DIS3L2* | rs3103296 | T | - | $3.1x10^{-5}$ | - | $5.6x10^{-5}$ | 0.76 |
| 35 | 2q35 | *PLCD4* | rs611203 | A | + | $1.2x10^{-4}$ | + | $1.2x10^{-5}$ | 0.25 |
| 36 | 1p36 | *RPS6KA1* | rs3816540 | A | + | $1.4x10^{-3}$ | + | $8.5x10^{-7}$ | 0.026 |
| 37 | 15q21 | *CYP19A1* | rs3751591 | A | + | $2.2x10^{-8}$ | + | $1.0x10^{-2}$ | 0.088 |
| 38 | 5q31 | *SLC22A5* | rs17622208 | A | + | $5.9x10^{-3}$ | + | $1.3x10^{-7}$ | 0.86 |
| 39 | 7p15 | *JAZF1* | rs864745 | T | + | $1.5x10^{-4}$ | + | $3.1x10^{-5}$ | 0.87 |
| 40 | 17p13 | *POLR2A* | rs8071847 | A | - | $4.4x10^{-6}$ | - | $1.1x10^{-3}$ | 0.31 |
| 41 | 1p22 | *PKN2* | rs12145922 | A | + | $3.3x10^{-4}$ | + | $2.4x10^{-5}$ | 0.71 |
| 42 | 7q22 | *CNOT4* | rs3812265 | T | + | $2.0x10^{-5}$ | + | $3.9x10^{-4}$ | 0.55 |
| 43 | 14p11 | *REST* | rs3796529 | T | + | $4.2x10^{-8}$ | + | $2.4x10^{-2}$ | 0.017 |
| 44 | 6p21 | *MICA* | rs2516448 | A | + | $6.0x10^{-3}$ | + | $1.5x10^{-6}$ | 0.20 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 45 | 11p11 | *PTPRJ* | rs4752805 | A | - | $9.8x10^{-4}$ | - | $1.8x10^{-5}$ | 0.53 |
| 46 | 16p13 | *CASKIN1* | rs258281 | A | - | $6.2x10^{-7}$ | - | $8.5x10^{-3}$ | 0.081 |
| 47 | 3q21 | *PCCB* | rs9844666 | A | - | $3.8x10^{-5}$ | - | $5.5x10^{-4}$ | 0.58 |
| 48 | 14q22 | *SAMD4A* | rs709939 | T | + | $1.1x10^{-2}$ | + | $1.7x10^{-6}$ | 0.13 |
| 49 | 11q13 | *BBS1-CTSF* | rs4630309 | A | + | $2.8x10^{-5}$ | + | $1.9x10^{-3}$ | 0.40 |
| 50 | 4q27 | *BBS7* | rs7659604 | T | + | $5.6x10^{-7}$ | + | $2.3x10^{-2}$ | 0.044 |
| 51 | 4q12 | *CLOCK* | rs4864546 | A | + | $2.6x10^{-5}$ | + | $2.9x10^{-3}$ | 0.35 |
| 52 | 12p12 | *PDE3A* | rs7137534 | T | + | $3.5x10^{-4}$ | + | $5.0x10^{-4}$ | 0.89 |
| 53 | 12q24 | *MPHOSPH9* | rs1051431 | A | - | $3.9x10^{-4}$ | - | $5.1x10^{-4}$ | 0.90 |
| 54 | 1p22 | *COL24A1* | rs2046159 | A | + | $1.2x10^{-5}$ | + | $7.8x10^{-3}$ | 0.20 |
| 55 | 1q23 | *DUSP23* | rs1129923 | A | - | $3.9x10^{-5}$ | - | $3.6x10^{-3}$ | 0.36 |
| 56 | 10q22 | *MAT1A* | rs7087728 | A | + | $2.1x10^{-4}$ | + | $1.2x10^{-3}$ | 0.70 |
| 57 | 2p15 | *PPP3R1* | rs1822469 | T | - | $2.7x10^{-3}$ | - | $9.0x10^{-5}$ | 0.60 |
| 58 | 7q36 | *ATG9B* | rs1800783 | A | - | $1.7x10^{-4}$ | - | $1.8x10^{-3}$ | 0.62 |
| 59 | 14q11 | *BCL2L2* | rs3210043 | A | + | $1.0x10^{-2}$ | + | $2.0x10^{-5}$ | 0.26 |
| 60 | 4p14 | *RFC1* | rs11096991 | T | + | $8.4x10^{-4}$ | + | $5.5x10^{-4}$ | 0.99 |
| 61 | 6p21 | *HLA-B* | rs2596494 | C | + | $5.5x10^{-3}$ | + | $7.1x10^{-5}$ | 0.40 |
| 62 | 6q21 | *ZBTB24* | rs1476387 | T | - | $2.7x10^{-3}$ | - | $1.8x10^{-4}$ | 0.65 |
| 63 | 17q24 | *GRB2* | rs959260 | T | + | $2.7x10^{-4}$ | + | $2.0x10^{-3}$ | 0.64 |
| 64 | 19p13 | *DNMT1* | rs8111085 | T | - | $1.1x10^{-4}$ | - | $4.4x10^{-3}$ | 0.43 |

*****lead SNP in locus from phase III

In both males and females, P is the significance of a sample size weighted Z-score-based fixed-effect meta-analyses.

**Table S4. Meta-analysis of Healthy Controls and Population-Based Cohorts**

| Locus rank | Chr | Candidate gene | SNP | Effect Allele | European ancestry phase III meta-analysis n = 90,446 +/- | *P* | European ancestry controls & population-cohorts meta-analysis n = 47,451 +/- | *P* |
|---|---|---|---|---|---|---|---|---|
| 1 | 7q22 | *CDK6* | rs4272 | A | - | $1.8x10^{-36}$ | - | $7.7x10^{-19}$ |
| 2 | 6p21 | *HMGA1* | rs1150781 | C | + | $7.3x10^{-32}$ | + | $2.9x10^{-22}$ |
| 3 | 12q15 | *HMGA2* | rs867633 | A | - | $5.6x10^{-31}$ | - | $5.4x10^{-17}$ |
| 4 | 20q11 | *MMP24* | rs2425019 | A | - | $2.4x10^{-26}$ | - | $1.4x10^{-19}$ |
| 5 | 17q23 | *MAP3K3* | rs8081612 | T | + | $3.2x10^{-20}$ | + | $1.0x10^{-9}$ |
| 6 | 17q24 | *GH1-GH2* | rs7921 | A | + | $3.3x10^{-20}$ | + | $7.8x10^{-8}$ |
| 7 | 1p36 | *MFAP2* | rs2284746 | C | - | $1.1x10^{-19}$ | - | $9.0x10^{-9}$ |
| 8 | 15q26 | *IGF1R* | rs2871865 | C | + | $1.3x10^{-18}$ | + | $5.3x10^{-11}$ |
| 9 | 7p22 | *GNA12* | rs1636255 | A | - | $3.0x10^{-18}$ | - | $1.1x10^{-9}$ |
| 10 | 17q23 | *TBX2* | rs9892365 | A | + | $1.4x10^{-17}$ | + | $3.5x10^{-11}$ |
| 11 | 12q22 | *SOCS2* | rs3782415 | T | - | $1.2x10^{-16}$ | - | $1.8x10^{-12}$ |
| 12 | 9q22 | *PTCH1* | rs10512248 | T | - | $1.1x10^{-14}$ | - | $1.5x10^{-5}$ |
| 13 | 14q11 | *NFATC4* | rs12590407 | T | - | $1.5x10^{-14}$ | - | $1.0x10^{-5}$ |
| 14 | 15q26 | *ACAN* | rs16942341 | T | - | $2.4x10^{-14}$ | - | $4.7x10^{-9}$ |
| 15 | 2q24 | *NPPC* | rs2679178 | T | - | $4.4x10^{-14}$ | - | $4.9x10^{-8}$ |
| 16 | 6p21 | *PPARD* | rs3734254 | T | + | $1.1x10^{-13}$ | + | $3.1x10^{-7}$ |
| 17 | 20q11 | *MYH7B* | rs2425012 | A | - | $3.4x10^{-13}$ | - | $1.0x10^{-9}$ |
| 18 | 19q13 | *IL11* | rs4252548 | T | - | $7.1x10^{-13}$ | - | $3.9x10^{-12}$ |
| 19 | 3q26 | *GHSR* | rs572169 | T | + | $8.3x10^{-13}$ | + | $8.8x10^{-9}$ |
| 20 | 2p23 | *POMC* | rs1866146 | A | - | $2.5x10^{-12}$ | - | $1.3x10^{-8}$ |
| 21 | 5p14 | *NPR3* | rs1173736 | A | - | $7.3x10^{-12}$ | - | $1.8x10^{-10}$ |
| 22 | 5p13 | *GHR* | rs6180 | A | + | $1.8x10^{-11}$ | + | $5.5x10^{-7}$ |
| 23 | 15q22 | *SMAD3* | rs35874463 | A | - | $2.5x10^{-11}$ | - | $1.5x10^{-7}$ |
| 24 | 11p15 | *SPTY2D1* | rs11024739 | A | - | $3.8x10^{-11}$ | - | $5.9x10^{-8}$ |
| 25 | 11p15 | *KCNQ1* | rs2075870 | A | - | $9.8x10^{-11}$ | - | $2.5x10^{-8}$ |
| 26 | 1p21 | *COL11A1* | rs4338381 | A | - | $1.6x10^{-10}$ | - | $2.4x10^{-5}$ |
| 27 | 9q21 | *PCSK5* | rs11144688 | A | - | $3.3x10^{-10}$ | - | $1.7x10^{-6}$ |
| 28 | 2p23 | *GCKR* | rs780094 | T | - | $6.4x10^{-10}$ | - | $4.8x10^{-6}$ |
| 29 | 1q41 | *TGFB2* | rs900 | A | - | $8.0x10^{-10}$ | - | $3.5x10^{-5}$ |
| 30 | 20q11 | *CDK5RAP1* | rs291700 | T | - | $9.9x10^{-10}$ | - | $7.2x10^{-4}$ |
| 31 | 2p12 | *EIF2AK3* | rs867529 | C | + | $1.3x10^{-8}$ | + | $8.9x10^{-8}$ |
| 32 | 19p13 | *INSR* | rs8108622 | A | + | $1.8x10^{-9}$ | + | $4.0x10^{-5}$ |
| 33 | 6q25 | *ESR1* | rs488133 | T | - | $2.6x10^{-9}$ | - | $2.0x10^{-5}$ |
| 34 | 2q37 | *DIS3L2* | rs3103296 | T | - | $4.8x10^{-9}$ | - | $2.0x10^{-6}$ |
| 35 | 2q35 | *PLCD4* | rs611203 | A | + | $5.8x10^{-9}$ | + | $2.5x10^{-2}$ |
| 36 | 1p36 | *RPS6KA1* | rs3816540 | A | + | $8.5x10^{-9}$ | + | $1.5x10^{-4}$ |
| 37 | 15q21 | *CYP19A1* | rs3751591 | A | + | $9.4x10^{-9}$ | + | $1.1x10^{-5}$ |
| 38 | 5q31 | *SLC22A5* | rs17622208 | A | + | $1.1x10^{-8}$ | + | $1.6x10^{-4}$ |
| 39 | 7p15 | *JAZF1* | rs864745 | T | + | $1.9x10^{-8}$ | + | $2.1x10^{-6}$ |
| 40 | 17p13 | *POLR2A* | rs8071847 | A | - | $3.0x10^{-8}$ | - | $5.2x10^{-4}$ |
| 41 | 1p22 | *PKN2* | rs12145922 | A | + | $3.2x10^{-8}$ | + | $5.6x10^{-4}$ |
| 42 | 7q22 | *CNOT4* | rs3812265 | T | + | $3.4x10^{-8}$ | + | $7.9x10^{-5}$ |
| 43 | 14p11 | *REST* | rs3796529 | T | + | $5.7x10^{-8}$ | + | $3.7x10^{-5}$ |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 44 | 6p21 | *MICA* | rs2516448 | A | + | $7.0x10^{-8}$ | + | $2.7x10^{-4}$ |
| 45 | 11p11 | *PTPRJ* | rs4752805 | A | - | $7.9x10^{-8}$ | - | $4.4x10^{-6}$ |
| 46 | 16p13 | *CASKIN1* | rs258281 | A | - | $8.3x10^{-8}$ | - | $2.6x10^{-3}$ |
| 47 | 3q21 | *PCCB* | rs9844666 | A | - | $8.9x10^{-8}$ | - | $7.3x10^{-5}$ |
| 48 | 14q22 | *SAMD4A* | rs709939 | T | + | $1.8x10^{-7}$ | + | $7.6x10^{-5}$ |
| 49 | 11q13 | *BBS1-CTSF* | rs4630309 | A | + | $2.7x10^{-7}$ | + | $4.0x10^{-5}$ |
| 50 | 4q27 | *BBS7* | rs7659604 | T | + | $3.2x10^{-7}$ | + | $3.5x10^{-4}$ |
| 51 | 4q12 | *CLOCK* | rs4864546 | A | + | $4.0x10^{-7}$ | + | $5.3x10^{-7}$ |
| 52 | 12p12 | *PDE3A* | rs7137534 | T | + | $6.1x10^{-7}$ | + | $3.5x10^{-4}$ |
| 53 | 12q24 | *MPHOSPH9* | rs1051431 | A | - | $6.9x10^{-7}$ | - | $1.6x10^{-4}$ |
| 54 | 1p22 | *COL24A1* | rs2046159 | A | + | $7.1x10^{-7}$ | + | $1.0x10^{-2}$ |
| 55 | 1q23 | *DUSP23* | rs1129923 | A | - | $7.4x10^{-7}$ | - | $1.7x10^{-3}$ |
| 56 | 10q22 | *MAT1A* | rs7087728 | A | + | $9.1x10^{-7}$ | + | $6.1x10^{-3}$ |
| 57 | 2p15 | *PPP3R1* | rs1822469 | T | - | $9.3x10^{-7}$ | - | $2.3x10^{-4}$ |
| 58 | 7q36 | *ATG9B* | rs1800783 | A | - | $1.2x10^{-6}$ | - | $2.7x10^{-4}$ |
| 59 | 14q11 | *BCL2L2* | rs3210043 | A | + | $1.3x10^{-6}$ | + | $2.0x10^{-6}$ |
| 60 | 4p14 | *RFC1* | rs11096991 | T | + | $1.5x10^{-6}$ | + | $5.5x10^{-4}$ |
| 61 | 6p21 | *HLA-B* | rs2596494 | C | + | $1.8x10^{-6}$ | + | $6.0x10^{-3}$ |
| 62 | 6p21 | *ZBTB24* | rs1476387 | T | - | $1.9x10^{-6}$ | - | $6.6x10^{-4}$ |
| 63 | 17q24 | *GRB2* | rs959260 | T | + | $2.1x10^{-6}$ | + | $5.3x10^{-6}$ |
| 64 | 19p13 | *DNMT1* | rs8111085 | T | - | $2.2x10^{-6}$ | - | $1.2x10^{-4}$ |

Cohorts included from population-based tests were: ARIC, CARDIA, CFS, CHS, FHS, MESA, KORA, WHII, SHARE, BWHHS, BOSS, GRAPHIC, AIBIII, HAPI, EPIC-NL, BHS. Control-only data from the following studies was included: PennCATH, PennCAC, MEDAL, WHI

**Table S5. Loci Surpassing Array-wide Significance Threshold in Multiethnic Phase IV but Not in Phase III**

| Chr | Candidate gene | SNP | Effect Allele | Effect | Multiethnic phase IV up to 114,223 *P* | Report before 2010 | Lango Allen *et al.* 2010 |
|---|---|---|---|---|---|---|---|
| 15q25 | *PDE8A* | rs289386 | T | - | $1.4x10^{-7}$ | | |
| 11p11 | *FOLH1* | rs202676 | A | - | $1.5x10^{-7}$ | | Yes |
| 10q26 | *GRK5* | rs291979 | A | + | $3.1x10^{-7}$ | | |
| 9p12 | *BAG1* | rs3758271 | T | + | $5.1x10^{-7}$ | | |
| 14q24 | *TGFB3* | rs3917210 | A | - | $1.7x10^{-7}$ | | |

**Table S6. Multiethnic Replication of Adult Height**

| Locus rank | Chr | Candidate gene | SNP | Effect Allele | European ancestry phase III meta-analysis n = 90,446 +/- | *P* | African-American meta-analysis n = 11,357 +/- | *P* | South Asian meta-analysis n = 6,003 +/- | *P* | Hispanic meta-analysis n=4,934 +/- | *P* | Concordant in all ethnicities? |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7q22 | *CDK6* | rs4272 | A | - | $1.8x10^{-36}$ | -* | **0.024** | -* | 0.062 | -* | **0.014** | Yes |
| 2 | 6p21 | *HMGA1* | rs1150781 | C | + | $7.3x10^{-32}$ | +* | **$1.6x10^{-5}$** | +* | **$2.1x10^{-3}$** | +* | **0.038** | Yes |
| 3 | 12q15 | *HMGA2* | rs867633 | A | - | $5.6x10^{-31}$ | -* | 0.059 | -* | 0.81 | -* | 0.063 | Yes |
| 4 | 20q11 | *MMP24* | rs2425019 | A | - | $2.4x10^{-26}$ | -* | 0.10 | + | 0.62 | -* | **$7.2x10^{-3}$** | |
| 5 | 17q23 | *MAP3K3* | rs8081612 | T | + | $3.2x10^{-20}$ | +* | **0.013** | +* | 0.44 | +* | 0.12 | Yes |
| 6 | 17q24 | *GH1-GH2* | rs7921 | A | + | $3.3x10^{-20}$ | +* | 0.065 | +* | 0.28 | +* | 0.14 | Yes |
| 7 | 1p36 | *MFAP2* | rs2284746 | C | - | $1.1x10^{-19}$ | + | 0.69 | -* | 0.17 | -* | **0.033** | |
| 8 | 15q26 | *IGF1R* | rs2871865 | C | + | $1.3x10^{-18}$ | +* | 0.19 | +* | 0.23 | +* | 0.31 | Yes |
| 9 | 7p22 | *GNA12* | rs1636255 | A | - | $3.0x10^{-18}$ | -* | **0.042** | | n/a | -* | 0.16 | Yes |
| 10 | 17q23 | *TBX2* | rs9892365 | A | + | $1.4x10^{-17}$ | +* | 0.49 | +* | 0.11 | +* | 0.10 | Yes |
| 11 | 12q22 | *SOCS2* | rs3782415 | T | - | $1.2x10^{-16}$ | -* | 0.56 | -* | 0.13 | -* | 0.32 | Yes |
| 12 | 9q22 | *PTCH1* | rs10512248 | T | - | $1.1x10^{-14}$ | + | 0.53 | -* | 0.26 | -* | 0.13 | |
| 13 | 14q11 | *NFATC4* | rs12590407 | T | - | $1.5x10^{-14}$ | -* | 0.82 | + | 0.98 | -* | 0.81 | |
| 14 | 15q26 | *ACAN* | rs16942341 | T | - | $2.4x10^{-14}$ | -* | 0.11 | -* | **0.047** | -* | 0.074 | Yes |
| 15 | 2q24 | *NPPC* | rs2679178 | T | - | $4.4x10^{-14}$ | -* | 0.30 | -* | 0.51 | -* | 0.23 | Yes |
| 16 | 6p21 | *PPARD* | rs3734254 | T | + | $1.1x10^{-13}$ | - | 0.52 | +* | 0.32 | - | 0.85 | |
| 17 | 20q11 | *MYH7B* | rs2425012 | A | - | $3.4x10^{-13}$ | + | 0.80 | + | 0.90 | -* | **0.027** | |
| 18 | 19q13 | *IL11* | rs4252548 | T | - | $7.1x10^{-13}$ | -* | 0.99 | -* | 0.086 | + | 0.99 | |
| 19 | 3q26 | *GHSR* | rs572169 | T | + | $8.3x10^{-13}$ | +* | 0.45 | +* | 0.80 | +* | 0.82 | Yes |
| 20 | 2p23 | *POMC* | rs1866146 | A | - | $2.5x10^{-12}$ | -* | 0.42 | -* | 0.84 | -* | 0.23 | Yes |
| 21 | 5p14 | *NPR3* | rs1173736 | A | - | $7.3x10^{-12}$ | + | 0.73 | -* | 0.28 | -* | 0.80 | |
| 22 | 5p13 | *GHR* | rs6180 | A | + | $1.8x10^{-11}$ | +* | 0.58 | +* | 0.29 | +* | **$4.8x10^{-3}$** | Yes |
| 23 | 15q22 | *SMAD3* | rs35874463 | A | - | $2.5x10^{-11}$ | -* | 0.070 | -* | 0.059 | -* | 0.086 | Yes |
| 24 | 11p15 | *SPTY2D1* | rs11024739 | A | - | $3.8x10^{-11}$ | + | 0.61 | -* | 0.25 | -* | 0.10 | |
| 25 | 11p15 | *KCNQ1* | rs2075870 | A | - | $9.8x10^{-11}$ | + | 0.91 | + | 0.59 | + | 0.88 | |
| 26 | 1p21 | *COL11A1* | rs4338381 | A | - | $1.6x10^{-10}$ | -* | 0.81 | -* | 0.99 | -* | **0.027** | Yes |
| 27 | 9q21 | *PCSK5* | rs11144688 | A | - | $3.3x10^{-10}$ | -* | 0.90 | -* | 0.95 | -* | 0.21 | Yes |
| 28 | 2p23 | *GCKR* | rs780094 | T | - | $6.4x10^{-10}$ | -* | **0.024** | -* | 0.29 | -* | 0.68 | Yes |
| 29 | 1q41 | *TGFB2* | rs900 | A | - | $8.0x10^{-10}$ | -* | 0.35 | -* | 0.56 | -* | 0.081 | Yes |
| 30 | 20q11 | *CDK5RAP1* | rs291700 | T | - | $9.9x10^{-10}$ | -* | **0.032** | -* | 0.99 | -* | 0.61 | Yes |
| 31 | 2p12 | *EIF2AK3* | rs867529 | C | + | $1.3x10^{-8}$ | +* | 0.46 | +* | **0.040** | +* | 0.22 | Yes |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32 | 19p13 | *INSR* | rs8108622 | A | + | $1.8x10^{-9}$ | +* | 0.11 | +* | 0.25 | - | 0.70 | |
| 33 | 6q25 | *ESR1* | rs488133 | T | - | $2.6x10^{-9}$ | -* | 0.071 | -* | 0.39 | -* | 0.35 | Yes |
| 34 | 2q37 | *DIS3L2* | rs3103296 | T | - | $4.8x10^{-9}$ | + | 0.075 | + | 0.55 | -* | 0.87 | |
| 35 | 2q35 | *PLCD4* | rs611203 | A | + | $5.8x10^{-9}$ | - | 0.96 | +* | 0.47 | +* | 0.39 | |
| 36 | 1p36 | *RPS6KA1* | rs3816540 | A | + | $8.5x10^{-9}$ | +* | 0.87 | - | 0.64 | +* | 0.46 | |
| 37 | 15q21 | *CYP19A1* | rs3751591 | A | + | $9.4x10^{-9}$ | +* | 0.82 | +* | 0.61 | +* | 0.11 | Yes |
| 38 | 5q31 | *SLC22A5* | rs17622208 | A | + | $1.1x10^{-8}$ | +* | **$2.1x10^{-4}$** | +* | 0.18 | +* | 0.10 | Yes |
| 39 | 7p15 | *JAZF1* | rs864745 | T | + | $1.9x10^{-8}$ | +* | 0.15 | | n/a | +* | 0.36 | Yes |
| 40 | 17p13 | *POLR2A* | rs8071847 | A | - | $3.0x10^{-8}$ | -* | 0.36 | -* | **$4.6x10^{-3}$** | -* | 0.60 | Yes |
| 41 | 1p22 | *PKN2* | rs12145922 | A | + | $3.2x10^{-8}$ | +* | **0.044** | +* | 0.77 | - | 0.42 | |
| 42 | 7q22 | *CNOT4* | rs3812265 | T | + | $3.4x10^{-8}$ | +* | 0.91 | +* | 0.11 | - | 0.23 | |
| 43 | 14p11 | *REST* | rs3796529 | T | + | $5.7x10^{-8}$ | +* | 0.46 | - | 0.89 | +* | 0.30 | |
| 44 | 6p21 | *MICA* | rs2516448 | A | + | $7.0x10^{-8}$ | +* | **0.042** | | n/a | +* | 0.49 | Yes |
| 45 | 11p11 | *PTPRJ* | rs4752805 | A | - | $7.9x10^{-8}$ | -* | 0.58 | -* | 0.22 | -* | 0.64 | Yes |
| 46 | 16p13 | *CASKIN1* | rs258281 | A | - | $8.3x10^{-8}$ | -* | **0.048** | -* | 0.986 | -* | 0.56 | Yes |
| 47 | 3q21 | *PCCB* | rs9844666 | A | - | $8.9x10^{-8}$ | + | 0.52 | -* | 0.89 | -* | **0.044** | |
| 48 | 14q22 | *SAMD4A* | rs709939 | T | + | $1.8x10^{-7}$ | - | 0.99 | +* | 0.77 | - | 0.47 | |
| 49 | 11q13 | *BBS1-CTSF* | rs4630309 | A | + | $2.7x10^{-7}$ | - | 0.58 | +* | 0.25 | +* | 0.16 | |
| 50 | 4q27 | *BBS7* | rs7659604 | T | + | $3.2x10^{-7}$ | - | 0.99 | +* | 0.11 | +* | 0.72 | |
| 51 | 4q12 | *CLOCK* | rs4864546 | A | + | $4.0x10^{-7}$ | +* | **0.042** | +* | 0.80 | +* | 0.38 | Yes |
| 52 | 12p12 | *PDE3A* | rs7137534 | T | + | $6.1x10^{-7}$ | +* | 0.95 | +* | 0.87 | +* | **$1.9x10^{-3}$** | Yes |
| 53 | 12q24 | *MPHOSPH9* | rs1051431 | A | - | $6.9x10^{-7}$ | -* | 0.66 | -* | 0.84 | + | 0.84 | |
| 54 | 1p22 | *COL24A1* | rs2046159 | A | + | $7.1x10^{-7}$ | - | 0.41 | +* | 0.85 | +* | 0.38 | |
| 55 | 1q23 | *DUSP23* | rs1129923 | A | - | $7.4x10^{-7}$ | + | 0.45 | + | 0.52 | + | 0.30 | |
| 56 | 10q22 | *MAT1A* | rs7087728 | A | + | $9.1x10^{-7}$ | +* | 0.55 | +* | 0.29 | +* | 0.45 | Yes |
| 57 | 2p15 | *PPP3R1* | rs1822469 | T | - | $9.3x10^{-7}$ | -* | 0.92 | + | 0.85 | + | 0.86 | |
| 58 | 7q36 | *ATG9B* | rs1800783 | A | - | $1.2x10^{-6}$ | + | 0.51 | -* | 0.47 | -* | 0.23 | |
| 59 | 14q11 | *BCL2L2* | rs3210043 | A | + | $1.3x10^{-6}$ | +* | 0.18 | +* | 0.20 | +* | 0.071 | Yes |
| 60 | 4p14 | *RFC1* | rs11096991 | T | + | $1.5x10^{-6}$ | +* | 0.69 | - | 0.86 | - | 0.46 | |
| 61 | 6p21 | *HLA-B* | rs2596494 | C | + | $1.8x10^{-6}$ | +* | 0.52 | +* | 0.26 | +* | 0.89 | Yes |
| 62 | 6p21 | *ZBTB24* | rs1476387 | T | - | $1.9x10^{-6}$ | -* | 0.12 | + | 0.37 | -* | 0.57 | |
| 63 | 17q24 | *GRB2* | rs959260 | T | + | $2.1x10^{-6}$ | +* | 0.43 | - | 0.93 | +* | 0.16 | |
| 64 | 19p13 | *DNMT1* | rs8111085 | T | - | $2.2x10^{-6}$ | -* | 0.45 | -* | 0.53 | -* | 0.37 | Yes |

* indicates that direction of effect is concordant with European ancestry. Bold entries surpass a marginal significance of $P < 0.05$.

48 out of 64 array-wide significant SNPs are concordant in African Americans ($P = 3.9 \times 10^{-5}$)

49 out of 61 array-wide significant SNPs are concordant in South Asians ($P = 9.8 \times 10^{-7}$)

53 out of 64 array-wide significant SNPs are concordant in Hispanics ($P = 5.0 \times 10^{-8}$)

35 of 64 SNPs were concordant across all 4 ethnic groups ($P = 8.0 \times 10^{-16}$)

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